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INHALT

EDITORIAL

Ernst Müller

Das *Forum Interdisziplinäre Begriffsgeschichte* hat in seiner zwölfjährigen Geschichte immer wieder Begriffe an der Schnittstelle von Biologie sowie Gesellschaft und Kultur, insbesondere aber solche des ökologischen Diskurses thematisiert. Die Ausgabe 2012 (3) behandelte die Beziehungen von *Außenwelt und Organismus* um 1800, in der Ausgabe 2014 (1) standen Interdifferenzen des *Evolutionsbegriffs* in Natur und Kultur im Mittelpunkt, in Heft 2014 (2) schließlich die Begriffe *Umwelt*, *Milieu* und *Ecosystem*. In der gleichen Ausgabe hatte Julia Nordblad unter dem Titel »The Future of the Noossphere« bereits über den wissenschaftliche wie nationale Grenzen überschreitenden Geologen und Mineralogen Wladimir Iwanowitsch Wernadski geschrieben, der heute auch als ein Vorreiter der Debatten um das Anthropozän angesehen wird. Das vorliegende, von der Slawistin Tatjana Petzer (Universität Graz) als Gastherausgeberin gestaltete Schwerpunktthema *Ecology in Eastern European Terminology*, entstanden im Rahmen des DFG-Netzwerks *Russian Ecospheres. Forms of Ecological Knowledge in Russian Literature, Culture and History* (2022–2025), lässt sich als Fortsetzung dieser Thematiken verstehen. Die Beiträge verdeutlichen, wie Wissenschaftlerinnen und Wissenschaftler osteuropäischer Länder und der Sowjetunion, die oftmals zunächst im engen Kontakt mit westeuropäischen Wissenschaftsentwicklungen standen, aufgrund der späteren, vor allem im Kalten Krieg forcierten Abkoppelung eigenständige Terminologien und Konzepte entwickelten, deren Zusammenhang mit westlichen Ideen dadurch verdeckt waren, und doch mitunter auch wieder auf sie zurückwirkten. Viele der behandelten interdisziplinären Begriffe (*Biogeochemie*, *Biogeozönose*, *Metabolismus*, *Regulation* oder *Geocryologie*) thematisieren den heute so intensiv diskutierten Zusammenhang zwischen Ökologie und Geologie. Die Autorinnen und Autoren sowie die Beiträge des Schwerpunktes stellt Tatjana Petzer in ihrer Einleitung vor.

Außerhalb des Themenschwerpunktes steht ein Beitrag zum politischen Schlagwort der *Märzgefallenen* von Christoph Hamann (Berlin). Der promovierte Historiker unterstützt die überparteiliche Bürgerinitiative *Aktion 18. März*, die sich über zahlreiche prominente Mitglieder und mit ihrem Publikationsorgan, dem *Aufruf*, seit langem um die Erinnerung an die Demokratiegeschichte in Berlin und Deutschland bemüht. Der 18. März 1848 ist der Tag der blutigen Barrikadenkämpfe in Berlin, die zur Zusage eines Verfassungsstaates von König Friedrich Wilhelm IV. führten. Anlässlich des Jahrestages der gescheiterten demokratischen Revolution von 1848 rekonstruiert Hamann präzise die politische und Mediengeschichte des politischen Schlagwortes ›Märzgefallene‹. So wie der 18. März – man denke an die DDR-Volkskammerwahl 1990 und den Anschluss an die Bundesrepublik ohne neue Verfassung – wie kaum ein anderer Tag der deutschen Geschichte für demokratisch-revolutionäre Bewegungen und ihr Scheitern steht, so diente die Semantik des Wortes ›Märzgefallene‹ sowohl dem Gedenken an die Opfer als auch deren Vereinnahmung und mitunter Verhöhnung.

Die Ausgabe beschließt eine Rezension von Constantin Sinn, der in Hamburg und an der Humboldt-Universität zu Berlin ein Studium Individuale und Kulturwissenschaft absolvierte und sich derzeit auf sein Promotionsstudium vorbereitet. In seinem Beitrag widmet er sich einem Wörterbuch der kleinen Form, nämlich dem von Hendrikje Schauer und Marcel Lepper herausgegebenen Titellexikon, in dem 25 Beiträge in spielerischer Form über Werke aus Literatur, Dichtung, Philosophie, Theater, Radio und Film reflektieren, die in irgendeiner Weise die Nacht zum Gegenstand haben.

In eigener Sache bleibt anzumerken, dass ab der nächsten Ausgabe Falko Schmieder die Herausgabe des FIB für das ZfL übernehmen wird.

ECOLOGY IN EASTERN EUROPEAN TERMINOLOGY
INTRODUCTORY REMARKS

Tatjana Petzer

The Soviet Union is remembered as a lab for socio-economic changes on larges scales and environmental catastrophes: the Chernobyl disaster, the Aral Sea tragedy, and ecocide[1]. However, little is known about the groundbreaking concepts and theories of Russian and early Soviet science which laid the foundation for systemic ecological thinking, environmental consciousness for nature conservation, and corresponding initiatives of the revolutionary years after 1917. The isolation of Eastern Europe that came as a result of Stalinism and the Cold War led to Soviet science developing its own scientific approaches and terminology during the 20th century. This does not only include ideological constructions and practices such as the pseudo-scientific Lysenkoism[2] which outlawed genetics and led to disastrous effects on agriculture, the people, and the scientific community. Soviet science has also managed to continue and unfold the new concepts and interdisciplinary dynamics of the ecological turn on the threshold of the 20th century, a development which, at that time, was only sporadically noted in the West. In the context of its thematic focus on Eastern European ecological terminology, this issue discusses a selection of these concepts.

Russian and Soviet scientists were always aware of and reflected upon their own contributions and the different potentials of environmental and ecological sciences. Their milestones include:

- the foundation of early soil science by pioneering Russian professor of mineralogy and geology at the St. Petersburg University, Vasilii Dokuchaev (1846–1903), who developed a combinatoric approach to environmental factors such as geology, topography, climate, and organisms, and, in accordance with their interaction, formulated the first soil classification system distinguishing ›natural-historical zones‹ (*estestvennoistoricheskie zony*)[3] such as the taiga, tundra, steppe, and others;

- the foundation of scientific forestry by Georgii Morozov (1867–1920), who was appointed professor for this field at St. Petersburg University. Here, he systematically developed the fundamentals of community ecology, also referred to – with recourse on the notion of *Biozönose* (biocoenosis) as coined by the German zoologist Karl Möbius which describes interacting organisms within a habitat – as biocoenology or synecology. Morozov was a vehement advocate for the foundation of nature sanctuaries (*zapovedniki*) in which any human activity other than scientific research was prohibited by law,[4] a necessity he postulated in 1910 at the Congress of Russian Naturalists;

- Aleksei Pavlov's (1854–1929) recognition of humanity as the main force of the Earth's evident change and its impact on a geological scale. In 1922, the professor and founder of the Moscow

1 See Murray Feshbach, Alfred Friendly (eds.): *Ecocide in the USSR: Health and Nature under Siege*, New York: Basic Books 1992.

2 A neo-Lamarckian doctrine developed and practiced by the agronomist Trofim Lysenko (1898–1976) and his supporters who claimed that crop plants could be ›educated‹ to free themselves from dependencies on soil and climatic conditions—to be transformed by being conditioned to new environments.

3 Borrowing from German terminology, the geographer Lev Berg (1876–1950) replaced Dokuchaev's ›natural zone‹ with ›geographical landscape‹ (*geograficheskii landshaft*).

4 Under Lenin, the resolution »On the Protection of Nature, Gardens, and Parks« was approved by the Soviet government in 1921. See Douglas R. Weiner: »Community Ecology in Stalin's Russia: ›Socialist‹ and ›Bourgeois‹ Science«, in: *Isis* 75 (1984), no. 4, pp. 684–696.

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school of geology introduced the alternate geochronological notion of the ›anthropogene period‹ (*antropogennii period*) or ›anthropogene‹ (*antropogen*)[5] as a substitute for the entire quaternary, a notion which was broadly used in the Soviet Union and Eastern Europe since it was officially accepted in 1963;[6]

- the rise of global ecology, or, in the words of Vladimir Vernadsky[7] (1863–1945), a student of Dokuchaev and professor of crystallography and mineralogy at Moscow University: the ›planetarian role‹ of the ›living matter‹ in the ›biosphere‹, a notion adapted from Austrian geologist Edward Suess who coined it in 1875 to distinguish the life-saturated envelope of the Earth's crust. However, Vernadsky used it to emphasize the anthropogenic transformations of biogeochemical cycles of the biosphere which, in turn, alterates itself towards a ›noosphere‹.

At this point, the aforementioned concept transfer allows for a recourse towards the polymath of the Russian Enlightenment, Mikhail Lomonosov, who, after being educated in humanities, natural sciences, and engineering in St. Petersburg, Moscow, Kyiv, Marburg, and Freiburg, introduced the linguistic basis for higher education into the Russian language and Russian terminology for his wide-ranging, multidisciplinary research from Earth studies to astronomy. His goal was to understand that the migration and translation of concepts is more than the appropriation of Western science and thought upon domestic learning. The Russian Academy of Science was recognized in the scholarly world and has maintained international cooperation. Nevertheless, conceptual migration processes in the opposite direction were non-existent or marginalized. Even though prerevolutionary and early postrevolutionary science was multilingual and present in international academic journals, concepts and theories from Russian and early Soviet geosciences were barely noted, let alone Russian-language publications, for instance on the establishment of interdisciplinary research fields such as permafrost science or permafrostology (*mrzlotovedenie*), which was later renamed to ›geocryology‹.[8] Here, a prominent example is Vernadsky's work on the biosphere: he taught at the Sorbonne in Paris between 1922 and 1926, where he published *La géochimie* (1922) and developed his concept of the biosphere, which was published in 1926 in Russian (*Biosfera*) and translated into French in 1929 (*La Biosphère*). However, this work remained unrecognized for decades, due to the terminological confusion, the misleading notion of the biosphere in general, and Vernadsky's holistic sphereological approach to the biogeochemistry of life and ecological co-evolution.[9] Moreover, the retrospective misreading of Vernadsky to fit the Soviet ideology of a collective communist human world transformative agency[10] neglects the scientists' resistance to the political bias as well as their independent and global ecological thought.

In addition to Paris, Berlin and London must be mentioned as places for the transfer of ideas of Soviet provenance: in 1927, the Russian Naturalist Week[11] was initiated in the context of the Soviet government's exchange agreement with Germany, followed by the Second International Conference on the History of Science and Technology in 1931, where scientists from the Soviet Union affected socialist thinkers and the British tradition of »red science«.[12] A few years later, the relationship between the East and the West changed, and all of the 1931 participants, together with further ecological scientists and thinkers as well as opponents of Lysenko fell victim to the Stalinist purges.[13] Nevertheless, the interest in Soviet science

5 The Russian ›-gen‹ suffix usually signifies a geological period.

6 A Commission for Quaternary Research was established in 1927 and chaired by Pavlov in the first couple of years. The commission's second session on stratigraphy accepted both ›quarternary‹ (*chetvertichnyi*) and ›anthropogene‹ (*antropogenovyi*) as equivalent terms.

7 Cyrillic letters are transliterated according to the Library of Congress romanization system, however, in the body of the text, familiar spellings of names are used in some cases (e.g. Vernadsky instead of Vernadskii).

8 See Mikhail I. Sumgin: *Vechnaia merzlota, pochvy v predelach SSSR* [Permafrost Soils in the USSR], Moscow: Akad. Nauk SSSR 1926. Id.: *Obshchee merzlotovedenie* [General Permafrostology], Moscow: Akad. Nauk SSSR 1940. Petr F. Shvetsov: *Vvodnye glavy k osnovam geokriologii* [Introductory Chapters on the Principles of Geocryology], Moscow: Akad. Nauk SSSR 1955, pp. 23–24.

9 Nicholas Polunin, Jacques Grinevald: »Vernadsky and Biospheral Ecology«, in: *Environmental Conservation* 15 (1988), no. 2, pp. 117–122, here p. 118.

10 Simon L. Lewis, Mark A. Maslin: »Defining the Anthropocene«, in: *Nature* 519 (2015), no. 7542, pp. 171–180, here p. 173.

11 Oskar Vogt, A[leksandr] E. Fersman: »Die Russische Forscherwoche in Berlin«, in: *Osteuropa* 2 (1927), no. 8–9, pp. 459–465.

12 John Bellamy Foster: *The Return of Nature: Socialism and Ecology*, New York, NY: Monthly Review Press 2020, p. 334.

13 See John Bellamy Foster: *Capitalism in the Anthropocene: Ecological Ruin or Ecological Revolution*, New York: Month-

persisted. In 1939, British ecologist Richard Carpenter reviewed the latest achievements of the synecological research conducted in the Soviet Union, including an 18-page-long list of his East European colleagues' publications.[14]

The Purges, the Second World War and the Cold War, Stalin's 1948 Plan for the Great Transformation of Nature, geoengineering, and Lysenko's attempt to intervene into forest management as well as the environmental degradation in the decade following Stalin's death in 1953 (Lysenkoism was not condemned and abandoned until 1965)[15] finally led to a caesura in ecologic science and environmental consciousness. First and foremost, there was the influential concept of biogeocoenology which was derived from forestry. Established by the geobotanist Vladimir Sukachev (1880–1967) in the 1940s as a further developmed form of biocoenology and as a ›biospheric‹ science in Vernadsky's sense, it provided the backbone to oppose and ultimately defeat Lysenko in the early 1960s.[16] Sukachev was aware of the closeness of his concept of biogeocoenosis to the Western »rather vague and not entirely unambiguous« notion of the ecosystem,[17] which, after being introduced by Arthur Tansley (1935), was hardly used until the Odum brothers' systematic take on an ecosystem ecology after the Second World War.[18] Secondly, on this fertile scientific ground of biogeocoenosis and its mathematical modelling of the 1950s and 1960s, Soviet climatology surrounding Mikhail Budyko (1920–2001) provided first calculations on the alarming interactions between the cryosphere, the Arctic greenhouse effect, and global climate change.

Following the early mystification of Vernadsky as philosopher of ›Russian Cosmism‹,[19] Sukachev was consequently attributed to this line of thought.[20] Citing Soviet scientists and their concepts as an exotic side stage of the history of global ecology, ecocriticism, and the Anthropocene debates, recent studies provide profound insight into the interaction between Soviet and Western scientists and its impact on contemporary ecological discourse.[21] There is also a domestic post-Soviet (post-colonial) re-thinking of Russian ecological and revival of holistic biospheric thought.[22] Recognizing the quick adaptation of Western popular concepts re-connect with the Western scientific discourse, the revision also includes the re-evaluation of terminology.[23] As a starting point, these post-Soviet developments chose the postulate of a Russian paradigm of non-Western (non-Darwinian) ecological and evolutionary thought which is not only different, but more prolific than the Western one.[24] This paradigm includes parameters such as the

ly Review Press 2022, pp. 274, 335.

14 J. Richard Carpenter: »Recent Russian Work on Community Ecology«, in: *Journal of Animal Ecology* 8 (1939), no. 2, pp. 354–386. See also id.: »Review: A New Russian Textbook in Ecology«, in: *Ecology* 20 (1939), no. 2, pp. 310–312.

15 See Zhores A. Medvedev: *The Rise and Fall of T. D. Lysenko*, New York, NY: Columbia Univ. Press 1969.

16 In a booklet, Sukachov only praised Stalin's transformation project to draw attention to the importance of forest protection, also describing (but not commenting on) Lysenko's plan to plant trees as a shelterbelt network – a plan which was deemed to fail from the very beginning. See Akademik V[ladimir] N. Sukachev: *Stalinskii plan preobrazovaniia prirody* [Stalin's Plan of Transformation of Nature], Moscow: Akad. Nauk SSSR 1950, pp. 15–19.

17 V[ladimir] N. Sukachev, N[ikolai] V. Dylis: *Osnovy lesnoi biogeotsenologii*, Moscow: Nauka 1964. Engl.: *Fundamentals of Forest Biogeocoenology*, Edinburgh: Oliver & Boyd 1968, p. 13: »poniatie ėkosistema dovol'no neopredelenno i ne vpolne odnoznachno«.

18 See Eugene P. Odum: *Ecology*, New York: Holt 1963. Howard T. Odum: »Ecological Tools and Their Use: Man and the Ecosystem«, in: *The Connecticut Agricultural Experiment Station, Bulletin* (1962), no. 652, pp. 57–75.

19 Russian cosmism is an umbrella term coined by adherents of the eccentric self-thought philosopher and religious thinker Nikolai Fedorov. The term aimed to unify a broad spectrum of scholars and biopolitical utopianists which were included in the eponymous anthology. See S[vetlana] G. Semenova, A[nastasiia] G. Gacheva (eds.): *Russkii kosmizm: Antologiia filosofskoi mysli* [Russian cosmism: anthology of philosophical thought], Moscow: Pedagogika 1993.

20 Petr Karako, professor of philosophy at Belorusian State University, claimed that Sukachev succeeded Vernadsky's cosmism. See P[etr] S. Karako: »V.N. Sukachev i russkii kosmizm« [Sukachev and Russian Cosmism], in: *Vestnik VGU. Seriia Filosofiia* 2020, no. 1, pp. 15–28.

21 See Jonathan D. Oldfield: *The Soviet Union and Global Environmental Change: Modifying the Biosphere and Conceptualizing Society-Nature Interaction*, London: Routledge 2021. Marco P. Vianna Franco, Antoine Missemer: *Early Soviet Ecology. A History of Ecological Economic Thought*, London: Routledge 2022.

22 In his last years, the historian of natural sciences Ėduard N. Mirzoian (1931–2014) started documenting Soviet biosphereological approaches and ecological theories in the series *Stanovlenie ėkologicheskikh kontseptsii v SSSR* (The Formation of Ecological Concepts in the USSR), published since 2013. Their publication continued after his death under the redaction of his pupil.

23 See E[katerina] A. Grigor'eva, A[rkardii] I. Grigor'ev: »Istoriia formirovaniia sistemnykh poniatii i terminov v ėkologii« [History of the formation of systemic concepts and terms in ecology], in: *Omskii nauchnyi vestnik* 106 (2012), no. 2, pp. 156–159.

24 See G[eorgii] A Zavarzin: »Smena paradigm v biologii« [Paradigm change in biology], in: *Vestnik RAN* 65 (1995), no. 1, pp. 8–23. A[leksei] M. Giliarov: »Stanovlenie ėvoliucionnoga podchoda kak ob'iasnitel'nogo nachala v ėkologii« [The formation of the evolutionary approach as an explanatory

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nutrient cycle, decomposition by microorganisms,[25] synthesis, and biogeocoenotic evolution.

Against this background, the international network »Russian Ecospheres. Forms of Ecological Knowledge in Russian Literature, Culture and History«[26] was established last year. It is funded by the German Research Foundation (DFG) and collaborates in the interdisciplinary investigation of the Russian[27] paradigm of ecological thought. All contributors to this issue are members of this research project, with the exception of an extern expert from Kyiv, Alexander Protasov, Professor at the National Academy of Sciences of Ukraine's Institute of Hydrobiology. In co-authorship with Georgy Levit, a private lecturer in biology at the University of Jena,[28] the two experts on Vernadsky dedicated their paper to the Ukraine period of Vernadsky's work and his concept of living matter (*zhivoe veshchestvo*). Tatjana Petzer, professor of Slavic literary and cultural studies at the Karl Franzens University of Graz, provides an introduction on Sukachev's notion of biogeocoenosis (*biogeotsenoz*). Both concepts are closely linked to the establishment of integrative disciplines in the Soviet Union, biogeochemistry, and biogeocoenology. A third cross-disciplinary area of study is introduced with the review on a survey book on *Geocryology* by Andy Bruno, associate professor of history and environmental studies at Northern Illinois University and an expert on the Russian Arctic.[29] Mieka Erley, associate professor of Russian and Eurasian studies at Colgate University and author of a book on Russian soil, discusses the Russian notion of metabolism (*obmen veshchestv*) which refers to both circulatory systems for constituting ecological as well as social equilibrium.[30] Clemens Günther, research associate for Slavic literature at Freie University of Berlin, and Philip Kohl, research associate for Slavic literature at Ludwig Maximilian University of Munich who currently holds the Feodor Lynen Research Fellow position at the University of Zurich, both initiators and coordinators of the Russian Ecospheres network, provide a system-theoretic perspective. Departing from conceptual history, their contributions on the notions of regulation and irreversibility respectively analyze the interdepending conceptualization of nature and culture within the realms of the emerging computation, cybernetics, and semiotics of culture. Thus, they demonstrate one of the network's basic concerns: the interdisciplinary approach to a genuinely multidisciplinary science (or, rather, a bundle of ecological and environmental sciences), its cross-cultural framework of terminology, and its undisciplined thought in the Russian longue durée.

principle for ecology], in: *Zhurnal Obshchei Biologii* 64 (2003), no. 1, pp. 3–22. Edmundas Lekevičius: »The Russian Paradigm in Ecology and Evolutionary Biology: *Pro et Contra*«, in: *Acta Zoologica Lituanica* 16 (2006), no. 1, pp. 3–19.

25 S[ergei] N. Vinogradskii: »O roli mikrobov v obshchem krugovorote zhizni« [The role of microbes in the general cycle of life (speech of 1896)], in: *Vestnik RAN* 66 (1996), no. 12, pp. 1116–1120.

26 For more information see https://russianecospheres.org/.

27 Here, ›Russian‹ refers to the historically grown epistemic framework for approaching the entangled Northern Eurasian space.

28 George S. Levit: *Biochemistry – Biosphere – Noosphere. The Growth of the Theoretical System of Vladimir Ivanovich Vernadsky*, Berlin: Verl. für Wiss. und Bildung 2001. A[lexander] A. Protasov: Kontseptsii biosferi i zhivogo veshchestvo v prilozhenii k issledovaniiam zhizni v gidrosfere [The concepts of biosphere and living matter applied to the study of life in the hydrosphere], in: V[olodimir] I. Vernads'kii: *Geokhimiia zhivoi rechovini* [The Geochemistry of Living Matter], part II, Kyiv: Veles 2012, pp. 551–571.

29 Andy Bruno: *The Nature of Soviet Power: An Arctic Environmental History*, New York, NY: Cambridge University Press 2016.

30 Mieka Erley: *On Russian Soil: Myth and Materiality*, DeKalb: Northern Illinois Univ. Press 2021.

LIVING MATTER
A KEY CONCEPT IN VLADIMIR VERNADSKY'S BIOGEOCHEMISTRY

Georgy S. Levit and Alexander A. Protasov

»Living matter is the totality of all organisms present on Earth at any one time«.
V. I. Vernadsky: »Biosphere and Noösphere«, 1945[1]

INTRODUCTION

Vladimir Vernadsky's concept of living matter is central to his biogeochemistry, the science he founded. For several reasons, his original understanding of living matter is one of the most complex notions in the history of the life sciences. First, biogeochemistry is by definition an interdisciplinary enterprise that embraces biology, including evolutionary theory, geology, and chemistry, and combines them into a unique research program. Second, if understood in the original sense as used by Vernadsky, living matter is a concept built into idiosyncratic metaphysics constructed around the so-called principle of life's eternity. Third, the concept of living matter reflects the specificity of Vernadsky's sophisticated philosophy of science as he insisted that ›scientific thought‹ is a planetary phenomenon as well as a geological force.

In our contribution, we will introduce Vernadsky's concept of living matter in its historical context. Accordingly, we will also give some chronology of Vernadsky's work related to the growth of his biosphere concept highlighting the ›Ukrainian‹ period as it is in this period that he intensively elaborated on the notion of living matter. This will be followed by his theory of living matter as it was formulated in his major works of the later period. We are going to locate the notion of living matter within Vernadsky's theoretical system and demonstrate that he regarded his theory of the living as an evolutionary theory complementary to that of Charles Darwin from the very beginning. Additionally, we will briefly present Vladimir Beklemishev's concept of ›geomerida‹ which he developed at approximately the same time as Vernadsky was elaborating on his ›living matter‹ to highlight the specificity of the latter's methodology.

THE GROWTH OF VERNADSKY'S CONCEPT OF LIVING MATTER

The third edition of the *Great Soviet Encyclopedia* (1968–1975) insisted that Vernadsky coined the term living matter (»zhivoe veshchestvo«[2]). This thesis was repeated many times. The co-founder of the International Vernadsky-Fund Guenzel Guegamian recently claimed that Vernadsky »was the first who introduced the fundamental notion of living matter into science«.[3] This is true to the extent that Vernadsky's notion was idiosyncratic both in a philosophical sense and as an empirical research program. Also, nobody before him used ›living matter‹ as a geochemical term. However, the very combination of the words ›living matter‹ was not invented by Vernadsky. In the context of natural science, the term was already employed by the French naturalist Georges Louis Leclerc de Buffon, whose works Vernadsky studied thoroughly. For Buffon, organized matter (*matière organisée*) corresponds with living matter (*matière vivante*). In certain cases, he refers to the distinction between living and dead sub-

1 W[ladimir] I. Vernadsky: »The Biosphere and the Noösphere«, in: *American Scientist* 33 (1945), no. 1, pp. 1–12, here p. 1; Rus.: »Живое вещество есть совокупность всех организмов Земли находящихся на ней в данный период времени«. V[ladimir] I. Vernadskii: *Biosfera i Noosfera*, Moscow: Nauka 1989, p. 139.

2 A[natolii] N Tiuriukanov: »Zhivoe veshchestvo« [Living matter], in: *Bol'shaia Sovetskaia Ėntsiklopediia* [Great Soviet Encyclopedia], vol. 9: *Evklid–Ibsen*, Moscow: Sov. Ėntsiklopediia[3] 1972, pp. 183–184.

3 Genzel' V. Gegamian [Guenzel V. Guegamian]: »O zhivom veshchestve v biosferologii V.I. Vernadskogo« [On living matter in the biosphereology of V.I. Vernadsky], in: *Zhizn' Zemli* [Life of the Earth] 43 (2021), no. 2, pp. 258–269.

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stances instead of the distinction between organized and raw matter (*matière brute*).[4] Diderot, who advocated the imperishability of life, distinguished between dead matter (*matière morte*) and living matter (*matière vivante*); the term living matter appears in his discussion with Maupertuis and was employed on both sides of the discussion.[5] In 19th-century French-language literature, the expression *matière vivante* was nothing exceptional. In 1884, for example, Belgium-born psychologist Joseph Delboeuf published a paper titled *La matiére brute et la matière vivante: L'origine de la vie et la mort* (Crude matter and living matter: The origin of life and death).[6] The German notion Lebensstoff (living substance, living matter), which was being used in the vitalist circles at the turn of the century, is reminiscent of Vernadsky's wording. However, this term referred to a mystical self-organizing material substrate.[7] In the context of vitalist discussions, Driesch also mentioned Kant's claim that »the possibility of a living matter is quite inconceivable«.[8] Kant's critique was directed towards hylozoism and has no relation to Vernadsky's use of the term.

In 1902, Jacques Loeb gave a series of lectures at Columbia University which was later published as a book titled *The Dynamics of Living Matter*.[9] Loeb used the term as both an opposition to »inanimate matter« and as a tool to demonstrate the affinity of his methods to the »chemistry of the laboratory«.[10] A champion of chemical determinism and reductionism, he regarded living matter as a mixture of various compounds, such as proteins, fats, carbohydrates, and salts. Nevertheless, this does not render his use of living matter inalienable from his theory. The term was abandoned for the title of the German version of his book *Vorlesungen über die Dynamik der Lebenserscheinungen* (Lectures on the Dynamics of the Manifestation of Life).[11]

Vernadsky himself credited Alexander von Humboldt with an understanding of global life akin to his own: »For him [Humboldt] living matter is an inseparable and lawful part of the Earth's surface, inseparable from its chemical environment«.[12] However, Humboldt never used living matter. Instead, he spoke in more traditional terms of »living and non-living nature« (*belebte und unbelebte Natur*). Another conceptual influence was certainly Lamarck, especially his *Hydrogeology*, which highlighted the influence of living organisms on the earth's crust.[13] Yet, in the introduction to his *Histoire Naturelle*[14], Lamarck explicitly stated that »there is no such thing as general living matter; each living body has a specific organization«.[15]

Vernadsky's diaries, accounts by contemporary witnesses, and other related documents clearly prove that the initial period of his work on living matter and biogeochemistry almost completely coincides with the so-called Ukrainian period of his biography. Although Vernadsky already used this term sporadically in the 1900s, he began to systematically elaborate on the concept of living matter in 1916.[16] Vernadsky's longtime secretary Anna Schakhovskaya remembers that he started working on the issue of living matter in 1916 and intensified this work in the following years: »As the beginning of his works on ›living matter‹, i.e. on biogeochemistry, Vernadsky himself considered 1916 […]. In July 1917, Vernadsky had to go to the hamlet Shishaki of the Poltava Province [central Ukraine – *auth.*] and there he was completely embraced by a burst of intensive creativity; there he wrote down his thoughts on living matter. From that time, especially in 1918,[17] and until 1920 he worked intensively on this

4 Georg Toepfer: »Organisation«, in: id.: *Historisches Wörterbuch der Biologie Geschichte und Theorie der biologischen Grundbegriffe*, vol. 2, Stuttgart/Weimar: J. B. Metzler 2011, p. 754–776, here p. 757.

5 Aram Vartanian: »Diderot and Maupertuis«, in: *Revue Internationale de Philosophie* 38 (1984), no. 148/149 (1/2): *Diderot et l'encyclopédie (1784-1984)*, pp. 46-66; Charles T. Wolf: »Endowed Molecules and Emergent Organization: The Maupertuis-Diderot Debate«, in: *Early Science and Medicine* 15 (2010), no. 1/2, pp. 38–65.

6 Joseph Delboeuf: »La matière brute et la matière vivante: L'Origine de la vie et de la mort«, in: *Revue Philosophique de la France et de l'Étranger* 18 (1884), pp. 24–56.

7 Hans Driesch: *Der Vitalismus als Geschichte und als Lehre*, Leipzig: Johann Barth 1905, p. 240; Id.: *Geschichte des Vitalismus*, Leipzig: Johann Barth 1922, p. 105.

8 Immanuel Kant: *Critique of Judgement*, transl. by J.C. Meredith, Oxford/New York: Oxford University Press 2007, p. 222.

9 Jacques Loeb: *The dynamics of living matter*, N.Y.: *The* Columbia University Press 1906.

10 See ibid., p. 29.

11 Jacques Loeb: *Vorlesungen über die Dynamik der Lebenserscheinungen*. Leipzig: Barth 1906.

12 V[ladimir] I. Vernadskii: *Ocherki geokhimii* [Essays on Geochemistry], Moscow: Nauka 1983, p. 19.

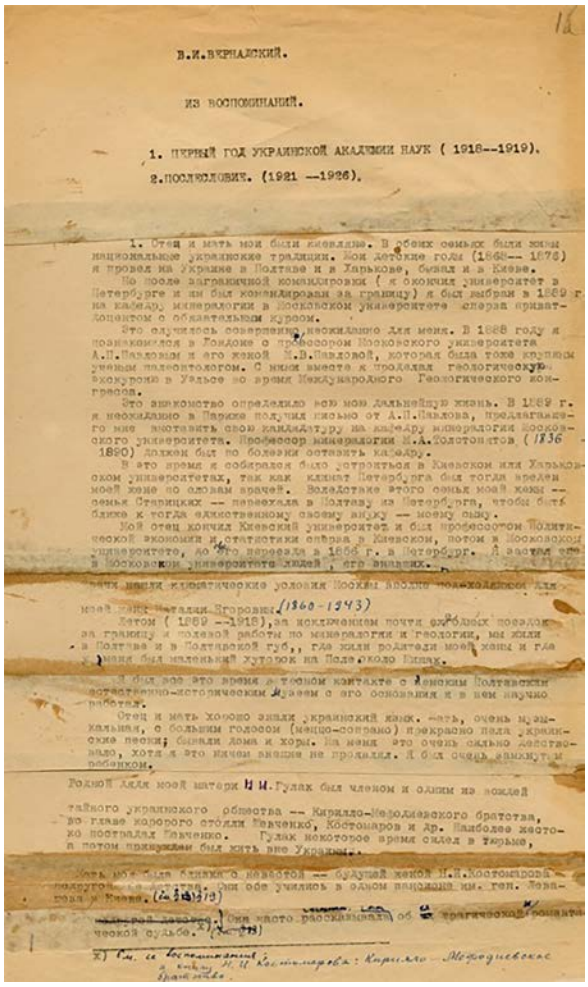
13 Albert V. Carozzi: »Lamarck's Theory of the Earth: Hydrogeologie, in: *ISIS* 55 (1964), no. 3, pp. 293–307.

14 Jean-Baptiste de Lamarck: *Histoire Naturelle des Animaux sans Vertébres*, vol. 1, Paris: Verdiere 1815, p. 12.

15 Frans A. Stafleu.: »Lamarck: The Birth of Biology«, in: *Taxon* 20 (1971), pp. 397–442. In his so-called 4th fundamental principle, Lamarck literally claimed that there is no matter in nature that by itself has the ability to live. See Lamarck: *Histoire Naturelle* 1 (note 14), p. 12.

16 See Gegamian (note 3).

17 Vernadsky's diaries from 1918 are full of notes proving that, at that time, he was working on living matter. For example, in an entry titled »8. III/23. II. 1918«, he literally notes: »I work on living matter«. In an entry titled »15/28.



В.И.ВЕРНАДСКИЙ.

ИЗ ВОСПОМИНАНИЙ.

1. ПЕРВЫЙ ГОД УКРАИНСКОЙ АКАДЕМИИ НАУК (1918--1919).
2.ПОСЛЕСЛОВИЕ. (1921 --1926).

Fig. 1: Page from the typescript of Vladimir Vernadsky's Reminiscences: »1. The First Year of the Ukrainian Academy of Sciences (1918-1919) … 1. My father and mother came from Kyiv. Ukrainian national traditions were alive in both families. I spent my childhood years (1868–1876) in Poltava and Kharkov, I was also in Kyiv. ...« Source: Archive of the Russian Academy of Sciences, fond 518, inv. no. 2, box 70, p. 1.

topic, it occupied a lot of place in his life and reached a great dimension«.[18]

Organizational work at the Ukrainian Academy of Sciences, of which Vernadsky became the first president in 1918, was not only a time-consuming activity that kept him from investing more work into the expanding theory of living matter, but it also opened up new possibilities. In 1918, Professor Solomon Frankfurt established a research institute at the experimental station of the All-Russian Association of Sugar Manufacturers (the station had well-equipped labs); here, Vernadsky began his experimental work on biogeochemistry. This was »the first biogeochemical laboratory in the history of natural science«.[19] A year later, Vernadsky noted: »In 1919, at the expense of the Ukrainian Academy of Sciences, we succeeded in organizing a systematic collection of animals and plants for chemical and spectroscopic studies«.[20] The resources he received (59400 carbovans) allowed him to conduct some quantitative research by employing three research assistants. This marked the very beginning of biogeochemistry and thus the beginning of the systematic research of living matter.

Vernadsky's notion of living matter is essential to his research program and becomes comprehensible only within biogeochemistry; nobody before him defined living matter as the sum total of all living organisms from a geochemical perspective. At the very initial stages of his work, Vernadsky already formulated the following empirical tasks: 1) to calculate a quantitative elementary composition of the different species; 2) to investigate the geochemical history of silicon, copper, zinc, lead, silver, and some other elements; 3) to determine some other geochemical characteristics of living organisms such as the average weight and water content as well as the percentage of carbon in the organisms.[21] Vernadsky was interested in the purely geochemical characteristics of living organisms while excluding their physiology, morphology, and other traditional biological fields. At the same time, he realized early on that his »doctrine of living matter« is »a new form

III.1918« he writes: »I was somehow captured by the work on living matter, which I have been thinking over, rethinking and processing, as well as by the thoughts on the current situation. But I can write solely about living matter, since I am barely finishing my work on it in the evening and I no longer have the desire and energy to write about the current moment«. V[ladimir] I.Vernadskii: *Dnevniki 1917–1921* [Diaries 1917–1921], ed. K[onstantin] M. Sytnik/B[oris] V. Levshin, Kyiv: Naukova dumka 1994, p. 63. On July 18, 1918, i.e., already in Kyiv, where he was occupied with establishing the Ukrainian Academy of Sciences, he wrote: »Today – these days – I nicely worked on living matter«. (Ibid., p. 118) On November 13, 1918, one day before Hetman Skoropadsky approved the foundation of the Ukrainian Academy of Sciences, Vernadsky wrote: »Today I worked on living matter, finished the 2nd lecture on geochemistry«. (Ibid., p. 125) All English translations are mine unless noted otherwise.

18 See V[ladimir] I.Vernadskii: *Zhivoe veshchestvo* [Living matter], Moscow: Nauka 1978, p. 325 (»From the editors«).

19 Konstantin M. Sytnik/Olena M. Apanovich/Stepan M. Stoiko (eds.): *V. I. Vernadskii: Zhizn' i deiatel'nost' na Ukraine* [V.I. Vernadsky: Life and Work in Ukraine], Kyiv: Naukova Dumka 1988, p. 72.

20 K[onstantin] M. Sytnyk/V[ira] V. Shmigovska: *Volodimir Vernads'kii i Akademiia* [Volodimir Vernadsky and the Academy], Kyiv: Naukova Dumka 2006, p. 161.

21 A[ndrei]V. Lapo/A[natoliy] A. Smyslov: »Biogeokhimiia: osnovy, zalozhennye V. I Vernadskim« [Biogeochemistry: The Foundations Laid by V.I. Vernadsky], in: A[leksandr] L. Yanshin (ed.): *Nauchnoe i social'noe znachenie deiatel'nosti V.I Vernadskogo* [Scientific and Social Significance of Vernadsky's Work], Moscow: Nauka 1989, pp. 54–61.

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of understanding« life and nature, which he noted in one of his letters to his colleague Boris Lichkov.[22]

In the summer of 1919, Vernadsky was threatened to become the target of political repressions and, following the urgent advice of his friends, decided to move to the biological station in Starosel'e and ›wait out‹ the troubled times, 20 kilometers up the River Dnieper from Kyiv.[23] It is during this period that the »nice and talented young zoologist« Theodosius Dobzhansky (future co-architect of the Modern Synthesis) assisted Vernadsky in overcoming these difficult times and became involved in his biogeochemical research.[24] Dobzhansky recalled: »When that thing [Red Terror – *auth.*] started, I believe it was May, 1919, my professor, Kushakevich and Vernadsky decided, probably quite reasonably, that it would be better for their health to move from hell's way and to disappear«.[25] Concerning Vernadsky's interests at that time, Dobzhansky commented: »And since the problem in which he was interested was the role of *living matter* [*auth.*] in geological processes, Kushakevich recommended to him that he hire me as a collector of the living material for his work«.[26] At the biological station Starosel'e in 1919, Vernadsky wrote his first paper that was explicitly devoted to the role of living matter in geological processes – »On the participation of living matter in the soil formation«. However, the paper that summarizes experimental studies conducted by Vernadsky in 1917–1919 was published only in 1984.[27] In this paper, Vernadsky provided a definition of living matter: »By the name of living matter, I mean the total sum of all organisms, plants, and animals, including humans. From the geochemical point of view, this totality of organisms has a significance only as the mass of matter it is made of, as a chemical composition, and as the energy connected to it«.[28]

Referring specifically to the role of living matter in soil formation, Vernadsky determined six crucial points[29]:

1. Living matter acts through the mass and composition of the substance it is made of. As such, living matter constitutes a part of the soil, either as it is or as the products of its transformation, i.e., a dying and dead substance.

2. Living matter determines the fineness of the soil.

3. Living matter changes the soil's structure, either due to the loosening or cementing activity of organisms dwelling in it or due to the character of their post-mortem destruction.

4. Living matter directly affects chemical processes within the soil, turning them into biochemical processes.

5. Living matter causes an extraordinal compounding of soil chemical elements, being the main factor in their mixing, and this determines the course of all chemical reactions taking place in the soil.

6. Living matter transports matter from afar and introduces it to the composition of soils, thereby violating the relationship between soil and subsoil. In this respect, it acts either by its own mass or in an indirect way.

»All these changes have been produced over the past millennia with an extremely intense, ever-increasing force by that part of the living matter that makes up cultural humanity«, Vernadsky argued.[30] As with »cultural humanity« with which Vernadsky referred to the growth of human civilizations, this early paper not only presented the concept of living matter but already contained a first nod towards the future noosphere theory.[31]

22 V[alentina] S. Neapolitanskaia (ed.): *Perepiska V.I. Vernadskogo s B.V. Lichkovym* [Correspondence of V.I. Vernadsky with B.V. Lichkov], *1918-1939*, Moscow: Nauka 1979, p. 31.
23 Sytnyk/Shmigovska: *Volodimir Vernads'kii i Akademiia* (note 20), p. 189.
24 V[ladimir] I. Vernadskii: *Dnevniki 1921-1925* [Diaries 1921-1925], ed. V. P. Volkov, Moscow: Nauka 1999, p. 164.
25 Theodosius Dobzhansky: *The reminiscences of Theodosius Dobzhansky*, typewritten transcript of interviews conducted 1962–1963 by B. Land. Oral History Research Office, New York, NY: Columbia University 1975.
26 See ibid.
27 Sytnik/Apanovich/Stoiko: *Vernadskii* (note 19), pp. 186–213, commentaries of publishers: pp. 338–345; see also G[leb] V. Dobrovolskii: »Poluzabytaia, no ochen' vazhnaja dlia pochvovedeniia i ucheniia biosfere stat'ia V.I. Vernadskogo« [A half-forgotten, but very important article by V.I. Vernadsky for the soil science and the biosphere study], in: *Zhivye i biokosnye systemy / Live and bio-abiotic systems. Scientific electronic periodical* (2013), no. 2, https://jbks.ru/archive/issue-2 (accessed on 01.03.2023).
28 See Sytnik/Apanovich/Stoiko: *Vernadskii* (note 19), p. 193.
29 Ibid., pp. 194–195.
30 Quoted after ibid., p. 195.
31 Jesse P. Hiltz/Georgy S. Levit: »The Biosphere and Noosphere: Vladimir Vernadsky and Teilhard de Chardin«, in: SynergieWissen (15.10.2012), https://www.synergiewissen.de/doku.php?id=features:biosphere_and_noosphere (accessed on 01.03. 2023).

At the end of August 1919, the Bolsheviks abandoned Kyiv and the city was occupied by the troops of General Anton Denikin. Following his negotiations with the new authorities, Vernadsky left Kyiv in November 1919 for Rostov-on-Don, where Denikin was residing, and never returned to Kyiv. In January 1920, Vernadsky moved to Crimea (to the ownership Gornaia Shel', near Yalta), where he contracted typhus and experienced what his biographers call a »spiritual turn«.[32] Vernadsky realized that he was about to formulate a completely new doctrine which would revolutionize science. Despite his illness, Vernadsky continued to contemplate on living matter; in January 24th, 1920, he wrote the following note into his diary: »I am in bed with a high temperature. Yesterday it was 39 degrees. The head is mentally clear and fresh, but heavy. Yesterday I was thinking over the composition of my work on living matter all the time, which I am writing ...«.[33] After waking from a three-week long unconsciousness, Vernadsky immediately designed the experimental study of living matter and asked his wife to write it down.[34] During this spiritual turn, Vernadsky clearly realized that he was creating another kind of evolutionary theory which complemented Darwin's doctrine: »I am amazed by the awareness that, in my work on the living matter, I created a new doctrine which represents the other side, another aspect of the evolutionary theory, and this became clear to me only now after the sickness«.[35]

In Crimea, Vernadsky was, among others, teaching at the newly established Taurida University. In September 1920, he was approved as the new rector of this university, which today bears his name. In March 1921, however, Vernadsky returned to Petrograd (since 1924: Leningrad) where he continued his work on living matter. In his letter to Lichkov (28.04.1921), Vernadsky wrote that he was »mostly working on living matter« and gave lectures on »living matter and geochemistry«.[36] One of these lectures was his programmatic address »The Beginning and Eternity of Life«, in which he presented the concept of living matter as a cosmic phenomenon for the first time. It was published as a separate brochure the following year.[37]

In this small but seminal publication, Vernadsky formulated a philosophical premise that would determine his whole way of thinking on living matter: »Pointing out the logical necessity of the beginning for the evolutionary process is more of philosophical than of scientific interest«.[38] The idea of the beginning of life is closely related to the doctrine of the beginning of the world in the Judeo-Christian religious tradition. However, this is not the only way of thinking. Buddhists, for example, do not ask for the world's beginning. Vernadsky himself would approach the beginning of life as a scientist, not as a philosopher. The idea of the eternity of life, Vernadsky continued, opens up the broadest horizons for scientific creativity. The acceptance of life's eternity would, in turn, lead to the idea of a crucial difference between life and death. Thus, in 1922, Vernadsky clearly formulated three hypotheses, which he would continue to develop throughout the rest of his scientific career: living matter is a cosmic phenomenon, living matter differs crucially from inert matter, and therefore the evolutionary process had no beginning in the biosphere, there was no empirical evidence of abiogenesis. The very term biosphere still wasn't central to Vernadsky's paper as he only employed it once and without providing any explicit definition.

Despite his tendency towards generalizations on a metaphysical level, Vernadsky was first of all an empirical scientist. At the initial stage, he formulated the following tasks: 1) to calculate a quantitative elementary composition of the different species; 2) to investigate the geochemical history of silicon, copper, zinc, lead, silver, and some other elements; 3) to determine some other geochemical characteristics of living organisms such as the average weight and water content as well as the percentage of carbon in the organisms.[39]

Vernadsky's concept of living matter was developed as part of his geochemical research. Two years after the publication of the booklet *The Beginning and Eternity of Life*, he published his seminal *La Géochemie*[40] followed by *The Biosphere* in Russian,[41] which can be considered the first attempt to offer a general concept

32 G[ennadii] P. Aksenov: *Tri biografii Vladimira Vernadskogo* [Three Biographies of Vladimir Vernadsky], Moscow: Archiv RAN 2014, p. 13.
33 See Sytnik/Apanovich/Stoiko: *Vernadskii* (note 19), p. 86.
34 G[ennadii] P. Aksenov: *Vernadskii*, Moscow: Molodaia Gvardiia 2010.
35 See Sytnik/Apanovich/Stoiko: *Vernadskii* (note 19), p. 88.
36 See Neapolitanskaia: *Perepiska* (note 22), p. 21.
37 V[ladimir] I. Vernadskii: *Nachalo i vechnost' zhizni* [The Beginning and Eternity of Life], Petrograd: Izdatel'stvo Vremia 1922.
38 Ibid., p. 55.
39 Lapo/Smyslov: »Biogeokhimiia« (note 21), p. 55.
40 W[ladimir] Vernadsky: *La géochimie*, Paris: Félix Alcan 1924.
41 V[ladimir] I.Vernadskii: *Biosfera*, Leningrad: Nauchno-Technicheskoe Izdatel'stvo 1926.

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of global ecology and energy transformation. However, it does not contain his complete theory. In *La Géochimie*, Vernadsky gave the first comprehensible geochemical definition of living matter: »[…] We must define all organisms only in relation to their weights, chemical composition, and energy. By defining all living organisms with these parameters, it is necessary to introduce new notions into the phenomena of life, to introduce these unstable phenomena into the framework of chemistry, into the set of almost immutable products, raw materials, minerals, and rocks. What we will call living matter is the entirety of all organisms, expressed in weight, in chemical elements, in energy«.[42] From a purely biogeochemical viewpoint, living matter is reducible to its mass, energy, and chemical composition, varying both spatially and temporally. Still, several further steps were needed to complete the theory's methodological basis.

The Biosphere was completed at the end of his research stay in France (1922–1925), after the publication of *Geochemistry*. In part, it coincides with the unpublished report to the Rosenthal Foundation titled »Living Matter in the Biosphere«.[43]

In 1926, Vernadsky returned to Leningrad from his long trip abroad and, in 1928, he gave a talk to the *Leningrad Society of Natural Scientists* (Obshchestvo Estestvoispytatelej) in which he formulated the first and the second biogeochemical principles. These would form the foundation of his doctrine of living matter.[44] The independent *Biogeochemical Laboratory of the Academy of Sciences* was officially founded in the same year (1928) on the basis of the *Department of Living Matter* of the *Commission for the Study of the Natural Productive Forces of the Country* (KEPS)[45] and existed as an independent unit until 1947. Thus, both the theoretical foundation (biogeochemical principles) and empirical basis for the study of living matter were established in 1928, initiating what is referred to as the ›mature period‹ of Vernadsky's developing theory of living matter. As one of his contemporaries reported in *Nature*: »Vernadsky is convinced that the geochemical role of organisms is grossly misunderstood and underrated. This fascinating problem was raised by him so far back as 1918, and in 1928 a special laboratory was created for the purpose of investigating it«.[46]

A year later (1929), a slightly expanded version of *The Biosphere* was published in French in Paris.[47] That same year, Vernadsky prepared a collection of papers under the joint title *Living Matter* for publication. However, due to the increasing censorship and ideological control following the restructuring of the Soviet Academy of Sciences of the USSR in 1929–1930, this book remained unpublished. The second attempt to publish *Living Matter* dates back to 1935 but also remained unsuccessful. Only 33 years after Vernadsky's death was the book finally published.[48]

In the mid-1930s Vernadsky began planning what he would call ›the book of my life‹, which was ultimately split into two projects. The first was completed in 1938 under the title *Scientific Thought as a Planetary Phenomenon*[49], an expression of his mature ›philosophy‹. Due to strong state censorship, the second project, which Vernadsky considered the final manifestation of his theory of the biosphere, was published as late as 1965 under the title *The Chemical Structure of the Earth and its Environment*.[50] This is Vernadsky's opus magnum, which was mostly written during the Second World War. It consists of two parts titled »Geological and geochemical manifestation of the Earth as a planet in the Solar System and Milky Way« and »Geochemical Structure of the Biosphere. The Planetary

42 Vernadsky: *La géochimie* (note 40), p. 54.

43 See Gennadii Aksenov: *Vernadskii*, Moscow: Molodaya Gvardia ²2010.

44 W[ladimir] Vernadsky: »Über die geochemische Energie des Lebens in der Biosphäre«, in: *Centralblatt für Mineralogie, Geologie und Paläontologie*, Abt. B (1928), no. 11, pp. 583–594.

45 L[oriana] D. Vinogradova: *Istoriia biogeokhimicheskikh issledovanii* [History of Biogeochemical Research], in: *BIOGEL AN SSSR. Trudy XII mezhdunarodnoj biogeokhimicheskoi shkoly* [Proceedings of the 12th International Biogeochemical School], Tula: TGPU 2021, pp. 33–42.

46 B[oris] P. Uvarov: »Geochemistry of Living Matter«, in: *Nature* 134 (1934), pp. 11–12.

47 W[ladimir] Vernadsky: *La Biosphere*, Paris: Félix Alcan 1929; Alexei M. Ghilarov: »Vernadsky's Biosphere Concept: An historical perspective«, in: *The Quarterly Review of Biology* 70 (1995), no 2, pp. 193-203.

48 Vernadskii: *Zhivoe veshchestvo* (note 18); Sergii M. Kirzhaev et. al: *V.I. Vernads'kii i Urkaina: z listuvannya* [V.I. Vernadsky and the Ukraine: Correspondences], vol. 2, Kyiv: Natsional'na biblioteka Ukraini imeni Vernads'kogo/Institut arkhivoznavstva 2019.

49 V[ladimir] I. Vernadskii: *Nauchnaia mysl' kak planetnoe iavlenie* [Scientific Thought as a Planetary Phenomenon], Moscow: Nauka 1991.

50 V[ladimir] I. Vernadskii: *Khimicheskoe stroenie biosfery zemli i ee okruzheniia*, Moscow: Nauka 1965. A[leksandr] L. Yanshin: »Zhivoe veshchestvo I biosfera v trudakh V.I. Vernadskogo« [Living matter and the biosphere in the works of V.I. Vernadsky], in: V[ladimir] I. Vernadskii: *Zhivoe Veshchestvo i Biosfera* [Living Matter and the Biosphere], Moscow: Nauka 1994, pp. 5–15.

role of living matter«. Vernadsky also planned a third part devoted to the noosphere. However, although he worked on the book until his last days, it was never realized. The most comprehensive and mature form of Vernadsky's theory of living matter in the biosphere in the context of biogeochemistry may be found in *The Chemical Structure,* even though this work was not finished by the author as planned.

VERNADSKY'S MATURE DOCTRINE OF LIVING MATTER

Vernadsky argues that living matter is a planetary constant. Across the earth's entire geological history beginning with the Archean, its quantity and average chemical composition fluctuated around a certain parameter.[51] Both the chemical structure of inert and living matter remained in a state of dynamic equilibrium. Vernadsky thus distinguished between biological evolution as reflected, for instance, in the changing morphological structures and biogeochemical evolution. As a constant value for living matter in general, particular biological species may be characterized biogeochemically as they differ in their chemical composition and ability to accumulate chemical substances. Vernadsky noted that the chemical composition of various organisms is very similar with regard to certain elements such as carbon, nitrogen, or sulfur, but it differs with regard to the quantity of other elements such as iron, manganese, iodine, bromine, arsenic, boron, etc., which are subject to great variations in various species.[52] Currently, the study of the concentration function of various organisms is a biogeochemical routine. However, Vernadsky's original idea was not to simply point out that different species accumulate different substances, but to claim that the chemical compounds of living matter do not reflect that of their environment. Rather, life seems to determine the geochemical history of almost all the compounds of the earth's crust in the process of the interaction between living organisms and their environment.[53] To a certain extent, a biogeochemical function is primal in relation to an organismic function, and the same biogeochemical function may be fulfilled by different species. In that sense, biological evolution would not necessarily violate biogeochemical functions as the earth's crust experiences a series of cycling processes.[54] This was later reformulated by Georgy Zavarzin as the concept of the »space of logical possibilities« for microbial communities.[55] In terms of the functions performed by different organisms, the space of logical possibilities must be comprehensively fulfilled and it does not matter which specific organisms will complete this task. Vernadsky insisted that all biogeochemical functions can be carried out by the simplest unicellular organisms.[56]

Due of the biogenetic control of the flow of chemical elements, Vernadsky considered living matter to be the major factor in terrestrial geological evolution. Life is not a superficial or an accidental phenomenon.[57] Living matter is the most powerful chemical force on the Earth and »no other geological force can be even compared to it considering its intensity and continuity in time«; living matter »in essence, determines all basic chemical regularities in the biosphere«.[58] The biosphere is a peculiar layer of the earth embraced by life, which has had a »very lawful structure« for at least two billion years. The structure of the biosphere is characterized by a dynamic equilibrium fluctuating around a certain statistical value. Vernadsky labeled this dynamic structure »the organization of the biosphere« in order to distinguish it from purely mechanical structures: »The organization of the biosphere – the organization of living matter – should be regarded as equilibria, moving, constantly fluctuating within historical and geological time around a precisely expressed average. Displacements or fluctuations of this mean value continuously manifest themselves not in the historical, but in the geological time«.[59] In other words, the biosphere is a self-regulating system comprising the totality of living matter and various geospherical layers that serve as its inert environment.

From a chemical perspective, the most general manifestation of the ›organization of the biosphere‹ is the so-called biogeochemical functions of living matter that influence the entire planet and do not constrain on the ›territorial‹ (regional) conditions of the

51 See Eduard Mirzoian: »Teoriia zhivoi materii V.I. Vernadskogo« [V.I. Vernadsky's Theory of Living Matter], in: *Zhurnal Obshchei Biologii* 55 (1994), no.1, pp. 13–28.
52 See Uvarov: »Geochemistry of Living Matter« (note 46).
53 V[ladimir] I. Vernadskii: *Zhivoe veshchestvo i biosfera* [Living Matter and Biosphere]. Moscow: Nauka 1994.
54 See Mirzoian »Teoriia zhivoi materii« (note 52).
55 Georgii Zavarzin: *Fenotipicheskaia sistematika bakterii. Prostranstvo logicheskikh vozmozhnostei* [Phenotypic Systematics of Bacteria. The Space of Logical Possibilities], Moscow: Nauka 1974.
56 Vernadskii: *Dnevniki 1917-1921* (note 17), p. 458.
57 Alexei M. Ghilarov: »Lamarck and the Prehistory of Ecology«, in: *International Microbiology* 1 (1988), pp. 161–164.
58 Vernadskii: *Khimicheskie stroenie* (note 50), p. 236.
59 Vernadskii: *Nauchnaia mysl'* (note 49), p. 16.

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geosphere. The biogeochemical functions determine the basic chemical manifestation of life and describe the most fundamental chemical reaction of living matter impacting its environment. These functions include 1) gas functions, which regulate the gaseous structure of the atmosphere as well as of submarine and subterranean environments; 2) the already mentioned concentration functions, which allow organisms to capture and concentrate the chemical elements of their environments; 3) oxidation-reduction functions; 4) various biochemical functions wherein the feeding, breathing, multiplication, and destruction of organisms redistribute and mix matter; and 5) the biogeochemical functions of humans.[60]

Since relatively closed biogeochemical cycles determine the structure of the biosphere, it »appears in biogeochemistry as a peculiar envelope of the Earth clearly distinct from the other envelopes of our planet«.[61] A good example of a dynamic equilibrium in the biosphere is the troposphere: »All basic gases of the troposphere and of the higher gaseous envelopes – N2, O2, CO2, H2S, CH4, etc., – are produced and quantitatively balanced by the total activity of living matter. Their sum total is quantitatively invariable over geological time […]«.[62] Vernadsky concludes that »life, i.e. living matter establishes the troposphere and constantly maintains it in a dynamic equilibrium around a certain static equilibrium«.[63] In his terms, the troposphere is a »planetary« phenomenon as it was »created by living matter«.[64]

The basic laws regulating the dynamics of living matter on earth are three so-called biogeochemical principles (BGCPs). Here, we provide the first two BGCPs in two versions as Vernadsky's concept of energy may be misinterpreted.

First BGCP:

a) Geochemical biogenic energy tends towards its maximum in the biosphere.[65]

b) Biogenic migration of chemical elements tends towards its maximum in the biosphere.[66]

Second BGCP:

a) »Organisms survive in evolution only if they increase biogenic geochemical energy«.[67]

b) »The evolution of species (over geological time) tends toward the creation of stable life forms in the biosphere and aims to increase the biogenic migration of the atoms«.[68]

The *third BGCP* can be seen as a logical consequence of the first two principles. It states that, over geological time and since the Cryptozoic era, »the population of the planet has always been at the maximum possible level for all living matter«.[69]

The BGCPs fulfill a fundamental role in Vernadsky's theoretical system. He considered the first BGCP a so-called empirical generalization. Within Vernadsky's hierarchy of ›scientificity‹, this is the most reliable form of knowledge as empirical generalizations are immediately made on the basis of raw empirical data. The first BGCP refers to the fact that every biological species aims for the maximum possible quantitative value and this value can be redefined in biogeochemical terms.

Vernadsky admitted that the second BGCP »contains some assumption« as the biological data is incomplete.[70] It stands at a crossroads between the Darwinian theory of evolution and biogeochemistry as the struggle for existence guarantees that there can be no decrease in biogenic migration. Vernadsky's ›stable life forms‹ approximately correspond to the Darwinian-Spencerian concept of the ›survival of the fittest‹ even though Vernadsky's ›stable life forms‹ do not necessarily evolve as long as they fulfill their biogeochemical role in the biosphere. Vernadsky highlighted the unequal velocity of the evolutionary process for various species and the virtual immutability of certain ›species-persistents‹ that remained unchanged over millions of years (he provides examples of some *radiolaria* and *Lingula*).

60 Vernadskii: *Khimicheskie stroenie* (note 50), p. 237.
61 Vernadskii: *Nauchnaia mysl'* (note 49), p. 120.
62 Vernadskii *Khimicheskie stroenie* (note 50), p. 238.
63 Ibid.
64 Ibid., p. 238.
65 V[ladimir] I. Vernadskii: »Izuchenie iavlenii zhizni i novaia fizika« (1931) [The study of the phenomena of life and the new physics], in: id.: *Zhizneopisanie. Izbrannye trudy. Vospominaniia sovremennikov. Suzhdeniia potomkov* [Vladimir Vernadsky. Biography. Selected works. Reminiscences of contemporaries. Opinions of descendants. Sovremennik], Moscow: Sovremennik 1993, pp. 355–394.
66 Vernadskii: *Khimicheskie stroenie* (note 50), p. 283.
67 Vernadskii: *Izuchenie iavlenii zhizni* (note 66), p. 372.
68 Vernadskii: *Khimicheskie stroenie* (note 50), p. 270.
69 Ibid., p. 286.
70 Ibid., p. 285.

The second BGCP is the most central law with far-reaching consequences as it describes the directionality of evolution which ultimately leads to the transition of the biosphere into the noosphere. Vernadsky understood the noosphere as a lawful stage in the evolution of the biosphere. The crucial characteristic of this last stage of biospheric evolution is the dominance of scientific reason.[71]

THE SPACE-TIME OF LIVING MATTER

Starting in the early 1920s, Vernadsky consequently promoted the concept of the eternity of life in biogeochemical terms. It argued that, for a biogeochemist, life was a systemic property of the entire biosphere and must have occurred on earth immediately as a system that fulfills all basic biogeochemical functions.[72] Abiogenesis, as understood by biologists and chemists, i.e. an occurrence of single organisms in a primordial soup or similar conditions, was unthinkable in Vernadsky's theoretical world: »Talking about the origin of life on our planet we, in fact, are talking exclusively about the formation of the biosphere«.[73] Life is a global systemic property. His theory of a particular space-time of living matter was his most radical attempt to demonstrate the irreducibility of living matter to its inert counterpart.

To distinguish between living and inert substances as fundamentally different states of matter, Vernadsky introduced his notion of a ›state of space‹. This notion allowed him to contrast his views against Kant's concept of space: »Geometry is not a manifestation of the human reason *a priori*«.[74] Instead, it is the manifestation of the states of space that can be examined by investigating the geometrical properties of natural bodies.[75] In Vernadsky's terms, a ›natural body‹ is every natural material-energetic phenomenon separated in space and time from other natural bodies. Living organisms or minerals are examples of natural bodies. Although this definition might seem circular (the space of a natural body will be analyzed under the assumption that the natural body is spatially separated from other natural bodies), Vernadsky, in fact, was trying to liberate the notion of space (and time) not only from Kant's philosophy, but also from both Newton and Einstein. Newton's absolute space and time were based exclusively on negative characteristics, excluding them from scientific investigation (it is independent of the environment, eternal, etc.); Newton's space and time are isotropic. Einstein broke down this Newtonian picture, but he could not foresee the possibility for naturalists to study space-time as well.[76] The space of the naturalist is *anisotropic*, i.e., heterogeneous, and therefore can be approached through methods from natural science.

The state of space of a natural body is indicated by the investigation of its symmetry. For Vernadsky, the principle of symmetry was one of the most fundamental principles of nature. We may argue that, for him, the principle of symmetry was a cornerstone of the problems that were to be discussed. A highly important aspect is that the symmetry principle is fundamental also from the viewpoint of its place within the epistemological hierarchy as constructed by Vernadsky. According to Vernadsky's terminology, this principle is *an empirical generalization of the first kind.* In other words, this empirical generalization is formulated directly on the basis of the ›raw‹ facts.

Considering these two basic notions, ›the state of space‹ and ›symmetry‹, Vernadsky analyzed inorganic crystalline structures and arrived at the conclusion that crystalline matter can be characterized as *an anisotropic state of space that is completely defined by the laws of Euclidean geometry.* Anisotropic space will be defined as »geometrically expressed heterogeneity«.[77] It is heterogenous, but only in a certain sense: »The anisotropic space of the physicist and the crystallographer is discontinuous in the sense of homogeneity since the points that fill it are different from their environment, but it is homogenous in the sense of extension since it uniformly embraces the entire space, no matter what dimensions it may have«.[78] The state of space of inert

71 Georgy S. Levit: »The Biosphere and the Noosphere Theories of V. I. Vernadsky and P. Teilhard de Chardin: A Methodological Essay«, in: *Archives Internationales d'Histoire des Sciences* 50 (2000), no. 144, pp. 160–176.

72 Vernadskii: *Zhivoe veshchestvo i biosfera* (note 54), p. 454 and p. 457.

73 Ibid., p. 457.

74 V[ladimir] I. Vernadskii: *Filosofskie mysli naturalista* [Philosophical Thoughts of a Naturalist]. Moscow: Nauka 1988, p. 260.

75 See Georgy S. Levit/Wolfgang E. Krumbein/Reiner Grübel: »Space and Time in the Work of V.I. Vernadsky«, in: *Environmental Ethics* 22 (2000), no. 4, pp. 377–396.

76 V[ladimir] I. Vernadskii: *Trudy po filosofii nauki* [Contributions on the Philosophy of Science], Moscow: Nauka 2000, p. 134.

77 Ibid., p. 189.

78 V[ladimir] I. Vernadskii: Problema vremeni v sovremennoi nauke [The Problem of Time in Modern Science]. *Izvestiia Akademii Nauk SSSR. VII Seriia: Otd. Matematicheskikh i estestvennykh nauk* [Department of Mathematical and Natural Sciences] 4 (1932), pp. 511–541.

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matter is Euclidean in the sense that processes that take place in such a kind of space show the identity of leftness and rightness physically and geometrically. Furthermore, the inorganic crystals never feature a higher symmetry than one of the 6th and rarely of the 5th order.[79]

However, the situation changes in the world of living matter. Louis Pasteur already described a dissymmetry in the crystals of tartaric acid. Organic compounds, which are typical for all kinds of living matter, differ from compounds that the inert (non-living) parts of the Earth are composed of. Pasteur called these two categories *la nature vivante* and *la nature morte*. There are always two enantiomorphs[80] which could theoretically exist. The protoplasm of living matter consists of pure steric compounds. In the stereochemical equations of these compounds, the atoms preferentially arrange in left-handed or right-handed isomers instead of statistically distributing, something that could be expected as a result of physical/chemical laws alone. Pasteur stated that the biochemical processes of living matter and their crystallization products demonstrate the preferential synthesis and maintenance of left-turning or right-turning isomers.[81]

Vernadsky elevated the dissymmetry and declared it a universal principle, distinguishing the spaces of living and inert matter and reflecting the genetic difference between two kinds of matter: Only dissymmetry can generate dissymmetry. This is an important step that leads towards something he labeled the *Redi principle* (after Francesco Redi, 1626–1697), which claims: *Omne vivum e vivo* [all life from life]. In Vernadsky's terms, this means that »new living natural bodies are born only from pre-existing ones«[82] and this chain of being is eternal from the biogeochemical perspective, i.e., life is geologically eternal.[83]

The orders of the structural symmetry on the macro-level and dissymmetry on micro-level did not exhaust the discrepancy between living and inert states of spaces. These features are complemented by *dispersiveness* (the sharp separateness of a living organism from its environment), *stability* (the constant re-creation of form in a dynamic equilibrium), and *curvilinearity* (the separation of organisms from their environment by *curved surfaces* in contrast to inorganic crystals).

Living matter can also be contrasted with inert matter in relation to temporal properties. Vernadsky derived from his biogeochemical experience that the processes producing the inert natural bodies would feature cyclic, reversible, undirected characteristics in the absence of living matter: »In the cryptozoic era, the same minerals and rocks were being formed which are being formed now«.[84] It seems that only in living matter can there be a substantial irreversibility since evolution (an irreversible process) takes place only among the living natural bodies of the earth.[85]

The irreversibility of time is tightly connected to the anti-entropic properties of living matter. The German philosopher Adolf Meyer-Abich, a younger contemporary of Vernadsky, highlighted the importance of this principle: »The deep rift that Vernadsky tore between the organismic and the inorganic nature is further deepened by the fact that, based on geochemical experiences with the biosphere, he deems necessary a revision of the *entropy principle*, the second law of energetics. What Helmholtz, Maxwell, and others suspected, namely that the phenomena of life do not behave entropically, but rather in the opposite way, ectropically [...], is confirmed by modern geochemistry«.[86]

In his notes from 1941–1942, in the last years of his life, Vernadsky claimed: »Time, which is being expressed by a polar vector in physical-chemical and biological processes in living matter, is irreversible; it does not go back. That shows that entropy will take no place in the material medium of living matter«.[87] In other words, Vernadsky connects the irreversibility of time in living matter with the opposite idea that living natural bodies escape entropy. This idea was not solely Vernadsky's claim. Approximately at the same time (1944), Erwin Schrödinger remarked that living organism »feeds on negative entropy«.[88] Vernadsky, however, speculated on the level of living matter, not

79 Vernadskii: *Khimicheskie stroenie* (note 50), p. 178.
80 »A structure that is a mirror image of another, being exactly the same shape as the other except for the reversal of left and right« (overview »Enantiomorph«, in: www.oxfordreference.com (accessed on 01.03.2023)).
81 Louis Pasteur: *Oeuvres de Pasteur*, Vol. 1: *Dissymétrie moléculaire*, Paris: Masson et Cie, Éditeurs 1922, p. 343.
82 Vernadsky: »The Biosphere and the Noösphere« (note 1).
83 Vernadskii: *Zhivoe veshchestvo i biosfera* (note 54), p. 452.
84 Vernadsky: »The Biosphere and the Noösphere« (note 1).
85 See Vernadskii: *Filosofskie mysli* (note 75), pp. 30, 175, 181, 286.
86 Adolf Meyer-Abich: *Naturphilosophie auf neuen Wegen*, Stuttgart: Hippokrates 1948, p. 186.
87 Vernadskii: *Filosofskie mysli* (note 75), p. 274.
88 Erwin Schrödinger: *What is Life?* Cambridge: Cambridge University Press 1992, p. 71.

on the level of a single organism. As a biogeochemist, he could see that the evolution of the biosphere is a movement towards a more perfect orderliness and stability. Hence, the evolution of living matter as well as the evolution of the entire biosphere are irreversible processes. This irreversibility is caused by the presence of living matter in the biosphere.

Vernadsky's evolution is not only irreversible due to the immanent properties of living matter, but it is also directed. The evolution of the biosphere generally strives towards increasing the biogenic migration of atoms. However, there are also morphological signs of irreversibility. To illustrate the irreversibility and directedness of evolution, Vernadsky introduced the so-called Dana-principle or *Dana generalization* (after James D. Dana, 1813–1895). Going from his studies of crustacea, Dana formulated a principle: »The fundamental idea, which we shell find at the basis of the various distinctions of structure among species is, *the higher centralization of the superior grades, and the less concentrated forces of the interior* […]. This centralization is literally a *cephalization* of the forces«.[89] Vernadsky reformulated this principle[90] and stated that, with the course of geological time, the central nervous system of some species strives towards perfection (*cephalization*). The thesis on the irreversibility of evolution is one of the arguments in favor of Verdansky's *noosphere concept*.

Thus, Vernadsky's idiosyncratic space-time hypothesis is required to prove the thesis of the crucial difference between living and inert matter and, hence, the irreducibility of the life processes to physical-chemical laws. The cardinal difference between living and inert matter is supported by or associated with all substantial ›principles‹ of his theoretical system: 1. three biogeochemical principles, 2. the Redi principle, 3. the Dana principle, 4. the principle of biospheric evolution, and 5. the noosphere concept.

VLADIMIR BEKLEMISHEV'S ›GEOMERIDA‹ AS A COMPLEMENTARY APPROACH TO LIVING MATTER

Towards the end of the 1920s, the Russian zoologist and morphologist Vladimir Beklemishev developed another concept of living matter, which can be viewed as a complementary approach to Vernadsky's biogeochemical grasp of living organisms.[91] Beklemishev saw the organism as a dynamic equilibrium. However, in contrast to Vernadsky, he interpreted them from a structural rather than a chemical perspective. In 1928, he wrote: »Every organism is part of a semi-parasitic and semi-mutualistic community; the life of any wholeness is based on the conflict and destruction of the parts; the entire world ›lies in evil‹«.[92] Like Vernadsky, Beklemishev approached life on earth from a global perspective, introducing the new term geomerida which labels the totality of all living organisms on earth. For him, a geomerida was »the organism of the highest order« and another term for the biosphere (not to be confused with Vernadsky's use of the term). Formally speaking, Beklemishev did not coin the term geomerida, but he was the first who publically defined it as »the totality of everything alive on Earth«.[93] He adopted the term from the botanist Konstantin Starynkevich via the biologist and philosopher of science Aleksandr Liubishchev[94] who attended Starynkevich's lecture in 1919 at the Taurida University (Crimea). A year later, Vernadsky became its rector. Even though Beklemishev practically abandoned this term after 1931, he upheld the idea of »the living cover« as an object of study: »biology's main object of study is this swarming boundless world of living things – the living cover of the Earth.[95]

A fundamentally new concept that Beklemishev implemented into the debate on living matter and the biosphere is the concept of the morphoprocess, which he developed for »ordinary« living organisms to describe global and cosmic phenomena. On the scale of the biosphere, the morphoprocess is defined as »the totality of all living beings of the earth, this living

89 James D. Dana: »A review of the classification of Crustacea with reference certain principles of classification«, in: *The American Journal of Science and Arts* XXII (1856), p. 14–29, here p. 15.

90 Vernadskii: *Nauchnaia mysl'* (note 49), pp. 21–22.

91 Alexandr A. Protasov: »K voprosu o metodologii ekologicheskogo aktualisma. Liubishchevskie chteniia« [On the Methodology of Ecological Actualsim. Readings], in: *Sbornik materialov vserossiiskoj nauchnoi konferentsii* [Proceedings of the All-Russian Scientific Conference], Ulianovsk, 30.-31.03.2017, Ulianovsk: UlGPU 2017, pp. 114–119.

92 V[ladimir] N. Beklemishev: *Metodologiia sistematiki* [Methodology of Systematics], Moscow: KMK Press 1994, p. 57.

93 Ibid., p. 61.

94 Starynkevich's term ›geomerida‹ was recorded in Liubishchev's diary of the 4th May 1919. See Aleksandr Liubishchev: *Dnevnik, 1918-1922*, Ulianovsk: 2002; e-version: https://prozhito.org/notes?date=%221918-01-01%22&diaries=%5B90%5D (accessed on 01.03.2023).

95 Vladimir N. Beklemishev: »Ob obshchikh printsypakh organizatsii zhizni« [On the General Principles of the Organization of Life], in: *Bulleten MOIP. Otd. Biologii* 69 (1964), no. 2, pp. 22–38.

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crust, spread out on this rocky ball« existing due to its organization, that is, »the continuous preservation of typical forms and relations of the whole in the constant change of its parts«.[96]

Beklemishev developed a methodology for studying the geomerida. Since it was seen as the organism of the highest order and therefore existed as a single specimen, it could not be approached from the viewpoint of taxonomy. He argued that, on the level of the entire biosphere, biological systematics can only be a morphology and this morphology would be subdivided into tektology and architechtonics. In architectonics, every single phenomenon is understood as unique and occupying a certain place in the whole process, describing the relative position of all elements and parts. Tektology looks for similar parts, i.e., structural units of geomerida/biosphere and describes them on the basis of their differences and similarities. Beklemishev understands tektology as the systematics of parts composing a whole. He introduced the notion of the individuality of a system, one of the most important notions in his theory. There are as many systems, he argued, as there are clearly delineated individualities of certain orders. A system in that sense neglects the individualities of the higher orders and operates on the level of lower systemic units on which it depends and to which it is subordinated to. In that sense, the geomerida is the individuality of the highest order, consisting of biocenoses that function as its structural units. Biocenoses, in turn, consist of separate organisms as units.[97] Beklemishev elaborated on statistical methods of studying tektology and architectonics on all structural levels of geomerida. Biocenoses as structural units of geomerida show low levels of individuality, they are unstable and diffuse, but they differ from ›true organisms‹ only in their level of individuality. Since all organisms are ›collectives‹ consisting of subordinated individualities, the concept of individuality is applicable to all levels of the living. Beklemishev considers the totality of every living thing, structured into various ›complexes‹, as The Being, the biosphere. Beklemishev shared Vernadsky's idea that life is a planetary phenomenon. However, he disagreed with Vernadsky on the sharp difference between living inert matter as ›inert material‹ also being part of the living systems; the difference between living and bioinert systems is not a qualitative, but a quantitative one.[98]

This approach stands in sharp contrast to Vernadsky's version of living matter. Whereas Vernadsky focused on biogeochemical functions, i.e., on the biogenic flow of atoms, Beklemishev concentrated on the biospheric system's structural uniqueness from a morphological perspective as well as on the hierarchical relations between the whole and its individual parts. Beklemishev understood geomerida as a morphological phenomenon, not as a sum total of chemical elements. The morphoprocess, Beklemishev argued, is the preservation of certain organismic properties through the constant change of elements within this organismic system. Erythrocytes have their ›individual‹ lifespan of about one month, but the blood performs its gas functions without interruptions. Biocenoses or the biosphere as a whole can also be approached as morphoprocesses. Based on data on the historical development of the biosphere, the geomerida's change of elements is obvious, but it is still necessary to consider the ›permanence‹ of integrity from the viewpoint of actualism.[99]

Despite methodological discrepancies, their approaches are not mutually exclusive, but complementary since geomerida is another name for Vernadsky's living matter. Thus, both theories interpret the same global phenomenon.

CONCLUSIONS

Vernadsky's theory of living matter was founded on three logically interconnected hypotheses, which he clearly formulated in the early 1920s. First comes the principle of the eternity of life, which suggest that life is not the product of *abiogenesis* or *archeogenesis* (Vernadsky uses it in the sense of primordial origin) in the biosphere, but that it pre-existed the biosphere as a form of matter organization. There is no vitalism in this concept, it is a completely materialistic grasp of living nature. Second, life as a form of matter organization differs significantly from its inert environment, an essential difference that must be described through a separate set of fundamental laws. Third, life is a planetary phenomenon existing only and exclusively as a global unity. These three concepts are mutually dependent in the sense that life is an eternal phenomenon, something that was built into the initial

96 Beklemishev: *Metodologiia sistematiki* (note 92), p. 61.
97 See Pavel G. Svetlov: »Pamiati V. N. Beklemisheva [Memories of V. N. Beklemishev]«, in: ibid., pp. 6–16.
98 Beklemishev: *Ob obshchikh printsypakh* (note 95).
99 O[leksandr] O. Protasov: *Biogeomika. Ekosistemy svitu v strukturi biosferi* [Biogeochemistry. World Ecosystems in the Structure of the Biosphere], Kyiv: Akademperiodika 2017.

structure of the universe and exists only as a global systemic property.

These three basic hypotheses develop into a logically coherent conceptual structure, which we label Vernadsky's theoretical system.

In the mature version of this system, living matter was separated from its inert environment as a result of the very nature of the space-time it occupies (or shapes). The living matter could only be generated by living matter as it exists in a dissymmetric space and in a directed irreversible time. As two modes of matter organization (living and inert) exist in the biosphere in different space-times, the only connection between the two is the biogenic flow of atoms. In other words, Vernadsky's living matter concept presupposes the reality of a certain entirety, the biosphere, consisting of two strictly separate subsystems, living matter and inert matter that act as parts of a higher systemic entity. Thus, Vernadsky described the biosphere as a »bioinert system«.[100] The integrity (of the biosphere), including the integrity of lower-level subsystems, is guaranteed by living matter.

Since living matter consists of both individual organisms and their coenobiotic formations, the existence of these individuals of different levels is simultaneously intermittent and integral. In Vernadsky's theory, this ›discontinuous continuum‹ is a dialectical concept that describes the spatial specifics of living matter and guarantees its cyclical dynamics with the participation of its inert medium. Furthermore, it is facilitated by a constant excess of energy, ultimately emanating from the sun.

The cyclical flow of atoms between living and inert matter is the primary research subject of biogeochemistry, a science founded by Vernadsky. As the biosphere is composed of biogeochemical cycles, it is a self-regulating system. However, it is not the gaia in a strict sense as life doesn't equal its environment and these two modes of organization always remain separate.

The directionality of time along with the leading role of living matter (here, the term inert as employed by Vernadsky to describe non-living matter is very telling) suggests that the biosphere as a whole evolves in a certain direction.

Early on, Vernadsky realized that he was developing an evolutionary theory complementary to that of Darwin and his followers who only studied the transformation of species, but not the changes of the whole biospheric system or subsystems that compose the biosphere. The Vernadskian evolution, in contrast to the Darwinian one, is the evolution of living matter in its entirety towards the acceleration of biogeochemical cycles, i.e., it moves in the direction of the increasing biogenic migration of the atoms. At their core, human civilization and science contribute to the acceleration of atomic migration in a stronger way than any other factor, which means that science is a ›planetary phenomenon‹, i.e., it does not violate the course of the biospheric evolution and instead represents its logical continuation. As its supreme manifestation, human reason and science are not alien to the biosphere, but a part of its evolution, and Vernadsky did believe that it was only a question of time until the biosphere would be fully controlled by scientific thought. The transition from the biosphere into the noosphere, i.e., into the sphere of human reason that controls all biogeochemical cycles will be a major transition in the global evolution and its ultimate outcome/result.

In total, the concept of living matter lies at the core of Vernadsky's theory of the biosphere and is built into a holistic coherent logical structure that describes life as a global and evolving entity.

The comparison of Vernadsky's living matter with other global approaches in Russian-language science allows us to approach the specificity of his methodology. Vernadsky's younger contemporary Vladimir Beklemishev sometimes employed the term geomerida as coined by Konstantin Starynkevich, referring to the ›living cover of the Earth‹. Geomerida is not just another exotic term for the living part of the biosphere. It was coined to describe a purely biotic global system, whereas Vernadsky's biosphere is a bio-inert system.

As Beklemishev approached the global system from the viewpoint of morphology and systematics, he saw it as the ultimate object of biological systematics, not as a Vernadskian ›natural body‹, and described its

100 Alexandr A. Protasov/Chingiz M. Nigmatullin: »K istokam biosferologii: Geomerida K.D. Starynkevicha i V.N. Beklemisheva«, [On the Origin of Biosperology: Germerida of K.D. Starynkevich and V.N Belkemishev], in: *Sbornik materialov vserossiiskoj nauchnoi konferentsii* [Proceedings of the All-Russian Scientific Conference], Ulianovsk, 30-31.03.2017, Ulianovsk: UlGPU 2017, pp. 119–126.

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dynamics as a *morphoprocess*. For Beklemishev, the morphoprocess is the preservation of organismic features through a constant change of elements within this organismic system. In other words, it is not a system that fluctuates around a certain permanently evolving point along with its inert environment (as in Vernadsky's biosphere), but it is a morphologically relatively stable system that exists despite (or due to) an internal cyclical dynamic. Beklemishev implemented his notion of the morphoprocess on a global scale. A morphoprocess on the scale of the entire biosphere is a living crust, spread out on a rocky globe that exists due to its organization, that is, the continuous preservation of the typical forms and relations of the whole throughout the constant change of its parts. In a certain sense, Vernadsky's living matter and Beklemishev's geomerida are closely related notions. The critical difference lies in the methodology applied to its research and correspondingly in their theoretical significance. For Beklemishev, it was crucial to understand form as a biological property, which is why his process is a *morpho*-process. Vernadsky's living matter emphasizes the *matter*, i.e., the chemical composition of ›natural bodies‹. As Vernadsky's object of study crosses the borderlines of the living, his research program is an interdisciplinary enterprise.

The concept of a morphoprocess involves a regular growth and change of the identifiable lasting form. In other words, life as a morphoprocess is characterized by a form lasting throughout the flow of changes. However, at the same time, this ›lasting form‹ lies in the regular growth and change and is seen as a self-organizing process. The morphoprocess is a dynamic form of organization and is not necessarily interrupted when individual parts disintegrate. The global morphoprocess is the totality of all living matter on our planet.

Although Beklemishev's morphoprocess provided both global dimensions for the interpretation of life and the idea of cyclicity, it cannot be equated with Vernadsky's research program. Even though Vernadsky's concept of living matter (in its original idiosyncratic sense) did not uphold in contemporary science, the biogeochemistry, which developed as a result of Vernadsky's concept of living matter, proved itself as one of the fundamentals of modern natural science and even of the modern worldview and politics.

VLADIMIR SUKACHEV'S CONCEPT OF BIOGEOCOENOSIS

Tatjana Petzer

ECOSYSTEM AND/OR BIOGEOCOENOSIS (BGC)

In search for an ecological concept defining a »whole complex of organisms inhabiting a given region«[1] with more methodological value than ›complex organism‹ or ›biome‹ and ›biotic community‹, the British phytocenologist Arthur Tansley introduced the term *ecosystem* (from Greek οἶκος ›household‹, and σύστημα ›composite whole‹) in 1935. Referring to the physical notion of ›system‹ as an entity, he linked the organism-complex to the whole complex of habitat factors, blurring the division between natural and anthropogenic environments. Only after the Second World War did Tansley's concept receive broader recognition when the brothers Eugene and Howard Odum framed ecosystem ecology in the 1950s–1960s by linking the natural and social sciences and introducing cybernetic methods into the research of ecosystems.[2]

Independently of each other, other scientists from different countries also recognized the interconnectedness of all phenomena on the Earth's surface, resulting in the parallel coining of various notions. The Russian Botanist Vladmir Sukachev (1880–1967) introduced the term *biogeotsenoz* (biogeocoenosis or biogeocoenose, from Greek βίος ›life‹, γῆ ›earth‹, and κοινός ›common‹),[3] which was broadly used in the Soviet Union and throughout Eastern Europe. It was introduced into Russian in two stages: Following the forestologist Georgii Morozov (1867–1920), who systematically implemented Karl Möbius's term biocoenosis,[4] Sukachev first suggested the term *geotsenoz* (geocoenosis) in 1942.[5] It was meant to link the earth's surface with its inhabitants and abiotic environmental factors in a dynamic unit. However, in 1944, he changed geocoenosis into biogeocoenosis (in the following: BGC), implementing an integral connection with Vladimir Vernadsky's (1863–1945) concepts of the biosphere and the biogeochemical cycles.[6] According to Sukachev, BGC came close to Tansley's notion of the ecosystem which also brings together a biocoenosis with its habitat (the ecotope). However, both terms were not used synonymously: as a more general term, ecosystem was not precise enough to classify the unit of nature itself, whereas the BGC, in accordance with Vernadsky's concept of ›living matter‹,[7] did not include all abiogenic abiotic factors of the ecosystem. Also, the notions of ›facies‹ and ›landshaft‹, which were used by physical geographers, were discussed as similar conceptualization.[8]

1 A[rthur] G. Tansley: »The Use and Abuse of Vegetational Concepts and Terms«, in: *Ecology* 16 (1935), no. 3, pp. 284–307, here p. 299.

2 E[ugene] P. Odum: »The Strategy of Ecosystem Development«, in: *Science* 164 (1969), pp. 262–270. On the popularization and transformation of the concept of the ecosystem see Frank Benjamin Golley: *A History of the Ecosystem Concept*, New Haven: Yale University Press, 1993, ch. 4.

3 The term is also spelled ›biogeocenosis‹.

4 On the concept of biocoenosis see Karl A. Möbius: *Die Auster und die Austernwirthschaft*, Berlin: Wiegandt, Hempel & Parey 1877, pp. 72–87.

5 V[ladimir] N. Sukachev: »Ideia razvitiia v fitotsenologii« [The Idea of Development in Phytocenology], in: *Sovetskaia botanika (*1942), no 1–3, pp. 5–17. Id.: Razvite rastitel'nosti kak ėlementa geograficheskoi sredy v sootnoshenii s razvitiem obshchestva« [The Development of Vegetation as an Element of the Geographical Environment in Relation to the Development of the Community], in: S[ergei] A. Bogoslovskii et. al: *O geograficheskoi srede v lesnom proizvodstve* [On the Geographical Environment in Forest Production], Leningrad: Izd.-vo Lesotekhnich. akad. 1940, pp. 54–62.

6 V[ladimir] N. Sukachev: »O principakh geneticheskoi klassifikatsii v biogeotsenologii« [On the Principles of Genetic Classification in Biogecoenology], in: *Zhurnal obshchei biologii* 5 (1944), pp. 213–277.

7 See the contribution by Georgy S. Levit and Alexander A. Protasov in this issue.

8 V[ladimir] N. Sukachev: »O sootnoshenii poniatii geograficheskii landshaft i biogeotsenoz« [On the Correlation of the Concepts of Geographical Landscape and Biogeocoenosis], in: *Voprosy Geografii* 16 (1949), pp. 45–60. Id.: »Sootnoshenii poniatii ›biogeotsenoz‹, ›ėkosistema‹ i ›fatsiia‹«

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In the GDR, Russian immigrant Alexis Scamoni was professor at the Faculty of Forestry (1948–1963), which was transferred from the Humboldt University of Berlin to Eberswalde. There, he founded the School of Vegetation Research on the basis of Sukachev's concept.[9] Scamoni particularly emphasized the interdisciplinary approach initiated by Sukachev, which led to a cooperation between geology, geography, the branches of soil science, climatology, meteorology, vegetation science, ecology and zoology, as well as planning and economics.[10] In the late 1960s, the Soviet volume *Struktura i formy materii* (Structure and forms of matter) which introduced natural science concepts and methods into the context of dialectical materialism, including Sukachev's concept of BGC was translated into German.[11] In turn, Rolf Löther, the East German historian and philosopher of science in the fields of biology and medicine, quotes Sukachev's essay in his book *Biology and Philosophy*. However, instead of highlighting Sukachev's differentiation from the notion of the ecosystem, Löther cites the latter in parentheses – that is, as a synonym to BGC.[12] To him, the difference was of no concern as he was not interested in the exact and applied science, but rather in the philosophical question of scientific development – to understand life as an interaction of biotic and abiotic factors, of material and energy cycles in which the non-living environment is not only involved, but represents a driving factor of co-evolution. Moreover, he focused on the BGC as the scene of interaction, of (self-)regulation, and of radical change due to humanity's activity. Regarding the transition from the biotic forms of the movement of matter towards the social forms of the movement of matter, Löther points to Vernadsky's concept of the noosphere as well as to the introduction of cybernetics into evolutionary biology by Ivan Shmal'gauzen (1884–1963). The mathematical modelling of the BGC was also highlighted by Sukachev himself in the last chapter of his wide-reaching book on *Forest Biogeocoenology*, which was immidately translated into English.[13] A reviewer in the USA, a forester of Russian decent and educator who did not know about the translation commented:

»Those who know the Russian language will note that the book provides a complete account of the development of the ecological (if I may use an obsolete term) concept in Russia. The bibliography of more than 1000 Russian publications (up to 1964 and with a few titles in Ukrainian) will make the volume invaluable for reference purposes. The list of literature in Western languages includes some 500 titles (up to 1962)«.[14]

In 1971 and 1972, the first East-West meetings in the realm of the geographical sciences took place in Hungary and Canada with panels on »Man and Environment«. Here, the notion of BGC attracted international attention.[15] Also, a book translation com-

[Relationship of Biogeocoenosis, Ecosystem and Facies], in: *Pochvovedenie* 6 (1960), pp. 1–10; Engl. transl.: *Soviet Soil Science* 6 (1960), pp. 579–581. Id.: »Osnovnye poniatiia lesnoi biogeotsenologii. Biogeotsenoz kak vyrazhenie vzaimodeistviia zhivoi i nezhivoi prirody na poverkhnosti Zemli. Sootnoshenie poniatii ›biogeotsenoz‹, ›ėkosistema‹, ›geograficheskii landshaft‹ i ›fatsiia‹« [Fundamental Concepts of Forest Biogeocoenology. Biogeocoenosis as an Expression of the Interaction of Living and Nonliving Nature on the Earth's surface. The Correlation of the Concepts of ›Biogeocoenosis‹, ›Ecosystem‹, ›Geographical Landscape‹, and ›Facies‹], in: id., N[ikolai] V. Dylis (eds.): *Osnovy lesnoi biogeotsenologii*, Moscow: Nauka 1964, pp. 5–49.

9 Alexis Scamoni: »Biogeozönose – Phytozönose« (1960), in: Reinhold Tüxen (ed.): *Biosoziologie. Bericht über das Internationale Symposium in Stolzenau/Weser 1960*, Den Haar: Dr. W. Junk 1965, pp. 14–22.

10 Ibid., p. 19. A proper explanation of the term is given by M[artin] Schellhorn: »Biogeozönose«, in: *Philosophie und Naturwisssenschaften. Wörterbuch zu den philosophischen Fragen der Naturwissenschaften*. 3., vollst. überarbeitete Auflage. Bonn: Pahl-Rugenstein Nachf. 1997, S. 127–129. See also the mediation work of the Austrian botanist, who was born in Brno, educated in Switzerland and taught in Innsbruck, Helmut Gams: »Aus der Geschichte der Synökologie und Ökosystemforschung besonders in den Alpen und in Osteuropa« (Ljubljana 1975), in: *Mitteilungen der Ostalpin-Dinarischen pflanzensoziologischen Arbeitsgemeinschaft* 14 (1978), pp. 159–164.

11 V[ladimir] N. Sukachev: »Struktura biogeotsenozov i ikh dinamika« [The Structure of Biogeocoenoses and Their Dynamics], in: *Struktura i formy materii*, Moscow: Nauka 1967, pp. 560–577. Ger.: W[ladimir] N. Sukatschow: »Die Struktur der Biogeozönosen und ihre Dynamik«, in: *Struktur und Formen der Materie*, Berlin: Deutscher Verlag der Wissenschaften 1969, pp. 488–503.

12 Vgl. Rolf Löther: *Biologie und Weltanschauung. Eine Einführung in philosophische Probleme der Biologie vom Standpunkt des dialektischen und historischen Materialismus*, Leipzig: Urania-Verlag 1972, p. 49, 47.

13 Sukachev, Dylis: *Osnovy* (note 8); Engl. transl.: ead.: *Fundamentals of Forest Biogeocoenology*, Edinburgh, London: Oliver and Boyd 1964. Recounting the history of the concept of biogeocoenosis, Sukachov and Dylis mentioned the contribution of Vladimir Stanchinskii (1882–1942), who pioneered ecological energetics, to the development of biogeocoenology, and had fallen prey to the purges.

14 Nicholas T. Mirov: »Forest Ecology: Sukachev's Concept of ›Biogeocoenoses‹: Fundamentals of Forest Biogeocoenology. V. N. Sukachev and N. V. Dylis, Eds. Botanical Institute and Laboratory of Forest Science, Academy of Sciences of the U.S.S.R., Moscow, 1964. 574 pp. Illus.«, in: *Science* 148 (1965), no. 3671, p. 828.

15 See the comparative conceptual analysis by West-German geographer Carl Troll: »Landscape ecology (geoecology) and biogeocoenology: a terminology study«, in: *Geoforum* 8 (1971), pp. 43–46.

missioned by the NASA technical translation service of the Soviet Space biology series *Modelling Biological Systems* provided an overview on cybernetical approaches to biological associations such as the BGC.[16] The term itself was introduced as denoting the same as ›ecological system‹, but with an annotation by the authors stating that they have noticed a certain shift in the usage and meaning of these terms.[17] The following will trace the conceptual divergence from the perspective of the most obvious difference: the establishment of a discipline.

BIOGEOCOENOLOGY

While the ecological system is arbitrary in size and might equal the smallest unit of the terrestrial surface and as well as whole Earth, the BGC refers to an actually existing, definable territory. BGCs are visually distinguished by their vegetation, their height, and their closeness of tiers. They are usually named after the plants that dominate their different tiers. A BGC evolves from the continuous interactions between all components, (fig. 1)[18] known as structural-functional parcels (*partselly*), including living and dead organic matter, soil, and atmosphere:

»A Biogeocoenose is a combination on a specific area of the earth's surface of homogeneous natural phenomena (atmosphere, mineral strata, vegetable, animal, and microbiotic life, soil, and water conditions), possessing its own specific type of interaction of these components and a definite type of interchange of their matter and energy among themselves and with other natural phenomena, and representing an internally-contradictory dialectical unity, being in constant movement and development«.[19]

In its complexity, this definition of BGC as a coevolutionary unit of the biosphere provided the foundation for Sukachev's interdisciplinary science of biogeocoenology.[20] The concept served the investigation of the laws of matter and energy's processes of environmental transformation. As a diagnostic tool, it enabled the systematic land classification and mapping as well as, last but not least, the regulation of the BGC.

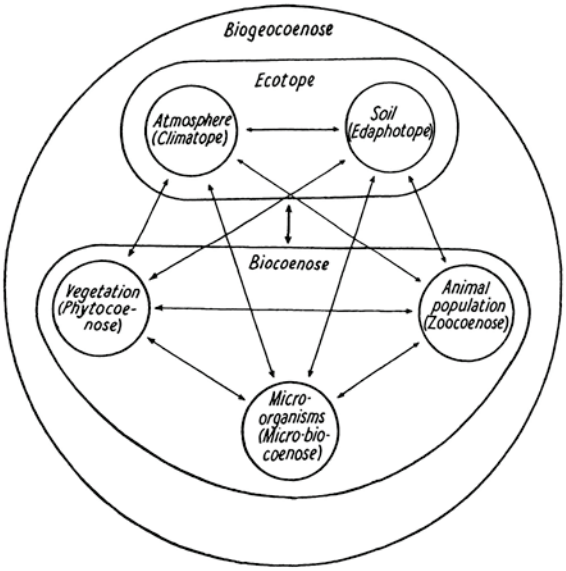

Fig. 1: Vladimir Sukachev's general scheme of biogeocoenosis

As there were many parallel developments within other emerging cross-border studies such as geobotany, geobiology, or vegetation geography, researchers with a different scientific background reacted similarly to the ecosystem-BGC-equation.[21] The mapping of ecological sciences by Czech

16 I[urii] M. Svirezhev, E[vgenii] Ia. Elizarov: *Problemy Kosmicheskoi Biologii*, vol. 20: *Matematicheskoe modelirovanie biologicheskikh sistem*, Moscow: Nauka 1972; Engl. transl.: *Problems of Space Biology, vol 20: Mathematical Models of Biological Systems*, NASA TT F-780, 1973.

17 Ibid., p. 5.

18 Engl.: Sukachev, Dylis: *Fundamentals* (note 13), p. 27.

19 Ibid., p. 26. Rus.: Sukachev, Dylis: *Osnovy* (note 8), p. 329: »Биогеоценоз – это совокупность на известном протяжении земной поверхности однородных природных явлений (атмосферы, горной породы, растительности, животного мира и мира микроорганизмов, почвы и гидрологических условий), имеющая свою особую специфику взаимодействия этих слагающих ее компонентов и определенный тип обмена веществом и энергией их между собой и с другими явлениями природы и представляющая собой внутренне противоречивое диалектическое единство, находящееся в постоянном движении, развитии«.

20 V[ladimir] N. Sukachev: »Osnovy teorii biogeotsenologii« [Fundamentals of the Theory of Biogeocoenology], Iubileinyi sbornik, posviashchennyi 30-letiiu Velikoi Oktiabr'skoi sotsialisticheskoi revoliutsii, part 2, Moscow, Leningrad: Izd.-vo AN SSSR 1947, pp. 283–304. Id.: »Lesnaia biogeotsenologiia kak teoreticheskaia osnova lesovodstva i lesnogo choziaistva« [Forest Biogeocoenology as a Theoretical Basis for Forestry and Forest Management], in: id. (ed.): *Voprosy lesovedeniia i lesovodstva: dokl. na V. Vsemir. lesn. kongresse* [Issues of Forest Science and Forestry: Papers presented at the V. World Forestry Congress], Moscow: Izd.-vo AN SSSR 1960, pp. 5–18. Id., N[ikolai] V. Dylis (eds.): *Programma i metodika biogeotsenologicheskikh issledovanii* [Biogeocoenological Research Programme and Methodology], Moscow: Nauka 1966.

21 Jiří Pacltl: »Bionomie und Ökologie«, in: *Phyton* 7 (1957), no. 1–3, pp. 225–227. Note the turning over of syllables to change meaning: Alois Zlatník: *Ekologie krajiny a geobiocenologie: jako vědecký podklad ochrany přírody a krajiny* [Landscape Ecology and Geobiocoenology: As a Scientific Basis for Nature and Landscape Conservation], Brno: VŠZ 1975.

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botanist Jiří Paclt (Slovak Academy of Sciences) can be summarized as such: biogeocoenology = geobiology, geobiology = biocoenology, biocoenology = synecology, synecology = geobiology, and ecology = synecology and biocoenology; accordingly, this field can simply be called ecology. For the complementary field, i.e., auto-ecology and ethology, Paclt suggested the term ›bionomy‹. The intention and impact of biogeocoenology remained unrecognized. At that time, however, both the approaches of biogeocoenology and, above all, the subdivision of forest biogeocoenology was highly esteemed within the applied sciences for its clear praxiological orientation and practical implication in environmental preservation. Sukachev's detailed empirical research into the specific conditions of forests resulted in the early recognition of their importance to hydrology and the anthropogenic regional climate change in deforested areas. This ecological understanding gave rise to the Great Stalin Plan for the Transformation of Nature in 1948, with a special emphasis on the field-protective afforestation and the promotion of watersheds. In the 1950s, the totalitarian party-scientist Trofim Lysenko, who had previously initiated the destruction of Soviet genetics and weakened of ecologists, attempted to extend his power to the control of forestry and the Transformation Plan. At this point, due to his civil and scientific standing[22], Sukachev was already a sufficiently distinguished individual to oppose Lysenko. The failures of Lysenko's steppe afforestation were reported to the highest levels and the absurdity of his pseudo-scientific theory was torn apart in the journals. Not only did Sukachev thus become a symbol for both the early ecological opposition and the largest conservation organization in the world at that time, but ecological consciousness also became a synonym for opposing ideology.[23] The renowned geneticist Nikolai Timofeev-Resovskii (also Timoféeff-Ressovsky, 1900–1981) is a prominent example for this movement which aimed to re-establish the ethics and ecology of science.

Acting as head of the Department of Experimental Genetics in Berlin-Buch during the interwar period, Timofeev-Resovskii was imprisoned after the Second Word War, incarcerated in a Gulag camp, and later transferred to a so-called *sharashka*[24] to work at a secret laboratory where he helped develop the Soviet atomic bomb project. Following his release (but not rehabilitation),[25] he was given a position at the Ural Branch of the Academy of Sciences in Sverdlovsk (today Yekaterinburg) where he headed the Department of Biophysics (1955–1964), a rare stronghold of ›Western‹ genetics in the years of Lysenko's decline. Additionally, he conducted experimental biogeocoenological studies at the biological station Miassovo in the Il'menskii zapovednik near the city of Miass (Chelyabinsk region).[26] Due to his interaction with scientists from other research areas, this theory developed into a dynamic field of Soviet science.

INTERDISCIPLINARY LEGACY

At the biological station Miassovo, Timofeev-Resovskii immediately began to conduct experiments on the treatment of water contaminated by radioactive slags, as well as on the radioactive stimulation of plants. Based on the experiments' results, Timofeev-Resovskii systematized the distribution and accumulation patterns of radioactive isotopes cycling in a BGC, their selective accumulation in organisms, and the migration within their communities. This new direction in research, the experimental radiation biogeocoenology became the objective of his doctoral thesis[27] and ultimately provided the foundation for handling the consequences of contamination and radiation accidents.

22 Sukachev headed the Botanical Society, the Academy of Science's Institute of Forestry, the Academy Presidium's Commission on the Zapovedniki (strictly protected nature reserves), and the editorial boards of the Botanical Journal and the Bulletin of Moscow Institute of Biology. In 1955, he was elected president of the Moscow Society of Naturalists, one of the most prestigious societies of natural sciences in Eastern Europe.

23 In the GDR, people followed Sukachev's opposition against Lysenko in the discussion on steppe afforestation in the early 1950s, however the ideological critique of biogeocoenology earned by Lysenkoists had fortunately no devastating effects, see Arnold Buchholz: »Kritik sowjetischer Biologen an Lysenko«, in: *Osteuropa* 3 (1953), no. 4, pp. 251–256.

24 Actually, the Russian word ›sharashka‹ denotes a shabby business based on fraud and extortion. Dissidents used the term to refer to those special Gulag prisons, in which incriminated scientists were gathered to supposedly continue their research work. In reality, however, they were misused by the government to aid the secret military developments.

25 Raissa L. Berg: »Defense of Timoféeff-Ressovsky«, in: *The Quarterly Review of Biology* 65 (1990), no. 4, pp. 457–479.

26 N[ikolai] V. Timofeev-Ressovskii: »Primenenie izluchenii i izluchatelei v èksperimental'noi biogeotsenologii«, [Radiation and Emitter Applications in Experimental Biogeocoenology], in: *Botan. Zhurnal* 42 (1957), no. 2, pp. 161–194.

27 N[ikolai] V. Timofeev-Ressovskii: *Nekotorye problem radiacionnoi biogeotsenologii* [Some Problems of Radiation Biogeocoenology], Sverdlovsk: Institut biologii UF AN SSSR 1962. Id.: »Avtoreferat« (The Author's Dissertation Abstract), in: *Problemy kibernetiki* 12 (1964), pp. 201–232. The DSc (as highest science) degree was finally approved after Lysenko's fall.

With Stalin's death in 1953, scientists began fighting for the acknowledgment of genetics and cybernetics (which was also condemned as a reactionary imperialist science). Informal exchange between mathematicians, physicists, and biologists flourished in the circles surrounding Timofeev-Resovskii at Miassovo and the Soviet pioneer of computer science Aleksei Lapunov (1911–1973) in Moscow. One of the key intellectual achievements of this collaboration was Liapunov's mathematical modelling of biological analysis and cybernetic regulation mechanisms on the BGC level.[28] Timofeev-Resovskii defined BGC as a ›biochorological‹ unit, the boundaries of which are determined by the synthesis of biostratigraphic data, as well as by the existence of a dynamic equilibrium as its main characteristic.[29]

As already mentioned above, the last chapter of Sukachev's and Dylis' *Fundamentals of Forest Biogeocoenology* was, as the title suggests, dedicated to the »opportunities of applying the theories and methods of cybernetics to forest biogeocoenology«.[30] It confirmed the prerequisites for the use of a cybernetic approach, confirming that the BGC is based on phenomena of self-regulation (*samoreguliaciia*) and can thus be regarded as a complex system. In the context of evolutionary biology,[31] Shmal'gauzen emphasized the BGC as being the ›regulator‹, i.e., the main stabilizing factor of evolution (fig 2).[32]

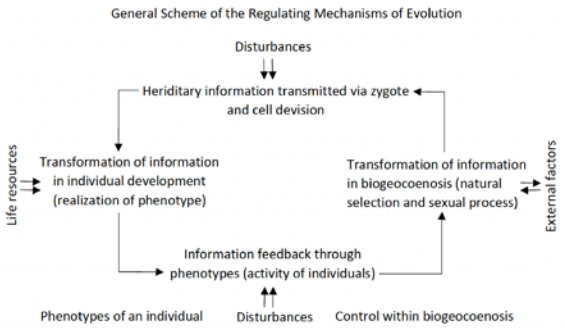

Fig. 2: Ivan Shmal'gauzen's general scheme of the regulating mechanism of evolution

Against the background of the emerging field of energetics, Mikhail Budyko (1920–2001) explored the global energy flows focusing on the human metabolism with nature. His methods for calculating the energy and heat balance became a pioneering element for further studies on physical and global climatology. Together with Evgenii Fedorov (1910–1981), he delineated the ice-albedo effect as a global warming feedback mechanism and openly addressed the anthropogenic effects on climate change as early as in 1961, thus developing the nuclear winter theory.[33] Not only was the anti-nuclear movement an issue of peace, but it was also closely related to environmental issues.

For the emerging environmental movement of the 1970s, Marx's theory of socio-ecological metabolism became just as important as it was for Sukachev's biogeocoenology. In his essay collection titled *Geography and Ecology*, the pedologist Innokentii Gerasimov confronted the Soviet public with serious ecological problems. Ivan Frolov, chief editor (1968–1977) of the USSR's leading philosophy journal *Voprosy filosofii* (Problems of Philosophy), called for a restructuring of human society on materialist-ecological grounds. The roots of Soviet opposition lie in the ecological movement, and the government's non-adequate response to the Chernobyl nuclear catastrophe initiated the end of the Soviet Union.

28 A[leksei] A. Liapunov, I[gor] V. Stebaev: »O biogeotsenologicheskom urovne upravleniia v ramkakh biosfery« [On the Biogeocoenological Level of Control within the Biosphere], in: *Problemy kibernetiki* 11 (1964), pp. 147–151. A[leksei] A. Liapunov: »O matematicheskom modelirovanii balansovikh sootnoshenii v biogeotsenoze«, in: *Zhurnal obshchei biologii* 29 (1969), no. 6, pp. 629–644.

29 N[ikolai] V. Timofeev-Resovskii: »O nekotorykh principakh klassifikatsii biokhorologicheskikh edinits« [On Some Principles of the Classification of Biochorological Units], in: *Trudy Instituta biologii UF SSSR* 27 (1961), pp. 23–29. Id., A[natolii] N. Tiuriukanov: »Ob èlementarnykh biokhorologicheskikh podrazdeleniiakh biosfere« [On the Elementary Biochorological Units of the Biosphere], in: *Biull. Moskovskogo obshchestva ispytivatelei prirody. Otd. Biol* 71 (1966), no. 1, pp. 123–132. Ead.: »Biogeotsenologiia i pochvovedenie« [Biogeocoenology and Soil Science], in*: Biull. MOIP. Otd. Biol.* 72 (1967), no. 2, pp. 106–117.

30 V[ladimir] N. Sukachev, N[ikolai] V. Dylis: »O vozmozhnosti primeneniia idei i metodov kibernetiki v lesnoi biogeologii« [On the Possibility of Applying the Ideas and Methods of Cybernetics to Forest Biogeocoenology], in: ead.: *Osnovy* (note 8), pp. 501–510.

31 I[van] I. Shmal'gauzen: »Osnovy èvoliutsionnogo protsessa v svete kibernetiki« [Fundamentals of the Evolutionary Process in the Light of Cybernetics], in: *Problemy Kibernetiki* 4 (1960), pp. 121–149.

32 1968, S. 40. Translation of terms follows Georgy S. Levit, Uwe Hossfeld, Lennart Olsson: »From the ›Modern Synthesis‹ to Cybernetics: Ivan Ivanovich Schmalhausen (1884–1963) and his Research Program for a Synthesis of Evolutionary and Developmental Biology«, in: *Journal of Experimental Zoology* 306 B (2006), pp. 89–106, here p. 101.

33 See Paul E. Lydoph: »Soviet Work and Writing in Climatology«, in: *Soviet Geography: Review and Translation* 7 (1971), no. 10, pp. 637–661. Jonathan D. Oldfield: »Climate Modification and Climate Change Debates Among Soviet Physical Geographers, 1940s–1960s«, in: *Advanced Physical Review* 4 (2013), pp. 513–521.

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Post-Soviet ecological research features two tendencies: the adoption of Western terminology in favor of a more profound connectivity to the Anglophone academic discourse and the insistence on one's own scientific tradition. Comparing the changes in the use of the notions of ecosystem and biogeocoenosis, Sergei Ostroumov attempted to redefine biogeocoenosis:

»Biogeocenosis is an aggregate of natural components (atmosphere, rocks, plants, animals, representatives of microorganisms and fungi, soil and hydrological conditions, and bottom sediments in the case of aquatic systems) in a particular area of land or water. Biogeocenosis is characterized by specific relationships between components; specific types of matter, energy, and information flows providing a certain degree of integrity (unity of components, indivisibility) and their changes with time. Organisms usually contribute to environment formation or modification«.[34]

Other definitions can be traced back to Sukachev's explanation: »The concept of an ecosystem is abstract, that is, it is not tied to a specific area, unlike a biogeocoenosis, which is usually tied to a concrete territory«.[35] In this case, BGC is also equated to ›landshaft‹ or a geographical version of the ecosystem. Currently, Russia experiences a tendency which aims to strengthen and valorize Soviet terminology.[36] Towards the end of the 20th century, the term biogeocoenesis was also broadly used in post-Soviet states. The beginning of the 21st century saw a recognition of the positive achievements of Soviet ecology and environmentalism as well as a revival of ecological culture, which empathizes with its ›green‹ tradition while also being politically reflective and critical of ecocide. This is also part of the legacy of Sukachev's teachings on biogeocoenosis.

34 S[ergei] A. Ostroumov: »New Definitions of the Concepts and Terms Ecosystem and Biogeocenosis«, in: *Doklady Akademii Nauk (Biological Sciences)* 383 (2002), pp. 141–143.

35 U[mar] T. Gairabekov et. al.: *Slovar' Geoėkologicheskikh terminov i ponatii. Uchebnoe posobie* (Dictionary of Geoecological Terms and Concepts. Study Guide), Groznyi: Izd-vo. ChGU 2015, p. 397: »Понятие экосистемы абстрактное, то есть не привязано к какому-либо конкретному участку территории, в отличие от биогеоценоза, который обычно привязан к какой-либо конкретной территории«.

36 See Ė[duard] N. Mirzoian: *Stabovlenie ėkologicheskikh koncepcii v SSSR. Biogeotsenologiia V. N. Sukacheva* (The Formation of Ecological Concepts in the USSR. V. N. Sukachev's Biogeocoenology), Moscow: Lenand 2016.

›OBMEN VESHCHESTV‹ – THE RUSSIAN AND SOVIET CONCEPT OF METABOLISM AND BEYOND

Mieka Erley

INTRODUCTION

Metabolism has long served as a broad organizing concept in Russian and Soviet culture for the exchange of material and energy between organisms and their environment. The Russian term *obmen veshchestv*, literally meaning »exchange of substances«, semantically ranges beyond the Latinate *metabolizm* (metabolism) and provides a framework for reflecting on bodies and material objects as open systems engaged in a constant process of transformation. *Obmen veshchestv* appears in public discourse in mid-19th century Russia as a calque from the German term *Stoffwechsel* (or *Wechsel der Materie*). Its usage in Russia reflects the enduring influence of German science.[1] In this entry, I will explore the development and expansion of this concept of material and energy exchange between organisms and their environment in Russia and the Soviet Union. In the course of a century, metabolism migrated from discussions of plant nutrition into physiology, thermodynamics, and ultimately into the Soviet practice of state economic planning. This entry will therefore pay particular attention to the early Soviet period when existing debates on metabolism took on new urgency as tools for praxis on every scale, from the body of the individual worker to humanity's future collective management of planetary material and energy flows.

PHYSIOLOGICAL MATERIALISM FROM GERMANY TO RUSSIA

To establish the concept's origin and lines of influence in the Russophone world, it is necessary to begin with early 19th-century German thought and research on metabolism and its reception. Among the influential German scientists who conducted and advanced research in the field were the cell biologist Theodor Schwann (who coined the term *metabolische* in 1839), physiologist Friedrich Tiedemann, physician Robert Mayer, and popular chemist Justus Liebig. Liebig contributed most significantly to the migration of the concept of material exchange from German into Russian, as parts of his works were translated and widely read as early as the 1840s. Liebig made important contributions to the study of metabolism in plants and animals, introducing such terms as *Stoffwechsel* and *Metamorphose* to describe the chemical, physical, and energetic transformations and exchanges within organisms and between organisms and their environment. In contrast to the specialized Latinate scientific terms *metabolische* and *Metabolism*, *Stoffwechsel* and *Metamorphose* in German and *obmen veshchestv* in Russian were artifacts from the era before the disambiguation of modern scientific fields. They remained a rich discursive and conceptual resource for those who believed in the unity of science and who sought to integrate the laws of chemistry, physics, and biology. The persistence of the term *obmen veshchestv* into the Soviet period signaled an affiliation with Marx and Engels who had extrapolated the concept into political economy.[2] For all these reasons, over the next centuries, metabolism became an inspirational and productive concept in Russian and Soviet intellectual life.

Liebig's mineral theory of plant nutrition revolutionized agriculture, displacing German agronomist Albrecht Thaer's »humus theory«, which had asserted that it was only the top layer of organic material in soil or humus that nourished growing plants.[3] Liebig observed that chemical and gas exchanges were constantly taking place between plants and the »non-living« material in soil and he proposed that plants and animals alike metabolized inorganic substances to sustain life processes. Moreover, this metabolic process depended on the recycling of minerals

1 For a forensic investigation of the German terms, see Franklin C. Bing: »The History of the Word ›Metabolism‹«, in: *Journal of the History of Medicine and Allied Sciences* 26 (1971), no. 2, pp. 158–180.

2 The Latinate *metabolizm* did not come into common usage in Russian until the 1960s–1970s.

3 A[leksei] A. Rode: *Soil Science*, Jerusalem: Israel Program for Scientific Translations 1962, p. 5.

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back into the soil, a process involving numerous social and economic exchanges. It was this vision of the political economy of material exchange that would significantly influence Marx, Engels, and many Russian political radicals, resulting in Liebig's induction into the Soviet pantheon and the republication of his works in multiple Soviet editions. This connection will be discussed further on.

In addition to his research on agriculture and plant nutrition, Liebig worked on the issues of animal chemistry, shaping the public understanding of nutrition, diet, and health. He even publicized a method of producing meat extract and lent his name to the commercial product, which was marketed with illustrated trade cards that are collectors' items today. (see fig. 1[4])

Fig. 1: A Russian-language trade card for Liebig's Meat Extract: »Liebig's Meat Extract: the best seasoning that gives an outstanding taste to soup, vegetables, sauces, and meat dishes«.

In the scientific domain, Liebig's most significant work concerned the source of animal heat, which vitalists had long regarded as evidence that living organisms possessed a »vital« essence. In forming his conclusion that animal heat must originate solely in the chemical reaction of food with oxygen, Liebig drew on Antoine de Lavoisier's insight that respiration was a form of combustion as well as Michael Faraday's theory that power cannot be created ex nihilo.[5] In turn, Liebig's work on animal heat influenced two of the crucial works that established the law of conservation, Robert Mayer's »Organic Motion in Its Relation to Metabolism« and Hermann Helmholtz's *On the Conservation of Force*.[6]

Liebig stood between the German romantic *Naturphilosophie* of Friedrich Schelling and Lorenz Oken and the new scientific materialism that would follow. Although Liebig renounced the *Naturphilosophie* of his youth in favor of rigorous experimentation and empirical data, he himself would be criticized as a vitalist and romantic by the younger generation of scientific materialists in Western Europe. In Russia, however, Liebig's ideas found fertile ground, and the younger Russians of the 1860s still venerated Liebig as an avatar of materialism. Among other things, the physiological materialists that followed Liebig set out to establish the human body as an object of scientific study, an object comprehensible within the framework of universal physical laws and explicable without any recourse to supernatural or spiritual causes. In 1855, the German physiologist Rudolf Wagner wrote a letter to Liebig in which he complained about the atheism and »materialism of Vogt-Moleschott-Büchner, which threatens us with a new era of barbarism«.[7] The three »barbarians« in question were the zoologist Karl Vogt, the physiologist Jakob Moleschott, and the physician Ludwig Büchner, all of whom enjoyed a wide and controversial reception in Russia. Exemplifying an irreverent materialism, Moleschott famously intoned, »Ohne Phosphor, kein Gedanke!« [No thought without phosphorus!], and Ludwig Büchner described animal life (and implicitly human life) as a »chemical laboratory«.[8]

4 »Miasnoi ėkstrakt'' Libikha« (Russian-language trade card for Liebig's Meat Extract), year unknown (about 1900), Russian National Electronic Library of Book Monuments, R0 no. 2/15, https://kp.rusneb.ru/item/material/myasnoy-ekstrakt-libiha-luchshaya-priprava-pridayushchaya-otlichnyy-vkus-supu-ovoshcham-sousam-i-myasnym-blyudam-luchshaya-priprava-pridayushchaya-otlichnyy-vkus-supu-ovoshcham-sousam-i-myasnym-blyudam (last accessed 01.04.2023).

5 Justus Liebig: »Zehnter Brief«, in: id.: *Chemische Briefe*, Heidelberg: C. F. Winter 1844, p. 117; Shaul Katzir: »Employment Before Formulation: Uses of Proto-Energetic Arguments«, in: *Historical Studies in the Natural Sciences* 49 (2019), no. 1, pp. 1–40.

6 P[eter] M. Heimann: »Mayer's Concept of ›Force‹: The ›Axis‹ of a New Science of Physics«, in: *Historical Studies in the Physical Sciences* 7 (1976), pp. 277–296.

7 Qtd. in Claus Spenninger: »A Movement That Never Materialized: The Perception of Scientific Materialism as a Secular Movement in Nineteenth-Century Germany«, in: *Freethinkers in Europe: National and Transnational Secularities, 1789-1920s*, ed. by Carolin Kosuch, Berlin: DeGruyter 2020, pp. 273–296, here p. 273.

8 Ludwig Büchner: *Kraft und Stoff: Empirisch-naturphiloso-*

In the domain of belles-lettres, where the liveliest intellectual debate took place in Russia, the physiological materialists were seen to be united in their attack on idealism and religion. In Ivan Turgenev's novel *Fathers and Sons* (1862), the younger generation reads Liebig's works and urges the older generation to set Pushkin aside and take up Buchner's *Kraft und Stoff*. In Dostoevsky's *Demons* (1871–1872), a character irreverently throws out an Orthodox icon and instead places »the works of Vogt, Moleschott, and Büchner on stands like three lecterns«.[9] Some Russian commentators believed that experimental physiology violated the values of Christianity, and indeed, Moleschott wrote that it was »matter«, not God, that »rules over men«.[10] Human metabolism was a dangerous, even taboo subject and its study was associated with a radically new worldview and the dawning of modernity in Russia.

The first of Russia's own physiological materialists was Ivan Sechenov, who studied with Karl Ludwig and Hermann Helmholtz in Germany and with the physiologist Claude Bernard in France. Although Sechenov is largely remembered for his work on the physiology and reflexes of the nervous system, he also carried out extensive work on the physical chemistry of the body, particularly gas exchanges in the blood.[11] In his authoritative Brockhaus-Efron encyclopedia entry on metabolism, titled »Exchange of Matter *and Forces* in the Animal Organism« (emphasis mine), Sechenov introduces energy exchange as a co-factor of metabolism, shifting the focus of the concept from matter to energy, or »force«. He writes that

»alongside metabolism, there is an exchange of energy between the animal organism and its external environment. The fact is that the substances of food and drink capable of burning, as well as the oxygen of the inhaled air, are carriers of energy, serving, during their transformations in the body, as a source of living forces, a source of all internal and external work of the body«.[12]

Sechenov focuses on »living forces« and their capacity to produce work. It should be remembered that Sechenov studied in Heidelberg with Hermann Helmholtz, a co-discoverer of the law of the conservation of energy. Helmholtz had followed Liebig's investigations of animal heat and metabolism, and he proposed that just as perpetual motion machines were impossible, so, too, was it impossible that animals were able to produce heat without fuel. Instead of possessing a »vital« force, organisms drew life energy from their environment through metabolic processes. Helmholtz's work was an important intervention in the vitalist controversy and further supported the theory of the conservation of energy—in both the inorganic and organic domains. Following this thermodynamic line of approach to metabolism, Sechenov quantifies the amount of energy that may be produced by the »human engine«. He notes that for the hourly work of a person of 24,000 kilogram-meters, »an extra 8.2 grams of fat burns in the body more than at rest«. For an eight-hour workday, the worker would, therefore, require an extra 64 grams of fat.[13] Such calculations of the metabolic cost of work were foundational to the study of nutrition and would also serve state biopolitical projects of managing resources and human bodies, a kind of management that suggests the Greek root of economy and ecology—oikos. We might further take note of the application of this technology of rule in the management of camps, penal colonies, and labor projects of the 20th century, where it was an institutional practice to ration calories per unit of labor. In an age when machine power was replacing human and animal labor, Sechenov closes his discussion with a rallying approval of the efficiency of the »working animal« relative to a machine:

»in the matter of utilizing energy, the working animal is superior to the steam engine in two respects: the engine utilizes only 8%, and the animal 25% of the total income; in the machine, 92% of the heat is wasted, and in the body, the corresponding excess goes to maintain normal body temperature«.[14]

Efforts to optimize the human motor, fueled by processes of digestion and metabolism, would find full expression in the Soviet period, in such Taylorist projects as Aleksei Gastev's Institute for the Scientific Organization of Work and the Mechanization of Man.

phische Studien, Leipzig: Theodor Thomas 1864, p. 221.

9 Fyodor Dostoevsky: *Demons*, trans. by Richard Pevear and Larissa Volokhonsky, New York: Vintage Books 1994, p. 346.

10 Qtd. in Michael Holquist: »Bazarov and Sečenov: The Role of Scientific Metaphor in *Fathers and Sons*«, in: *Russian Literature* 16 (1984), pp. 359–374, here p. 365.

11 See Galina Kichigina: *The Imperial Laboratory: Experimental Physiology and Clinical Medicine in Post-Crimean Russia*, Amsterdam; New York: Rodopi 2009.

12 I[van] M. Sechenov: »Obmen veshchestv i sil v zhivotnom organizme« [Metabolism and Forces in the Animal Organism], in: *Entsiklopedicheskii slovar'* [Encyclopedic Dictionary], vol. 21, St. Petersburg: Brokgauz i Efron, 1897, pp. 530–533, here p. 530. All translations by the author unless otherwise noted.

13 Ibid., p. 532. The kilogram-meter was a new unit that measured the work done by a kilogram force over the distance of a meter.

14 Sechenov: »Obmen veshchestv« (note 12), p. 533.

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METABOLISM: FROM MATTER TO ENERGY

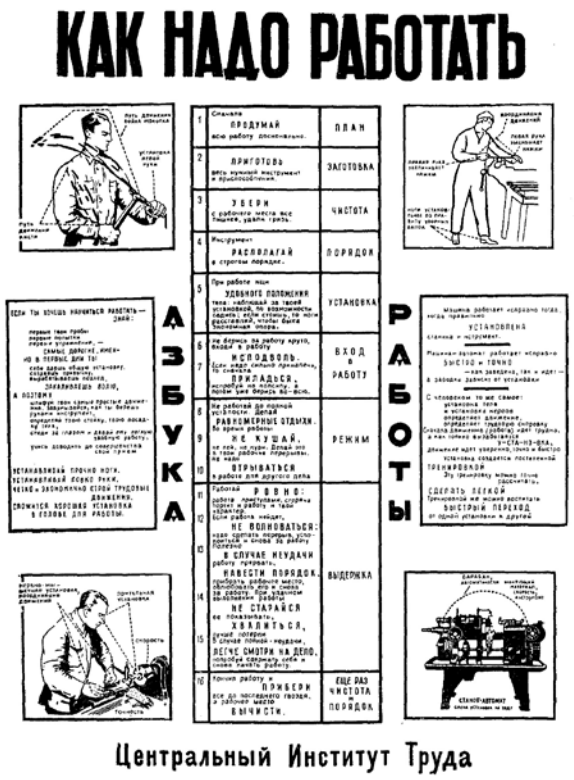

Fig. 2: An image from Gastev's *How to Work*

Gastev saw himself as both the engineer and the poet of the age of the human engine. In the book *How to Work*, he asks, »Why are there mountains of books written about thermal energy, about furnaces, boilers, steam engines, electricity, anthracite, hydraulic power, electrification, and yet nothing is written about the energy of the worker?«[15] He envisions the human body as the primary source of energy required to build socialism, an engine that can be brought into optimum efficiency by the mechanic and the engineer. Gastev writes,

»The science of the nourishment of a working organism should be as precise as the science of thermodynamics, as the science of the nourishment of a steam engine, of the nourishment of an electric motor; the consumption of human energy must be measured using scientific instruments down to the thousandths of even the smallest calorie«.[16]

Reducing human physiology to a mechanism, Gastev writes that »in the domain of machine production, biology is subordinated to the priorities of the engineer«. He refers to Sechenov's work approvingly, noting that it was no coincidence that the biologist acquired his first degree from an engineering school. (See fig. 2)[17]

Gastev's proposed methods of harnessing human energy provoked violent debate in the early 1920s. His Taylorist mode of organizing labor was opposed by the so-called »Group of Communists«, lead by Pavel Kerzhentsev, a former member of Proletkult, the Proletarian culture organization founded by the Bolshevik intellectual Aleksandr Bogdanov.[18] Kerzhentsev dismisses Gastev's laboratory-based research on the working body as a »vulgar fetish« and writes that Gastev overemphasizes muscular work relative to other factors of production.[19] Proletkultists like Kerzhentsev and Bogdanov were suspicious of Taylorism as a capitalist import whose sole aim was to make its workers sweat as much as possible, but they nonetheless recognized the importance of the scientific organization of labor under socialism. Bogdanov shared Gastev's thermodynamic vision of labor, although it was subsumed within a larger and more complex system of organization that he called »tektology«. Bogdanov's systems theory was inspired by Wilhelm Ostwald, whose energetic worldview framed the body as a system that maintains dynamic equilibrium through metabolic processes. In *Tektology*, Bogdanov writes,

»It is not so easy to account for the total needs of a worker, they are complex and diverse: food in its various forms, clothing, housing, cultural needs, and others. Of these needs, the easiest to trace quantitatively is nutrition. It is most convenient to start with actual muscular work. It results from the energy of oxidation, ›combustion‹ in the body of carbon-containing substances absorbed from food. Therefore, the role of food is quite similar to the role of fuel for a steam engine; and in exactly the same way as is being done with regard to fuel, the value of food as a source of energy for work is measured in calories, i.e., units of thermal energy«.[20]

15 A[leksei] K. Gastev: *Kak nado rabotat'. Prakticheskoe vvedenie v nauku organizatsii truda* [How to work. Practical Introduction to the Science of Organizing Labor], Moscow: Ėkonomika 1972, p. 46.
16 Ibid., p. 51.
17 Ibid., p. 2.
18 Kendall Bailes: »Alexei Gastev and the Soviet Controversy over Taylorism, 1918–24«, in: *Soviet Studies* 29 (1977), no. 3, pp. 373–394, here p. 389.
19 P[latan] M. Kerzhentsev: *Printsipy organizatsii* [Principles of Organization], Moscow: Ekonomika 1988, p. 312.
20 A[leksandr] A. Bogdanov: *Tektologiia: Vseobshchaia organizatsionnaia nauka* [Tectology: The Universal Organizational Science], Moscow: Ėkonomika 1989, p. 262.

As Bogdanov notes, the same measure of energy – the calorie – may apply to the work of a machine or the digestion of a biological organism, making these activities fungible within an energy economy.

While this thermodynamic understanding of labor was most practically applied to the human worker, it was perhaps more obvious in the case of photosynthesizing plants, which are the foundation of all energy exchange and metabolism on Earth. Where Sechenov extolls the efficiency and »forces« of the »working animal«, Russia's leading plant physiologist Klement Timiriazev does so for the humble »working plant«. He praises the efficiency of the plant, noting that, unlike animals, plants produce almost no waste – only carbon dioxide and water. Timiriazev, like Sechenov, studied with both Hermann Helmholtz and Claude Bernard and he applied his background in chemistry and physics to the study of plant metabolism. This yielded new insights, particularly into photosynthesis and its metabolites. It is precisely the green plant's capacity to transform solar energy into bodies that gives it, in Timiriazev's words, a »cosmical function«.[21] He observes that »the plant is the intermediary between heaven and earth. It is the real Prometheus, stealing fire from heaven. The ray of sun stolen by it burns both in the flickering light of a candle and in the dazzling spark of electricity. The ray of sun sets the enormous flywheel of the gigantic steam engine in motion, the painter's brush, the poet's pen«.[22] Timiriazev's praise of the plant precedes the Soviet rhetoric of Prometheanism, but it may still be read as a cheeky retort to the valorization of the human subject. Even if plants do not possess the »living force« that Sechenov attributes to animals, Timiriazev reminds us that the basis of all the »manifold manifestations of life in our planet« and all production, from the steam engine to art, rests upon the metabolic work of the plant.

SCALING UP: METABOLISM OF THE BODY, THE STATE, AND THE PLANET

Around the same time that Timiriazev was carrying out his research in the 1880s, the Ukrainian socialist and founder of ecological economics, Serhiy Podolynsky expanded the thermodynamic vision of plant metabolism into a comprehensive system of agricultural energetics. Podolynsky addressed not only the conservation of energy, but also the struggle against entropy within his system. Podolynsky's entropic vision was clearly exemplified in his discussion of the useful chemical work of the plant. He writes that the »sun's rays that arrive to us, warm, illuminating, and chemically effective, are so received by matter that they are transformed into free chemical affinity or into mechanical movement«.[23] He describes the plant kingdom as a »powerful ally of humanity« because it prevents solar energy from dissipating into useless heat, and instead renders it useful to humanity through metabolic transformation. In his essay on »Socialism and the Unity of Physical Forces« (1880), Podolynsky sketches a thermodynamic history of the universe, from the birth of the solar system to the complete dissipation of energy and the impossibility of any further transformation of matter. However, Podolynsky doesn't mourn the distant heat death of the universe; instead, he sets the goal of minimizing waste and maximizing the efficient use of the universe's finite energy to benefit humanity. He is optimistic that humans can accumulate useful energy by managing labor efficiently, thereby rendering **humanity activity** close to the »perfect engine« as imagined by Sadi Carnot.[24] Since activities related to nutrition are both the main source of energy and the main energy *expenditure* for humanity, Podolynsky seeks to optimize caloric inputs and outputs. He imagines that, under socialism, this kind of management of material and energy resources would be possible:

»A higher level and a more equitable division of the quality and quantity of foodstuffs would inevitably bring about an increase in the muscular and nervous force of humanity. From that would spring a new growth of production and a greater accumulation of energy on the earth's surface«.[25]

Podolynsky was sharply criticized by Engels, who argued that he had »confused physics with economics«.[26] As we are about to see, Marx and Engels preferred to »confuse« soil chemistry with economics. Podolynsky's work was not actively pursued in state agriculture after the revolution,

21 Kliment Timiriazev: *The Life of the Plant*, trans. by A. Sheremetyeva, Moscow: Foreign Languages Publishing House 1958, p. 341.

22 K[liment] A. Timiriazev: »Stoletnie itogi fiziologii rastenii [A Century of Results in Plant Physiology]« (1901), in: id.: *Sobranie sochineniia v chetyrekh tomakh* [Collected Works in Four Volumes], vol. 2, Moscow: OGIS-Sel'khozgiz 1948, pp. 359–404, here p. 382–3.

23 Sergei Podolinsky: »Human Labor and the Unity of Force«, trans. by Peter Thomas, ed. and annotated by Paul Burkett and John Bellamy Foster, in: *Historical Materialism* 16 (2008) no. 1, pp. 163–183, here p. 166.

24 Ibid., p. 182.

25 Ibid., p. 183.

26 Letter from Frederick Engels to Karl Marx, London, December 19, 1882, trans. by Dona Torr, From Marx-Engels Internet Archive, https://www.marxists.org/archive/marx/works/1882/letters/82_12_19.htm (last accessed 01.04.2023).

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but it continues to stimulate interest and debate in ecological economics.[27]

Metabolism is a concept in Marx and Engels' work, although it was more in line with Liebig's soil and social economy than Podolynsky's energetics. In *Dialectics of Nature*, which was published in the Soviet Union in the 1930s and had a significant impact on Soviet intellectual life, Engels provided a definition of life that Soviet schoolchildren would later recite aloud: »Life is the mode of existence of protein bodies, the essential element of which consists in continual metabolic interchange with the natural environment outside them«.[28] Engels also provided an evolutionary argument about diet in »The Part Played by Labour in the Transition from Ape to Man«, where he speculates that a meat diet introduced the »chemical premises for the transition to man«, leading to both new technologies and a qualitatively new physiology.[29] Eco-Marxist John Bellamy Foster has argued that the concept of metabolism is the very basis of Marx and Engels' broader ecological vision.[30] Marx followed the advances in agricultural chemistry and wrote to Engels that »the new agricultural chemistry in Germany, especially Liebig [is] more important than all the economists put together«.[31] Marx extended Liebig's political economy into what Foster calls the »theory of metabolic rift«.[32] In his popular writings on chemistry, Liebig had criticized modern agricultural and sanitation practices as a mismanagement of »material exchange« between city and country. Referring to the example of England, Liebig wrote that

»elements of soil indispensable to plants do not return to the fields – contrivances resulting from the manners and customs of English people […] render it difficult, perhaps impossible, to collect the enormous quantity of the phosphates which are, as solid and liquid excrements, carried into the rivers on a daily basis«.[33]

In Liebig's view, natural mineral cycles were being actively disrupted, leading to imbalances in both the soil economy and the social economy. Marx extends this critique in *Capital*, where he notes that agricultural conditions under capitalism have created

»an irreparable rift in the interdependent process of social metabolism [*Stoffwechsel*], a metabolism prescribed by the natural laws of life itself. The result of this is a squandering of the vitality of the soil, which, through trade, is carried far beyond the bounds of a single country (Liebig)«.[34]

This use of »metabolism« was more than a metaphor, as both Liebig and Marx understood these material and mineral flows as the basis of human nutrition, agriculture, and economy alike. Engels carried out his own exposition of Liebig's political economy in formulating his ideas about the »antithesis of town and country«. Engels writes that no one has called for the resolution of the contradictions between town and country

»more energetically than Liebig in his writings on the chemistry of agriculture, in which his first demand has always been that man shall give back to the land what he takes from it, and in which he proves that only the existence of the towns, and in particular the large towns, prevents this«.[35]

This critique of the »metabolic rift« between city and country exerted a particular influence on Russian radicals of the late 19th century, including Dmitrii Pisarev, Nikolai Chernyshevskii, Aleksandr Engelgardt, and Vladimir Lenin. After the revolution, the call for the unification of town and country (*smychka goroda i derevni*) would become a prominent political slogan, and Lenin was empowered to scale up the management of »metabolic« functions to

27 See Joan Martinez-Alier: *Ecological Economics*, Oxford, UK: Basil Blackwell, 1987; John Bellamy Foster/Paul Burkett: »Ecological Economics and Classical Marxism: The ›Podolinsky Business‹ Reconsidered«, in: *Organization & Environment* 17 (2004), no. 1, pp. 3–60.

28 Frederick Engels: *Dialectics of Nature*, trans. by Clemens Dutt, New York: International Publishers 1940, p. 195–197.

29 Ibid., p. 286.

30 See John Bellamy Foster: *Marx's Ecology*, New York: Monthly Review Press 2000.

31 Karl Marx/Frederick Engels: *Selected Correspondence, 1846–1895*, New York: International Publishers 1942, p. 204.

32 See John Bellamy Foster: »Liebig, Marx, and the Depletion of Soil Fertility«, in: id.: *Ecology Against Capitalism*, New York: Monthly Review Press 2002, pp. 154–170; »Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology«, in: *American Journal of Sociology* 105 (1999), no. 2, pp. 66–405. See also Joan Martinez Alier: »Marxism, Social Metabolism, and International Trade«, in: Alf Hornborg/J. R. McNeill/Joan Martinez Alier (eds.): *Rethinking Environmental History: World-System History and Global Environmental Change*, Lanham: AltaMira Press 2007, pp. 221–237.

33 Justus Liebig: *Familiar Letters on Chemistry in Its Relations to Physiology, Dietetics, Agriculture, Commerce, and Political Economy*, London: Taylor, Walton, and Maberly 1851, p. 473.

34 Karl Marx: *Capital: A Critique of Political Economy*, vol. 3, trans. by David Fernbach, ed. by Frederick Engels, London: Penguin Books 1991, p. 949.

35 Friedrich Engels: »The Housing Question« (extract), in: Karl Marx/Friedrich Engels/V[ladimir] I. Lenin: *On Historical Materialism: A Collection*, compiled by T. Borodulina, New York: International Publishers 1974, pp. 155–158, here p. 158.

the level of centralized state planning. The Marxist vision of social metabolism would be applied to the material exchanges between town and country, as well as among national republics in the all-union division of labor.[36]

The Soviet biogeochemist Vladimir Vernadsky's concept of the noosphere may be considered the ultimate expression of the ambition to rationally manage metabolism—not just at the level of the state, but at the level of the entire planet. In his work *Biosphere* (1926), Vernadsky posited that living matter was a geological force on earth that had shaped the conditions of its own development, transforming the geosphere into the »biosphere«. Vernadsky writes of the metabolism within the biosphere: »Between its inert lifeless part, its inert natural bodies and living substances that inhabit it, there is a continuous material and energy exchange, materially expressed in the movement of atoms caused by living matter«.[37] As the most active substance in the biosphere, living matter has long directed the movement of inert matter. The transformative action of living matter upon inert matter results in increasing complexity, culminating in the stage of natural history that Vernadsky calls the »noosphere«. As Georgy Levit explains, the noosphere is not a new geological surface, but rather a qualitatively different state of the biosphere, in which the mind, as a naturally emergent property of living matter, directs the planet's flows of material and energy.[38] This constant management of the »biogenic flow of atoms« results in a dynamic equilibrium. Life and mind thus potentiate their own increasing complexity while continuously re-balancing the metabolism of the larger biogeochemical system that is the planet.

CONCLUSION

Metabolism was intentionally employed as an interdisciplinary concept by those seeking to integrate and unify the increasingly specialized knowledge generated within the fields of biology, chemistry, physics, and the social sciences from the 19th century onwards. The concept of metabolism was multi-scalar, trans-species, and disciplinarily promiscuous, and in this lay its value. Metabolism offered a particular way of thinking about the *ecology* and *economy* of nature, by focusing specifically on exchange—exchange of matter and energy between organisms and their environment at multiple scales and across the divide of living and non-living substances. Economy is rooted in the Greek *oikos*, which refers to the household and the activities of budgeting, saving, spending, and managing the flows of the household and all its members and constituent parts. Economy and metabolism are thus conceptually related, and it is here that we can see the particular appeal of the concept for 19th-century radicals and Soviet Marxists as it offered a vision of material flows that encompasses the human body, nature, and the state, holding the promise of rationalizing these flows within a single managed economy. Metabolism was a preferred concept for describing processual change in Marxist and Soviet thought precisely because it emphasized exchange, a fundamentally economic concept that reflected a Marxist view of life processes. In this we might see what Reinhart Koselleck calls »the convergence of concepts and history«.[39] The Soviet Union gave shape to the radical visions of the metabolic economy of the 19th-century, and the ambition to integrate natural science, social science, and policy contained within the concept of metabolism turned the Soviet Union into fertile ground for the emergence of planetary ecology.

36 For an extended discussion, see Mieka Erley: *On Russian Soil: Myth and Materiality*, Ithaca, NY: Cornell University Press 2021, pp. 34–48.

37 V[Ladimir] I. Vernadskii: *Nauchnaya mysl' kak planetnoe iavlenie* [Scientific Thought as Planetary Phenomenon], Moscow: Nauka 1991, p. 15.

38 Georgy Levit: »The Biosphere and the Noosphere Theories of V.I. Vernadsky and P. Teilhard de Chardin: A Methodological Essay«, in: *Archives internationales d'histoire des sciences* 50 (2000), no. 144, pp. 160–176, here p. 165.

39 Reinhart Koselleck: »Introduction (*Einleitung*) to the *Geschichtliche Grundbegriffe*«, in: *Contributions to the History of Concepts* 6 (2011), no. 1, pp. 7–25, here p. 21.

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ORIGINS AND DIMENSIONS OF REGULATION IN RUSSIAN AND SOVIET DISCOURSE

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In the very beginning of the 20th century, the foreign verb »to regulate« (*regulirovat'*) entered the Russian vocabulary and was presented as an independent lemma in the third (1907) edition of the standard-setting *Explanatory Dictionary of the Living Great Russian Language*. Although its short and unchanged definition—: »to equalize (course, movement), to put something in proportion, to set in order«[1]—could already be found in the dictionary's first edition and later remained unchanged, this was the first time that it was granted its own lemma. The small lexicographic change indicates the increased importance of the term regulation (*regulirovanie*[2]) in the second half of the 19th century. Although its semantic career had already begun earlier in philosophy and economy during the 18th century,[3] the pervasive use of regulation as a conceptual category in recent physics and biology incentivized this valorization. It evolved into a universal category of systemic thinking that could also be adapted in emerging disciplines such as political science, economy, cybernetics, and ecology.

The term regulation was not only migrating across disciplines, as this paper intends to show, but also across empires. While its formation was closely linked to German, French, and British thought, Russian scientists of the second half of the 19th century such as Ivan Vyshnegradskii, Ivan Pavlov, Vasilii Dokuchaev, or thinkers like Nikolai Fedorov developed their own distinct understanding of regulation over time. This article follows the conceptual history of regulation in the Russian and Soviet context from the late 19th to mid-20th century and emphasizes its ecological dimension. Considering that regulation is a fundamentally interdisciplinary concept applied in biology, economics, law, or political science, such a history cannot strictly limit itself to the conceptual use of regulation in ecological theory. Here, ecology is rather generally understood as a scientific knowledge of nature that is being formed in various sciences throughout the 19th and 20th century by reintegrating knowledge generated in such different disciplines as natural history, biology, medicine, physics, or physiology.[4] This paper exemplarily traces the constitutional process of ecology as a science with regard to the concept of regulation by acknowledging the transdisciplinary and sometimes metaphorical use of the concept and its oscillation between the organic and the social, the natural and the artificial, the mechanic and the dynamic, the intrinsic and the extrinsic.

Georges Canguilhem has defined regulation as a rule-based alignment of different movements, actions, effects, or products.[5] This alignment can be under-

1 I[van] A. Boduena-de-Kurtenė [Jan Niecisław Ignacy Baudouin de Courtenay] (ed.): *Tolkovyi slovar' zhivago velikoruskago iazyka Vladimira Daliia – ispravlennoe i znachitel'no dopolnennoe izdanie* [Explanatory Dictionary of the Living Great Russian Language], vol. 3. P-R. St. Petersburg/Moscow: T-va M. O. Vol'f 1907, p. 1669. *Reglament'* had been introduced as a French loanword, while *regulirovat'* (to regulate) was attributed to the German »regulieren«.

2 The Russian language knows two words for regulation, *regulirovanie* and *reguliatsiia* (similar to the German use of Regulierung und Regulation) which are used synonymously. In general, *regulirovanie* is used more frequently and encompassing than *reguliatsiia*, which is mainly limited to medicine.

3 See Georges Canguilhem: »La formation du concept de régulation biologique aux XVIIIe et XIXe siècles«, in: *Idéologie et rationalité dans l'histoire des sciences de la vie*, Paris: Vrin, 1977, pp. 81–99; Georg Toepfer: »Regulation«, in: *Historisches Wörterbuch der Biologie. Geschichte und Theorie der biologischen Grundbegriffe*, ed. by Georg Toepfer, Stuttgart/Weimar: Metzler 2009, pp. 148–199; Robert Mitchell: »Regulating Life: Romanticism, Science, and the Liberal Imagination«, in: *European Romantic Review* 29 (2018), no. 3, pp. 275–293.

4 Benjamin Bühler: Ecocriticism. Grundlagen – Theorien – Interpretationen, Stuttgart: Metzler 2016, p. 10.

5 Georges Canguilhem: »Regulation«, in: *Encyclopaedia universalis.* 19, Paris: Encyclopaedia Universalis 2002, pp. 583–585, here p. 583. Although Canguilhem limits his

stood as an innate and intrinsic mechanism (self-regulation) for self-preservation and stabilization as in regulatory processes of the body or as an extrinsic mechanism shaped by extra-systemic ideals and intervention, such as in the regulation of the financial market. Regulation aims to restore the balance of a *status quo*. It serves as a compensatory tool for rectifying inordinacy, while the intended balance can either be a natural or an artificial setpoint. Acknowledging these differences, Canguilhem distinguishes biological and social regulation. However, an element that unites these discourses is a »very *specific* language of *regulation* based on the notions of repression, cooperation, blockage, and induction«,[6] consisting mainly of »metaphorical components«.[7]

I. REGULATING SYSTEMS

In 1868, Scottish physicist James Maxwell published his paper »On Governors« in which he sought an analytical solution to ensure the operability and functionality of machines that were regularly experiencing disturbances. Maxwell complained that the inventors of machines »confine[d] their attention to the way in which it [the machine] is designed to act« but did not pay sufficient attention to the actual operative conditions marked by irregularity and disorder.[8] He promised a mathematical »remedy for these disturbances«.[9] However, he was less interested in practical solutions for engineering and more in a theoretical discussion of what would today be called »dynamic stability«,[10] the ability of a system to maintain functionality and to ensure regularity »notwithstanding variations«[11] in its working conditions.

Maxwell's paper marks one of the »origins of cybernetics«[12] and a starting point for theories of automatic regulation.[13] At the same time, but probably independently from Maxwell's approach, Ivan Vyshnegradskii, the later Russian minister of finance, published his research on a *General Theory of Regulators* and *On Regulators of Direct Action*.[14] Unlike Maxwell, who was primarily interested in questions of theoretical mechanics, Vyshnegradskii looked at applied mechanics, particularly at the projection and construction of steam machines.[15] To this end, Vyshnegradskii calculated the resistances which prevented the device from remaining in balance and the angular speed of the device to rebalance the regulator. This meant establishing an early version of a feedback mechanism, matching the parameters used in the theoretical calculus with the actual physical parameters of the system.[16]

In the following years, the mathematical theory of system stability was further developed by Nikolai Zhukovskii and Andrei Liapunov before eventually being expanded into revolutionary thought by Aleksandr Bogdanov. In his *Tektology*, an early form of general

genealogy to Western examples, it is also of use for similar Russian discourses.

6 Hans-Jörg Rheinberger: »The Notions of Regulation, Information, and Language in the Writings of François Jacob«, in: *Biological Theory* 1 (2006), no. 3, pp. 261–267, here p. 263.

7 Canguilhem: »Regulation« (note 3), p. 584.

8 James Maxwell: »On Governors«, in: *Proceedings of the Royal Society of London* 16 (1867/1868), pp. 270–283, here p. 272.

9 Ibid.

10 Otto Mayr: »Maxwell and the Origins of Cybernetics«, in: *Isis* 62 (1971), no. 4, pp. 424–444, here p. 427. The contemporary relevance of this term can be seen in a competition initiated in 1875 by Cambridge University which was devoted to »The Criterion of Dynamic Stability«, see Christopher Bissell: *A History of Automatic Control, in Springer Handbook of Automation,* ed. by Shymon Nof, Berlin/Heidelberg: Springer 2009, pp. 53–69, here p. 56.

11 See Maxwell: »On Governors« (note 8), p. 270.

12 See Mayr: »Maxwell« (note 10).

13 Maxwell's essay opens the seminal Soviet anthology on the topic, see A. Andronov/I. Voznesenskii (eds.): *Teoriia avtomaticheskogo regulirovaniia* [Theory of Automatic Regulation], Moscow: Izd. Akad. Nauk SSSR 1949 and is also highlighted in the article on automatic regulation in the Great Soviet Encyclopedia, see A. A. Voronov: »Regulirovanie avtomaticheskoe« [Automatic Regulation], in: *Bol'shaia sovetskaia entsiklopediia* [Great Soviet Encyclopedia], vol. 21: *Proba –Remensy*, ed. by Aleksandr Prokhorov, Moscow: Izd. Sov. Ents. 1975, pp. 566–567. For a history of concepts of regulation in control engineering, see Stuart Bennett: *A History of Control Engineering* (1800–1930), Stevenage UK: Peter Peregrinus Ltd. 1979, pp. 7–50.

14 Ivan Wischnegradski: »Sur la théorie générale des régulateurs«, in: *Comptes rendus hebdomadaires des séances de L'Academie des sciences* 83 (1876), pp. 318–321; I[van] A. Vyshnegradskii: »O reguliatorakh priamogo deistviia« [Regulators of the Immediate Action], in: *Izvestiia S.P.B. Prakticheskogo tekhnologicheskogo instituta* 1 [Proceedings S.P.B. of the Practical Technical Institute 1] (1877), pp. 21–62.

15 See A[leksandr] Andronov/I[van]. Voznesenskii: »O rabotakh D. K. Makswella, I. A. Vyshnegradskogo i A. Stodoly v oblasti teorii regulirovaniia mashin« [About the Works of D.K. Maxwell, I.A. Vyshnegradskii and A. Stodoly on the Theory of Machine Regulation], in: *Teoriia avtomaticheskogo regulirovaniia* [Theory of Automatic Regulation], ed. by A. Andronov and I. Voznesenskii, Moscow: Izd. Akad. Nauk SSSR 1949, pp. 253–301, here p. 262.

16 See Aleksandr Lerner: *Nachala kibernetiki* [The Beginning of Cybernetics], Moscow: Nauka 1967, p. 136. Vyshnegradskii was highlighted by Lerner as the only, and thus also the international key pioneer for prefiguring the regulatory mechanisms in dynamic systems.

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systems theory, Bogdanov, who studied at Liapunov in the 1890s in Kharkiv, expanded the meaning of regulation into one of the two main organizational mechanisms.[17] To illustrate this idea, he gave ecological examples such as the adaptation of plants and animals in light of local climate change. In the case of this and other examples, Bogdanov's understanding of regulation also included selection mechanisms to maintain a »dynamic balance«[18] (*podvizhnoe ravnovesie*) within a system. This idea was strongly informed by Darwin and Malthus (who had already mentioned population regulation in the 18th century). Still, it lacked any systematized argument concerning the actual mechanisms of regulation in its rather unsystematic sequence of examples.

Bogdanov's approach somehow foreshadowed Norbert Wiener's argumentation in his seminal work *Cybernetics or control and communication in the animal and the machine*. In this work, he famously highlighted James Maxwell's paper as »the first significant paper on feedback mechanism«,[19] omitting Vyshnegradskii's contributions that were at the same time rediscovered and heralded in Soviet science[20]. While Maxwell and Vyshnegradskii had limited their research on mechanics, Wiener suggested mapping automatic regulating mechanisms onto the organic world of living organisms. This was similar to Bogdanov's approach and the Soviet »community ecology« of the 1920s, which also migrated quantitative methods to the study of ecological questions such as »biocenoses« to detect their »regulatory mechanisms«.[21]

II. REGULATING BODIES

However, yet another Russian pioneer of cybernetic thinking was prominently mentioned in Wiener's genealogy: Ivan Pavlov. According to Wiener, Pavlov was a pivotal figure in drawing the attention of psychologists towards mental processes instead of mental content, developing a dynamic and systemic understanding of mental action. Pavlov started his career with research on the digestive system, which he understood as a »complex chemical factory«.[22] This metaphor favored a mechanistic understanding of body functions and was further developed into the designation of the nervous system as the chief regulator of the body.[23] Pavlov understood the body as a hierarchized system of main and side-factories held together by a superior regulative mechanism. Pavlov's machine metaphor echoed Claude Bernard's earlier description of the human body as a »living machine«.[24] Bernard was the first scientist »who gave the concept of physiological regulation a positive note«[25] and viewed regulation as an inner, self-regulatory function, contrasting the view of Comte and others who saw the organism as governed by the environment.[26] Pavlov was introduced to Bernard's theories by his mentor Il'ia Tsion and his »investigations of the nervous regulation of organ systems«.[27]

In the following years, Pavlov and his students developed further physiological theories of regulatory processes in the bodies and brains of humans and animals. Their research can be framed as a transition from a technomorphic model of regulation still oriented on the functionality of the machine to a cybernetic model oriented on self-acting regulatory mechanisms, to draw on a helpful differentiation from Karl Rothschuh.[28] While Bernard's conception of the

17 Aleksandr Bogdanov: *Tektologiia. Vseobshchaia organizatsionnaia nauka. Kniga 1* [Tectology. A General Organizational Science. Book 1], Moscow: Ekonomika 1989 [1922], pp. 189–206. The other main mechanism is the formative mechanism.

18 Ibid., p. 197.

19 Norbert Wiener: Cybernetics or control and communication in the animal and the machine, Cambridge: The MIT Press 1985 [1948], pp. 11–12.

20 See Andronov/Voznesenskii: »O rabotakh« (note 15). Later, Vyshnegradskii's contributions were also appreciated in Western science, see his mentioning in John Warfield: »Cybernetics«, in: *Encyclopedia of Human Behavior,* vol. 2, ed. by Vilayanur Ramachandran, San Diego: Academic Press 1994, pp. 63–72, here p. 63.

21 Douglas Weiner: »Community Ecology in Stalin's Russia. ›Socialist‹ and ›Bourgeois‹ science«, in: *Isis* 75 (1984), pp. 684–696, here pp. 687–688.

22 Ivan Pavlov: »O vzaimnom otnoshenii fiziologii i meditsiny v voprosakh pishchevareniia« [On the Mutual Relations of Physiology and Medicine in Questions of Digestion], in: *Polnoe sobranie sochinenii* [The Complete Works], vol. 2, Book 1, Moscow/Leningrad: Izd. Akad. Nauk SSSR 1951, pp. 245–274, here p. 250.

23 Ibid., p. 252.

24 Claude Bernard: *An introduction to the study of experimental medicine*, New York: Dover Publication 1957, p. 76.

25 Canguilhem: »La formation du concept« (note 3), p. 96.

26 Ibid., 95.

27 Daniel Todes: *Ivan Pavlov. A Very Short Introduction*, Oxford: Oxford Univ. Press 2022, p. 19. Tsion had been invited to Bernard's laboratory in the 1850s, see Galina Kichigina: *The Imperial Laboratory: Experimental Physiology and Clinical Medicine in Post-Crimean Russia*, Boston: Brill 2009, pp. 262–263.

28 Karl Rothschuh: »Historische Wurzeln der Vorstellung einer selbsttätigen informationsgesteuerten biologischen

body as a »living machine« had already overcome the mechanist Cartesian model of the body as a machine by qualifying the inner regulatory mechanisms within the organism,[29] the means of this regulation were still obscure. Although Pavlov already had a better understanding of the nervous system as the central regulatory instance of the body, he still could not fully understand the diverging behavior patterns of his study objects. At the same time, avant-gardists such as the poet and labor scientist Aleksei Gastev tried to capitalize on Pavlov's theories in favor of a new organization of work. This optimization of movements should be reached through repetition and training, which was to ultimately lead to the internalization and habitualization of new regulatory mechanisms of the body.[30] Similarly, the regulation of the nervous system became a metonymy for the regulation of the state in the painter and art theorist Kazimir Malevich's famous definition of »[t]he state [a]s an apparatus by which the nervous systems of its inhabitants [is] regulated«.[31]

Petr Anokhin, who worked in Pavlov's laboratory in the 1920s after starting his scientific career at Vladimir Bekhterev's Leningrad-based *Institute of Medical Sciences*, took a critical role in advancing Pavlov's approach toward a theory of functional systems.[32] Anokhin studied brain functions and explained their functionality as the result of »reverse afferentations« between the periphery and the center of the brain. This feedback mechanism contributed to his understanding of the brain as a »dynamic, autoregulating organization[ ]«.[33] While this theory had already been outlined in the 1930s – during late Stalinism, Anokhin's work was dismissed for its alleged undermining of Pavlov's theory of reflexes[34] – it was later reformulated in cybernetic terms. Anokhin expanded the scope of his theory by arguing that the functional system of the organism served as a role model »for any system with automatic regulation«.[35] This agenda required a clarification of the differences between organic and mechanic functional systems. In both cases, regulation was the essential mechanism. Still, while the machine's reaction to disturbances had no creative and spontaneous element, the organism had to find solutions autonomously:

»One of the essential differences is that the organism solves independently every moment the question: ›What is to be done?‹ For the machine, this question does not stand. For the machine, the question ›What is to be done?‹ has already been solved in the design office, on the factory floor, and perhaps even in the planning staff«.[36]

In contrast to a machine with limited ways of coping with disturbances, organisms could realize various possibilities to achieve regulatory adjustment effects.[37]

While Anokhin's theory of functional systems only hinted at an expansion towards ecological issues, evolutionary biologist Ivan Shmal'gauzen realized this amplification. Shmal'gauzen is best known as a pioneer of the »modern synthesis«, establishing a dialogue between Darwinian evolutionary theory and genetics.[38] In his evolutionary theory, regulatory mechanisms in organisms ensure the integration of the system, i.e., the »mutual adaptedness of all parts and functions of the organism, providing general stability«.[39] Shmal'gauzen follows regulatory processes on the individual and the supra-individual level.

Regelung«, in: *Nova Acta Leopoldina* 37 (1972), no. 1, pp. 91–106, here p. 93.

29 See for this trajectory Philippe Huneman/Charles Wolfe: »Man-Machines and Embodiment. From Cartesian Physiology to Claude Bernard's ›Living Machine‹«, in: *Embodiment. A History*, ed. by Justin Smith, New York: Oxford Univ. Press 2017, pp. 241–276.

30 See Tricia Starks: *The Body Soviet: Propaganda, Hygiene, and the Revolutionary State*, Madison: Univ. of Wisconsin Press 2008, p. 165.

31 Kazimir quoted by Boris Groys: *The Total Art of Stalinism*, Princeton: Princeton Univ. Press 1992, p. 17.

32 Galina Egiazaryan/Konstantin Sudakov: »Theory of Functional Systems in the Scientific School of P.K. Anokhin«, in: *Journal of the History of the Neurosciences* 16 (2007), pp. 194–205, here p. 195; for a genealogy of Anokhin's approach see Samuel Corson/Elizabeth O'Leary-Corson: »From Descartes to Pavlov to Anokhin. The Evolution of General Systems Concepts in Biomedical Sciences in Eastern Europe«, in: *Psychiatry. The State of Art. Vol. 2. Biological Psychiatry, Higher Nervous Activity*, ed. by P. Pichot, New York/London: Plenum Press 1983, pp. 679–682.

33 Egiazaryan/Sudakov: »Theory of Functional Systems in the Scientific School of P.K. Anokhin«, pp. 196–197.

34 Ibid., p. 201.

35 Petr Anokhin: »Teoriia funktsional'noi sistemy kak predposylka k postroeniiu fiziologicheskoi kibernetiki« [The Theory of Functional Systems as a Prerequisite for the Construction of Physiological Cybernetiacs], in: *Kibernetika funktsional'nykh sistem* [Cybernetics of Functional Systems], ed. by Konstantin Sudakov, Moscow: Meditsina 1998, pp. 12–32, here p. 15.

36 Ibid., p. 24.

37 Ibid., p. 15.

38 Levit, Georgy/Uwe Hossfeld/Lennart Olsson: »From the ›Modern Synthesis‹ to Cybernetics: Ivan Ivanovich Schmalhausen (1884–1963) and his Research Program for a Synthesis of Evolutionary and Developmental Biology«, in: *Journal of Experimental Zoology* 306 B (2006), pp. 89–106.

39 Ibid., pp. 93–94.

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The first is formed on the molecular, cellular, and multi-cellular levels, the latter on the levels of population, species, and biocenoses.[40] According to him, on all these levels »›biological regulation‹ is always ›self-regulation‹« within a system.[41] The system, however, must not be imagined as a closed system but as an open system connected to the outer systemic in multiple ways.[42] Thus, like Anokhin, Shmal'gauzen advances towards a cybernetic understanding of biological regulation, extending its functional mechanisms in the direction of ecology.

III. REGULATING NATURE

The concepts discussed so far approached the idea of regulating nature from the grammatical point of the subjective genitive. However, this last chapter shifts towards the objective genitive. The regulation of nature manifests in the early modern period, predominantly with the idea of regulated rivers. Since the late 17th century, almost all major European rivers had become an object of state intervention, e.g., through the shortening of watercourses, bank stabilization, the influencing of flow velocity, and the construction of dams and artificial waterways.[43] The regulation of rivers was motivated by economic reasons, sovereignty claims, and a growing need for prevention. It was guided by the widespread idea that »only human intervention could finalize the state of nature«.[44] In the Russian empire, regulation of rivers gained momentum in the second half of the 19th century and was vividly discussed in relation to rivers such as the Dniester, the Dnepr, and the Volga.[45] As the Bolsheviks seized power in 1917, the regulation of rivers was expanded and became a central means in infrastructure policy.[46]

As the empire was plagued by drought and harvest failure in 1891, the discussion about regulation intensified. In these ensuing discussions, the soil scientist Vasilii Dokuchaev occupied a central role.[47] He argued that the steppes were characterized by a »natural regime«, formed throughout centuries that regulated the interaction between air, water, earth, animal, and plants long before man's arrival on the planet.[48] As this equilibrium had been destroyed, measures had to be implemented »to eradicate the evil« caused by man and nature.[49] These measures comprised the regulation of rivers, ravines, gulleys, and water management in the steppes.[50] This »Dokuchaev Plan«[51] was partly realized, making it one of the first comprehensive endeavors to regulate nature in Russia, including hydrological intervention and measures in forest and soil management.

Nikolai Fedorov followed the scientific debates about the environmental catastrophes at the turn of the century and expanded upon ideas of regulating natural processes by Aleksandr Voeikov[52] and others. In his writings, nature becomes an object of regulation (*reguliatsiia prirody*). Whereas Dokuchaev grants nature a strong self-regulatory potential, Fedorov sees

40 Ivan Shmal'gauzen: »Integratsiia biologicheskikh sistem i ikh samoreguliatsiia« [The Integration of Biological Systems and their Self-Regulation], in: *Kiberneticheskie voprosy biologii* [Cybernetic Questions of Biology], Novosibirsk: Nauka 1968, pp. 157–182.

41 Ibid., 176. The semantic field of mechanics is central to Shmal'gauzen's understanding of self-regulatory processes and structures in organic systems, indicating a similarity of organic and mechanic systems in his thought.

42 Shmal'gauzen: »Integratsiia« (note 40), p. 176.

43 Andreas Dix: »Flussregulierung«, in: *Enzyklopädie der Neuzeit*, Bd. 3: *Dynastie–Freundschaftslinien*, ed. by Friedrich Jäger, Stuttgart: Metzler 2005–2012, pp. 1042–1046, here p. 1043.

44 Nicolai Hannig: Kalkulierte Gefahren Naturkatastrophen und Vorsorge seit 1800, Göttingen: Wallstein 2019, pp. 125–126.

45 Mikhail Shuliatikov: *K voprosu o regulirovanii r. Volgi* [On the Question of Regulating the River Volga], Moscow: Tipo-Lit. N.I. Kumanina 1886; N.N.: »Stat'i ob uluchshenii sudostroeniia, sudokhodstva i moreplavaniia na Chernom i Azovskom moriakh i k voprosu o regulirovanii rek Volgi i Dnestra« [Articles on the Improvement of Shipbuilding, Shipping and Navigation in the Black and Azov Seas and on the Question of Regulating the Rivers Volga and Dnistr], Moscow: Tipo-Lit. N.I. Kumanina 1886.

46 The growing attention towards the regulation of rivers can exemplarily be shown in the encompassing entry on the topic in the *Technical Encyclopedia* of 1933, see S. Briling: »Regulirovanie rek« [The Regulation of Rivers], in: *Tekhnicheskaia entsiklopediia* [Technical Encyclopedia], vol. 19: *Razrabotka poleznykh iskopaemykh* [Development of Minerals], ed. by L. K. Martens. Moscow: Sov. Entsiklopediia 1927–1936, pp. 257–271.

47 See David Moon: »The Environmental History of the Russian Steppes: Vasilii Dokuchaev and the Harvest Failure of 1891«, in: *Transactions of the Royal Historical Society* 15 (2005), pp. 149–174.

48 Jan Arend: Russlands Bodenkunde in der Welt. Eine ost-westliche Transfergeschichte 1880–1945, Göttingen: Vandenhoeck & Ruprecht 2017, p. 85.

49 Vasilii Dokuchaev: *Nashi stepi prezhde i teper'* [Our Steppes before and now], St. Petersburg: Tip. E. Evdokimova 1892, p. 107.

50 Ibid., pp. 108–110.

51 Moon: »Environmental History« (note 47), p. 166 and p. 170.

52 Nikolai Fedorov: »Padaiushchie miry i protivodeistvuiushchee padeniiu sushchestvo« [Falling Worlds and the Creature Resisting the Fall], in: id.: *Sobranie sochinenii v chetyrekh tomakh [Collected Works in four Volumes]*, vol. 2, ed. by P. B. Shalimov, Moscow: Progress 1995, pp. 243–249, here p. 248.

it as a blind force without any soul and reason.[53] Man must complement this force (*usovershenstvovanie prirody*)[54] through a common task[55] (*obshchee delo*)[56]. Fedorov's rhetoric is characterized by its religious overtones as he understands regulation as a prayer and the human realization of the biblical »Give us this day our daily bread«.[57] Although the object of regulation is nature as a whole, Fedorov privileges meteorological interventions, thus becoming an early advocate of anthropogenic climate engineering. As shown by Michael Hagemeister, Fedorov's ideas of regulating nature influenced early Soviet thought and the Stalinist plans for transforming nature.[58]

Another scientist who was instantly inspired by Dokuchaev and Fedorov was Vladimir Vernadsky.[59] Following the Austrian geologist Edward Suess, he coined the concept of the »biosphere« which he understands as the »field of existence of life« characterized by the interaction between geological, biological, and human forces.[60] This emphasis on interaction and interconnectedness between different milieus echoes Bernard's research on the exchange processes between inner and outer milieus.[61] Although Vernadsky does not speak prominently about regulation,[62] regulatory mechanisms play a critical role in his understanding of »living matter« and his studies on the »properties and structures of living things«.[63] Vernadsky's writings also rekindle Dokuchaev's double understanding of regulation as a natural mechanism and a compensatory and creative human force, as Vernadsky promotes man's role as a geological force. Later on, these ideas evolved in Soviet cybernetic ecological thinking, most prominently in the case of Nikita Moiseev, a university professor for applied mathematics. Moiseev argued that one could not any longer speak about regulation and control (*upravlenie*) of such complex systems as nature but should limit to guidance (*napravlenie*), as giving direction to a specific development,[64] a shift indicating a growing disillusion with regulatory efforts.

IV. CONCLUSION

This article has traced the evolution and migration of concepts of regulation in the natural sciences and across the division between the »two cultures«. Since the mid-19th century, regulation has become a central term in physics, biology, and medicine as these disciplines gradually acknowledged the systemic character of their objects of study. In the Russian empire, the ground-breaking theories of Maxwell, Bernard and others were quickly adapted and expanded upon. At the turn of the 20th century, Russian science had developed an original understanding of regulation and significantly contributed to international debates.[65] At this point, the formerly mechanistic understanding of regulation was increasingly replaced by an energetic understanding of the exchanges of matter and information and, ultimately, by a (proto-)cybernetic conception of regulation. At the same time, regulation was conceived in evolutionary terms, which provoked a shift in orientation from closed to open systems. The acknowledgement of the evolutionary character of regulatory mechanisms and the possibility to create

53 Nikolai Fedorov: »Samoderzhavie« [Autocracy], in: id.: *Sobranie sochinenii v chetyrekh tomakh*, vol. 2, ed. by P.B. Shalimov, Moscow: Progress 1995, pp. 3–38, here p. 33.

54 See Nicolai Fedorov: »Prakticheskaia filosofiia Lottse, ili nauka o tsennosti bytiia« [Lotse's Practical Philosophy or the Science of the Value of Being], in: id.: *Sobranie sochinenii v chetyrekh tomakh*, Vol. 2, ed. by P.B. Shalimov, Moscow: Progress 1995, pp. 189–191, here p. 190.

55 Fedorov's concept of *obshchee delo* has also been translated as ›common cause‹ and ›common work‹; the latter meaning hints also to the probable derivation of *obshchee delo* from the Greek word for liturgy (note by the editor).

56 Fedorov: »Samoderzhavie« (note 53), p. 33.

57 Nikolai Fedorov: »Reguliatsiia meteoricheskaia, kak ispolnenie molitvy ›Khleb nash (t.e. trudom priobretennyi) dazhd' nam (t.e., vsem) dnes'‹« [Meteorological Regulation as the Fulfillment of the Prayer »Give Us [i.e. all] This Day Our Daily Bread [i.e. Acquired by Work«], in: *Sobranie sochinenii v chetyrekh tomakh*, vol. 2, ed. by P.B. Shalimov. Moscow: Progress 1995, p. 52.

58 See Michael Hagemeister: *Nikolaj Fedorov. Studien zu Leben, Werk und Wirkung*, München: Otto Sagner 1989.

59 Alexej Ghilarov: »Vernadsky's Biosphere Concept: A Historical Perspective«, in: *The Quarterly Review of Biology* 70 (1995), no. 2, pp. 193–203; George Young: *The Russian cosmists: the esoteric futurism of Nikolai Fedorov and his followers*, Oxford: Oxford Univ. Press 2012, pp. 155–162.

60 Ibid., p. 196 and p. 198.

61 See Jacques Grinevald: »Introduction: The Invisibility of the Vernadskian Revolution«, in: Vladimir Vernadsky: *The Biosphere*, New York: Copernicus 1998, pp. 20–32, here p. 30.

62 Exceptions are comments of the oceans as »heat regulator[s]« (Vernadsky, »The Biosphere« (note 61), p. 49) or organisms as »the intermediaries in the regulation of the chemistry of the crust by solar energy« (ibid., p. 55).

63 Ibid., p. 77.

64 Eglė Rindzevičiūtė: *The Power of Systems. How Policy Sciences Opened Up the Cold War World*, Ithaca: Cornell Univ. Press 2016, pp. 178–179.

65 This overview, however, is not meant to promote something like a Russian Sonderweg. As Canguilhem and others have shown, the migration of biological concepts of regulation to the social sciences is a constitutive part of the conceptual history of regulation. At most, Nikolai Fedorov's regulatory furor and the cosmism movement he founded was a specific phenomenon of the Russian empire which became influential in the early Soviet Union.

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new regulation mechanisms brought forth the idea to artificially create new regulation processes. At this point, nature became an object of human regulation in Dokuchaev, Fedorov, and Vernadsky. Although this thinking inspired later Soviet endeavors to alter the face of Earth, it should not be limited to this kind of technocratic omnipotence. Instead, this way of thinking originated from a strong awareness of the threats the technological civilization was facing, an awareness that manifested itself in the proto-ecological theories of Dokuchaev and Vernadsky and in Moiseev's later downscaling from *upravlenie* to *napravlenie*.

IRREVERSIBLE PROCESSES: BETWEEN THERMODYNAMICS, BIOLOGY, AND SEMIOTICS OF CULTURE

Philipp Kohl

I. INTRODUCTION

Within the political debate on climate change that has been taking place during the last decades, speaking of irreversibility seems to have become an irreplaceable rhetorical tool, e.g., when it seems necessary to emphasize the urgency of action to avoid breaching »irreversible tipping points«[1]. It has been noted that the emphasis on irreversibility in the context of ecological sustainability has little in common with physical, medical, or economic definitions of the term.[2] As a scientific concept, irreversibility is not native to ecology, but evolved from 19th-century thermodynamics. By appropriating irreversibility, climate and sustainability discourses have imported not only the rhetorically persuasive, but also the conceptually dangerous aspects – a risk of conflating the local with the global, the particular with the total.[3] It may not be by accident that the theoretical school that inspired the following essay, Moscow-Tartu semiotics, is, by way of its ideological and institutional situation in the late Soviet Union, deeply engaged with questions of particular and total sign systems. With his conceptualization of irreversible processes in an attempt to bridge disparate disciplinary traditions, Juri Lotman will be the focal point of the following sketch of an interdisciplinary history of irreversibility, one that is *ecocritical* in that it problematizes interactions of human agency and the laws of nature.

Prior to a historical analysis of the concept, it is helpful to provide some remarks on the relationship between irreversible processes and agency. The urgency associated with irreversibility in political discourse features an affective dimension that physicist Hans Reichenbach aptly describes as an existential theme of time's passing and human mortality:

> »The coming of death is the inescapable result of the irreversible flow of time. If we could stop time, we could escape death – the fact that we cannot makes us ultimately impotent, makes us equals of the piece of lumber drifting in the river current. The fear of death is thus transformed into a fear of time, the flow of time appearing as the expression of superhuman forces from which there is no escape. The phrase ›passing away‹, by means of which we evasively speak of death without using its name, reveals our emotional identification of time flow with death«.[4]

Before the study of culture can come to terms with irreversibility, there is a need to establish an idea of reversibility. Its apprehension in the history of ideas profits from the study of myth, a reversible world. What Mircea Eliade has called the »terror of history« is the affective resistance against the »new« in history, the ways in which archaic humanity »defended itself, to the utmost of its powers, against all the novelty and irreversibility which history entails«.[5] In the history of ideas, it takes irreversibility as an innovation by Judeo-Christian tradition to see history as a process not only present in human life, but also in nature.[6] As a feature of the historical process, irre-

1 Examples for this common use of the term can be found in Greta Thunberg: *The Climate Book*, London: Penguin Books 2022.

2 Neil A. Manson: »The concept of irreversibility: its use in the sustainable development and precautionary principle literatures«, in: *The Electronic Journal of Sustainable Development* 1 (2007), p. 3–15.

3 On the cosmological relationship between local and large-scale aspects of irreversibility see Lawrence Sklar: *Physics and Chance. Philosophical Issues in the Foundations of Statistical Mechanics*, Cambridge, Mass.: Cambridge University Press 1993, p. 297.

4 Hans Reichenbach: *The Direction of Time*, ed. Maria Reichenbach, Berkeley/Los Angeles/London: University of California Press 1971, p. 4.

5 Mircea Eliade: *Cosmos and History. The Myth of the Eternal Return*, New York: Harper and Row 1954, p. 48.

6 Stephen Jay Gould: *Time's Arrow, Time's Cycle. Myth and Metaphor in the Discovery of Geological Time*, Cambridge:

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versibility is a paradox, an impersonal idea expressed in a grammatical form which supposes a subject. But there is no historical subject which would be ›able‹ to revert anything. Who accounts for the ›-ibility‹ of the irreversible? Is it the enlightened subject of Rousseau's »perfectibilité«,[7] or its 19th century version living in times of entropic degeneration, the »dark side of progress?«[8] In his 1960 work *Paradigmen zu einer Metaphorologie* (*Paradigms for a Metaphorology*), Hans Blumenberg points to the connection between the irreversible and the nostalgia concerning the loss of an imaginary home, coining the term »Heimkehrlosigkeit« (»denied homecoming«) for the modern voyage metaphor of an irreversible, noncircular trajectory (as opposed to Homer's cyclical ship traveling).[9]

These remarks should have clarified why irreversibility is an affective phenomenon, despite its emergence from an anonymous physical mechanism. This may also explain why resistance against irreversibility does not end with archaic societies and their mythical notions of reversibility. In the 20th century, a new »mistrust of time«[10] famously arises with Einstein's dismissal of the irreversible passage of time in past, present, and future as an illusion. In their works on the »rediscovery of time« in the 1980s,[11] physicist Ilya Prigogine and philosopher Isabelle Stengers argue for »a pluralistic universe in which reversible and irreversible processes coexist, all embedded in the expanding universe«.[12] By approaching irreversibility as a problem of the *two cultures* of the sciences and the humanities, they apply a historiographical concept to the study of physical time, similarly to French historiographer Fernand Braudel's ›scales‹ of geographical, social, and individual time.[13]

For the following essay, these preliminary considerations allow to discern those which have been called the »many faces of irreversibility«.[14] The essay will focus on three of these scales, sketching a history of irreversibility in 20th-century Russian thought: The abstract irreversibility of time in physics, the ›embodied‹ irreversibility of biological evolution and, finally, the irreversibility of cultural processes. The first part will trace the history of irreversibility in 19th-century physics and biology. The second part will discuss Vladimir Vernadsky's theory of biological time as an attempt to synthesize physical and biological irreversible processes (*neobratimye protsessy*) as phenomena of asymmetry in space-time. The third part will look at the migration of scientific ideas of irreversibility into the theory of culture, i.e., Juri Lotman's semiotic theory of irreversibility as unpredictable and unrepeatable processes of culture. In this three-step sketch, the history of irreversibility will be outlined as one of spatialization (from an abstract law to the image of ›time's arrow‹) and of specialization (from the law of entropy to the case of the generation of meaning).

II. ENTROPIC IRREVERSIBILITY, DOLLO'S LAW, TIME'S ARROW

In order to understand the Russian discussion of irreversible processes, it is necessary to trace their semantic origins in the 19th century. While William Thomson (later known as Lord Kelvin) touches upon irreversibility as part of energy dissipation in 1852,[15] Rudolf Clausius provides the classic thermodynamic definition of irreversible processes in his 1865 paper on heat theory, which is most notable for coining the term entropy. Clausius derives the neologism from ›energy‹, in which he replaces ›ergon‹ (›work‹) with ›tropé‹ (›transformation‹). Whereas energy is the »thermal and ergonal content«, entropy is the »transformational content«.[16] Clausius describes changes in a cyclic process which can either be reversible

Harvard University Press 1987, pp. 10–13.

7 Reinhart Koselleck: »Die Verzeitlichung der Begriffe«, in: id.: *Begriffsgeschichten*, Frankfurt a. M.: Suhrkamp 2006, pp. 77–85, here p. 78 f.

8 See Edward Chamberlin/Sander L. Gilman (eds.): *Degeneration. The Dark Side of Progress*, New York: Columbia University Press 1985.

9 Hans Blumenberg: *Paradigms for a Metaphorology*, Ithaca 2010, p. 17; original: Hans Blumenberg: »Paradigmen zu einer Metaphorologie«, in: *Archiv für Begriffsgeschichte* 6 (1960), pp. 7–142, here p. 23.

10 Ilya Prigogine/Isabelle Stengers: *Order Out of Chaos. Man's New Dialogue With Nature*, Toronto et al.: Bantam Books 1984, p. 15.

11 Ibid., pp. 19, 213–232.

12 Ibid., p. 251.

13 See Alvin Toffler: »Foreword«, in: ibid., pp. xi–xxvi, xvii–xviii.

14 Kenneth Denbigh: »The Many Faces of Irreversibility«, in: *The British Journal for the Philosophy of Science*, 40 (1989), pp. 501–518; the title is an allusion to Harold Grad: »The Many Faces of Entropy«, in: *Communications on Pure and Applied Mathematics* XIV (1961), pp. 323–354.

15 »When heat is created by any unreversible process (such as friction), there is a dissipation of mechanical energy, and a full restoration of it to its primitive condition is impossible«. William Thomson: »On a Universal Tendency in Nature to the Dissipation of Mechanical Energy«, in: *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science* 4 (1852), pp. 304–306, p. 304.

16 Rudolf Clausius: *The Mechanical Theory of Heat. With Its Applications to the Steam-Engine and to the Physical Properties of Bodies*, London: John van Voorst 1867, p. 357.

or irreversible.[17] While the root ›tropé‹ is commonly understood as ›transformation‹, its etymology features a more evolutive meaning (PIE ›*trep-‹, ›to turn‹), implying an irreversible motion rather than the changing of a form. Claudius stresses its directedness in the final, »fundamental theorem« of his mechanical theory of heat: »The entropy of the universe tends to a maximum«.[18]

The transformative semantics of the term »entropy« already imply an evolutionary logic. Nevertheless, it takes a few decades for biology to derive a principle of irreversibility from Darwin's theory of natural selection. In 1893, Belgian paleontologist Louis Dollo postulates that evolution is

1. discontinuous (occurring in rather rapid jumps),

2. irreversible (»that an organism cannot return, even partially, to a former state already realized in the series of its ancestors«) and

3. limited (necessary extinction of all organisms after having completed a cycle).[19]

In contrast to thermodynamic irreversibility, Dollo's law only pertains to the development of living beings over time. As Dollo later writes in a paper on the adaptation of dinosaurs, the former state is never left behind without a remainder:

»An organism never returns exactly to a former state, even if it finds itself placed in conditions of existence identical to those in which it has previously lived. But by virtue of the indestructibility of the past […] it always keeps some trace of the intermediate stages through which it has passed«.[20]

Here, the impossibility of reversion does not result from necessity, but, as per Stephen Jay Gould, from the improbability to return to a former state.[21]

Similarly, Richard Dawkins argues that Dollo's law of irreversibility should not be misinterpreted as a law implying an »inevitability of progress«.[22] Although frequently evoked as a deterministic principle, Dollo's evolutionary irreversibility does not imply any developmental necessity.

While the theory of evolution is equipped with the powerful symbol of the Tree of Life in Darwin's *On the Origin of Species* (1859), thermodynamic irreversibility circulates as knowledge without an image. If there is any iconic representation of late-19th-century thermodynamics, it is a counter-image: Maxwell's Demon, a thought experiment that violates the Second Law. Only another few decades later does the abstract concept of entropic irreversibility find its canonical visual representation: ›time's arrow‹, as coined by Arthur Stanley Eddington. In his book *The Nature of the Physical World* (1929), he chooses the symbol of the arrow »to express this one-way property of time which has no analogue in space«. This property, Eddington writes, is both recognized by consciousness and »insisted on by our reasoning faculty which tells us that a reversal of the arrow would render the external world nonsensical«.[23] With time's arrow, Eddington has provided the standard metaphor for the irreversibility of time according to the Second Law of Thermodynamics – or, in his words, »the ›irrevocable‹«.[24] His vision culminates in time's directionality heading towards a state of maximum entropy:

»In such a region we lose time's arrow. You remember that the arrow points in the direction of increase of the random element. When the random element has reached its limit and become steady the arrow does not know which way to point. It would not be true to say that such a region is timeless; the atoms vibrate as usual like little clocks; by them we can measure speeds and durations. Time is still there and retains its ordinary properties, but it has lost its arrow; like space it extends, but it does not ›go on‹«.[25]

17 Ibid., p. 143.
18 Ibid., p. 365.
19 Louis Dollo: »Les Lois de l'évolution«, in: *Bulletin de la Société belge de géologie, de paléontologie et d'hydrologie* 7 (1893), pp. 164–166; translation quoted after Stephen Jay Gould: »Dollo on Dollo's Law: Irreversibility and the Status of Evolutionary Laws«, in: *Journal of the History of Biology* 3 (1970), pp. 189–212, here p. 211.
20 Louis Dollo: »Les Dinosauriens adaptés à la vie quadrupède secondaire«, in: *Bulletin de la Société belge de géologie, de paléontologie et d'hydrologie* 19 (1905b), pp. 441–448, here p. 443; quoted after Gould: *Dollo on Dollo's Law* (note 19), p. 196.
21 Gould: *Dollo on Dollo's Law* (note 19), p. 202.
22 Richard Dawkins: *The Blind Watchmaker. Why the Evidence of Evolution Reveals a Universe without Design*, New York: Norton 1986, p. 94.
23 Arthur Stanley Eddington: *The Nature of the Physical World*, New York/Cambridge: Macmillan/Cambridge University Press 1929, p. 69.
24 Ibid.
25 Ibid., pp. 78–79.

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Eddington's image of »time's arrow« becomes a popular metaphor in other fields, too. In his 1987 book *Time's Arrow, Times Cycle*, Stephen Jay Gould uses it to illustrate irreversibility in the »deep time« of geology.[26] Unlike Darwin, who includes a tree diagram as the only illustration in his 1859 work, Eddington does not graphically depict the image of the arrow, a cross-culturally familiar symbol. Once transferred to the realm of biology, it becomes less clear how the arrow of irreversible organic evolution may look like. With its multiple discontinuities, it has been imagined as visually »broken« rather than straight.[27]

III. VERNADSKY: IRREVERSIBLE PROCESSES IN THE SPACE-TIME OF THE BIOSPHERE

Irreversible processes are a critical element in the spatial-temporal thought of Soviet geochemist Vladimir Vernadsky.[28] His work can be regarded as an attempt to connect the irreversibility of theoretical physics with the empirical data of biology, geochemistry, and mineralogy. In a 1931 manuscript for a book project which was later titled *O zhiznennom (biologicheskom) vremeni* (1931, On Vital [Biological] Time), Vernadsky makes an empiricist attempt to grasp the phenomenon of irreversible time, drawing on Bergson's philosophy, Einstein's concept of space-time, and recent discoveries in radioactivity. Following the classic thermodynamic terminology as outlined above, Vernadsky speaks of »irreversible processes« in the plural. His empiricist approach is based on what he calls »empirical facts« (»èmpiricheskie fakty«) and »empirical generalizations« (»èmpiricheskie obobshcheniia«).[29] He takes less interest in the nature of time and more in the scientific approaches to measure it. To demonstrate the variety of time measuring methods for planetary processes, Vernadsky quotes his fellow mineralogist and geochemist Alexander Fersman. In a short introduction titled *Vremia* (1922, Time), Fersman introduces individual chapters on eight different categories: 1. Astronomic and astrophysical 2. geophysical; 3. geological; 4. geochemical; 5. Radioactive; 6. magnetometrical and 7. cultural-historical (mainly archeology).[30] Vernadsky adds two more: the change of generations of organisms and the evolutionary process of changing species of organisms.[31] Vernadsky also provides a list of the irreversible processes central to his work: 1. radioactive decay of atoms of matter, associated with the destruction of individual chemical elements and the creation of new ones; 2. the evolution of types of stars; 3. the history of the earth's crust; 4. the evolution of types of living matter; 5. the change of generations within species and 6. the historical process of changing human societies, including humankind's transition from the Pleistocene into the Pliocene.[32] It is a characteristic trait of his approach – one arguably not immune to pitfalls – to extend the irreversible quality of time to not only include biological processes, but also cultural and societal dynamics.

However, in order to explain what makes time irreversible, Vernadsky does not rely upon measuring techniques, but on a philosophical concept. Henri Bergson's idea of *durée* allows to see time as an irreversible process resulting from biological evolution, one involving consciousness. In his 1907 work *L'Évolution créatrice* (*Creative Evolution*), Bergson describes the irreversibility of time as something we perceive. It is an outcome, a »survival of the past« of earlier stages of cerebral evolution, from which »it follows that consciousness cannot go through the same state twice. […] That is why our duration is irreversible. We could not live over again a single moment, for we should have to begin by effacing the memory of all that had followed«.[33] Thus, Bergson transposes irreversibility from the biological world to personal time. In Vernadsky's view, Bergsonian duration takes over the entire world, becoming the »time of everything alive, unfolding in the evolutionary process«.[34] This movement very much corresponds with Vernadsky's later ideas of scientific thought as a planetary phenomenon and his concept of the

26 Gould: *Time's Arrow, Time's Cycle* (note 6).
27 See Peter Coveney/Roger Highfield: *The Arrow of Time. A Voyage Through Science to Solve Time's Greatest Mystery*, New York: Fawcett Columbine 1990, p. 255.
28 See George S. Levit: *Biogeochemistry – Biosphere – Noosphere. The Growth of the Theoretical System of Vladimir Ivanovich Vernadsky*, Berlin: VWB-Verlag für Wissenschaft und Bildung 2001, pp. 22–32.
29 V[ladimir] I. Vernadskii: *Filosofskie mysli naturalista* [Philosophical Thoughts of a Naturalist], ed. M. S. Bastrakova et al., Moscow: Nauka 1988, p. 303. Replying to a polemic article by Marxist philosopher Abram Deborin in 1933, Vernadsky stresses that his treatment of time was not a philosophical one; ibid., p. 449.
30 Aleksandr Fersman: *Vremia* [Time], Peterburg: Vremia 1922, pp. 17–45.
31 Vernadskii: *Filosofskie mysli* (note 29), pp. 360–361.
32 Ibid., p. 367.
33 Henri Bergson: *Creative Evolution*, New York: The Modern Library 1944, p. 8.
34 »[K]ак время всего живущего, развертывающееся в эволюционном процессе«, Vernadsky: *Filosofskie mysli* (note 29), p. 331.

noosphere (the realm of thought) as a new geological phenomenon reconstructing the biosphere. Quite remarkably, Vernadsky does not refer to Dollo's law. Instead, he introduces the so-called ›Dana principle‹ for the directionality of evolution, named after American geologist James Dwight Dana and his observation of ›cephalization‹, i.e. a steady increase in size of the central nervous system in living organisms.[35] Bergson, Vernadsky writes, »transferred this notion of the creative character of time onto the entire world: ›Time is creation (invention) or it is nothing‹«.[36]

The advent of radiometric dating at the beginning of the 20th century makes it possible to measure time in absolute values. In his chapter on the cosmological implications of radioactivity, Fersman concludes: »Isn't this a new conception of the world determined by time, the power of the decaying atom of nature?«[37] For Vernadsky, radioactive time measurement is an emancipation from sunlight. Furthermore, it allows for a worldview in which the inorganic world ceases to be immutable. From the new view on chemical elements subject to transformation, Vernadsky expands the irreversible process that has so far dominated living organisms to include the world of seemingly inert matter.[38]

Semiotician Viacheslav Ivanov has called Vernadsky's work »the first clear formulation of what may be called the direction of time with regard to biological evolution«.[39] Unlike Dollo, who projects irreversibility as a special case of a general law onto the consecutive stages of the evolution of organisms, Vernadsky's theory of irreversible time situates the matter of life in the space-time of physics. He therefore requires a concept of asymmetry in which time appears as a »polar vector«,[40] very similar to, but less metaphorical than Eddington's »arrow«. In a note written during the same period as the treatise on time, edited as *Pravizna i levizna* (The Principles of Right and Left), Vernadsky draws a connection between the dissymmetry of space and the irreversibility of time. According to what he calls the Pasteur-Curie principle (after findings by biologist Louis Pasteur and physicist Pierre Curie), dissymmetry can only result from a cause that is in itself asymmetrical. This is a key feature of the evolution of living beings in space-time, rendering their development irreversible:

»We know that space and time are inseparable. We are dealing only with space-time. The manifestation of Pasteur's dissymmetry here is reflected in the fact that the vectors of time are polar, that is, the processes of life are irreversible. This is what our experience teaches [us] at every step«.[41]

What makes Vernadsky's theory of irreversible processes interdisciplinary is not only that it intertwines the temporalities of biology and physics, but also that he reflects them as a historian of science. In Vernadsky's semiotic reception, this extends to the humanities.

IV. LOTMAN: IRREVERSIBILITY AND UNPREDICTABILITY IN SEMIOTIC PROCESSES

Vernadsky's text on the Pasteur-Curie principle was published only in the 1970s, in the heyday of the Tartu-Moscow School of semiotics. For thinkers such as Juri Lotman and Vyacheslav Ivanov,[42] the principle of dissymmetry becomes the scientific base for an innovative theory of sign processes and the generation of meaning. Their semiotic idea of asymmetry avoids cosmological analogies between the generation of meaning and creation. It argues that if asymmetric structures can only result from structures that are themselves asymmetric, there is no impulse from the outside that ›creates‹ culture. In his 1984 essay *O semiosfere* (*On the Semiosphere*), Lotman coins the concept of the ›semiosphere‹ as an analogy to Vernadsky's ›biosphere‹. Similarly to the biosphere

35 Here, directedness (*napravlennost'*) is used instead of irreversibility (*neobratimost'*). Vladimir Vernadskii: »Neskol'ko slov o noosfere [Some Words on the Noosphere]«, in: *Uspekhi sovremennoi biologii* 18 (1944), no. 2, pp. 113–120.

36 »Бергсон перенес это представление творческого характера времени па весь Мир: ›Время есть созидание (invention) или есть ничто‹« Vernadskii: *Filosofskie mysli* (note 29), p. 332.

37 »Разве это не новая концепция мира, – определяемая временем, власть распадающегося атома природы?« Fersman: *Vremia* (note 30), p. 61.

38 Vernadskii: *Filosofskie mysli* (note 29), p. 334.

39 Borrowing a term from the title of Hans Reichenbach's book *The Direction of Time* posthumously published in 1956; Vyacheslav Ivanov: »The Category of Time in Twentieth-Century Art and Culture 1973«, in: *Semiotica* 1 (1973), pp. 1–45, here p. 10.

40 Vernadskii: *Filosofskie mysli* (note 29), p. 381.

41 »Мы знаем, что пространство и время неразделимы. Мы имеем дело только с пространством-временем. Проявление диссимметрии Пастера здесь сказывается в том, что векторы времени – полярные, то есть процессы жизни необратимы. Этому учит [нас] наш опыт на каждом шагу«. Ibid., p. 384.

42 Viacheslav Ivanov: *Chet i nechet. Asimmetriia mozga i znakovykh sistem* [Even and Uneven. The Asymmetry of the Brain and Sign Systems], Moscow: Sovetskoe radio 1978.

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which entails the totality of living organisms on a planet, the semiosphere contains the totality of all texts and languages present in the semiotic universe. Unlike Vernadsky's subject matter, the semiosphere's spatial qualities are abstract. The semiosphere has a »diachronic depth« and is characterized by an expanding movement which becomes ever more general: »This is the sense of semiosphere in the contemporary world, steadily expanding into space over the centuries, it has now taken on a global character, and includes within itself the call signs of satellites, the verse of poets and the cry of animals«.[43]

Lotman does not explain whether this process is irreversible on a cosmological scale. He discusses the concept of irreversibility on the smaller scale of creative processes. In his 1990 book *Vnutri mysliashchikh mirov* (Within Thinking Worlds, transl. *Universe of the Mind*), the creative process is irreversible as far as it produces something new that can neither be predicted nor programmed:

»We cannot envisage the generation of a literary text as an automatic working of a single, set algorithm. The creative process is an irreversible process […], and hence the passage from one stage to another must involve elements of randomness and unpredictability«.[44]

From this specific unpredictable irreversibility, Lotman derives the asymmetrical quality of the creative process: »[T]he fact that one and the same primary symbol can be developed into different plots, and the actual process of this development is irreversible and unpredictable, proves that the creative process is asymmetrical«.[45]

The idea that the creative process is irreversible also affects Lotman's notion of the irreversibility of history. In the chapter »Historical laws and the structure of the text«, Lotman develops his argument against the backdrop of a critical evaluation of the Annales school, particularly from a reading of Marc Bloch. For Lotman, literary history is not a ›slow‹ history of a *longue durée*, as proposed by the Annales school, but one that is instead marked by instances of creativity: »History develops along a time-vector: its course is defined by the movement from past to present; but a historian looks at the texts from the present to the past«.[46] He does not agree with the retrospective view proposed by Marc Bloch that allows the historian to distinguish the essential from the accidental, looking at history as if it were a film played backwards. Therefore, historiography cannot be written in reverse. To Lotman, this view neglects the role of creativity and its unpredictable turns. Lotman's preferred way of looking at history would therefore mean to »see that the events which actually took place are surrounded by clusters of unrealized possibilities«.[47] In Lotman's cultural history, irreversible processes are anything other than vectors with a predetermined outcome. For Lotman, irreversibility cannot be thought without randomness, unpredictability, and chaotic moments. This is why a depiction of »time's arrow« as a straight line would be the most unfavorable representation of this kind of irreversibility marked by discontinuities, a theme Lotman explores much deeper in his final book *Kul'tura i vzryv* (*Culture and Explosion*, 1992).[48]

Lotman's idea of creative irreversibility is indebted to a recent work between science and the history of ideas: The book *Order Out of Chaos* by the Belgian authors Ilya Prigogine, a Russian-born physicist, and Isabelle Stengers, a philosopher of science. They promise a ›rediscovery of time‹ with a reassessment of thermodynamics in the light of chaos theory. From Prigogine and Stengers, Lotman borrows two ideas for his model of history, the first one being ›bifurcation points‹. At these points, Lotman argues, »the process reaches a point when clear predictability of the future is no longer possible. The next stage comes by the realization of one of several equally probable alternatives«.[49] The other idea is that of the »far-from-equilibrium state« where »new types of structures may originate spontaneously« and »transformation from disorder, from thermal chaos, into order« occur.[50] Lotman includes this idea in his account of the moment of creative inspiration, which he describes as a »situation of extreme far-from-equilibrium«.[51] Instead of employing the term as a malleable metaphor for sociological analysis, Lotman limits his theory transfer to the intimate moment of (artistic) creation, thus reformulating a romantic paradigm along the lines of chaos

43 Juri Lotman: »On the Semiosphere«, in: *Sign Systems Studies* 33 (2005), no. 1, pp. 205–226.
44 Yuri Lotman: *Universe of the Mind. A Semiotic Theory of Culture*, London/New York: Indiana University Press 1990, p. 74.
45 Ibid., p. 101.
46 Ibid., p. 229.
47 Ibid., p. 230.
48 Juri Lotman: *Culture and Explosion*, Berlin/New York: de Gruyter 2009.
49 Lotman: *Universe of the Mind* (note 44), p. 231.
50 Prigogine/Stengers: *Order Out of Chaos* (note 10), p. 12.
51 Lotman: *Universe of the Mind* (note 44), p. 101.

theory. He thus strips irreversible processes of their cosmological overdetermination and instead focuses on the singular instance of the artistic generation of meaning. This movement has been prepared by Prigogine and Stengers, who, in their introduction, quote Isaiah Berlin's position on the difference between the natural and the humanitarian sciences as a difference between interest in the repeatable and interest in the unique. They write: »When we move from equilibrium to far-from-equilibrium conditions we move away from the repetitive and the universal to the specific and the unique«.[52] Lotman clarifies that this transfer is crucial to his argument: He detaches thermodynamic irreversibility from its cosmological burden, reducing it to the moment of (semiotic) creation.[53] In the light of the unpredictability of far-from-equilibrium states and bifurcation points, irreversibility becomes the unrepeatability of a creative event. »[A]t moments of bifurcation«, Lotman writes, »the process acquires individuality taking on the characteristics of a human being«.[54] Thus, this seemingly impersonal and abstract process apprehended by the sciences becomes accessible to the humanities. The very idea of Prigogine's and Stengers' book, originally titled *La nouvelle alliance* (The New Alliance, 1979), is the coming together of the »two cultures«.[55]

V. CONCLUSION

Like Clausius, who introduced the concept of entropy, Vernadsky, Prigogine and Stengers, as well as Lotman speak of irreversible processes in the plural. This multiple mode alleviates irreversibility from much of its cosmological burden. From this perspective, irreversibility is not a demonic motor behind what Eliade has called the »terror of history«,[56] the cosmological inevitability that time's arrow points to, but a potentiality. Lotman's transfer of chaos theory towards the generation of creative meaning allows to view the evolution of culture as an assemblage of irreversible processes which, although inevitable, is also unrepeatable. With his cultural theory rooted in both scientific and historiographic models of developmental processes, Lotman offers the instruments for an ecocritical approach to culture based on the analysis of irreversible processes.[57] Reading creative products not as the outcome of events but of irreversible processes helps understanding and locating the points of contingency that made them possible in the first place.

52 Prigogine/Stengers: *Order Out of Chaos* (note 10), p. 13; Lotman: *Universe of the Mind* (note 44), p. 231.

53 As far as the ›interior‹ of creative products and semiotic systems is concerned, Lotman is interested in the reversible as much as in the irreversible. His 1984 essay on the semiosphere makes its argument on the interference of asymmetry and symmetry with palindromic texts, i.e. reading in reverse. In his canonical definition of the narrative event as the crossing of a border, irreversibility is not a criterion, as the boundary can be crossed in two directions, thus enabling the »reversibility of plots«, Jurij Lotman: *The Structure of the Artistic Text*, Ann Arbor: The University of Michigan Press 1977, p. 238. Narratologists do not necessarily agree with this. In Wolf Schmid's narratology, for example, irreversibility is one of the criteria of the narrative event. Wolf Schmid: *Narratology. An Introduction*, Berlin/New York: de Gruyter 2010, pp. 11–12.

54 Lotman: *Universe of the Mind* (note 44), p. 233

55 Prigogine/Stengers: *Order Out of Chaos* (note 10), p. 309.

56 See note 5.

57 For an ecocritical approach informed by Prigogine's view on nonequilibrium physics and irreversible time see Heather I. Sullivan: »Affinity Studies and Open Systems: A Nonequilibrium, Ecocritical Reading of Goethe's Faust«, in: *Ecocritical Theory: New European Approaches*, ed. Axel Goodbody and Kate Rigby, Charlottesville: University of Virginia Press 2011, pp. 243–255, 244.

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REVIEW ESSAY

STUART A. HARRIS/ANATOLI BROUCHKOV/CHENG GUODONG: GEOCRYOLOGY: CHARACTERISTICS AND USE OF FROZEN GROUND AND PERMAFROST LANDFORMS, LONDON: CRC PRESS, 2018.

Andy Bruno

Concerns about the changing characteristics of frozen ground have become a major part of public discourse surrounding anthropogenic climate disruption. Journalists sometimes breathlessly describe the potential for permafrost »melt« to unleash methane which has long been stored in frozen landforms. In the atmosphere, methane functions as an even more potent greenhouse gas than the carbon dioxide that humans have been emitting by burning fossil fuels. As warming gives way to the conditions to spur more warming, a dreaded feedback loop could arise that leads to climate havoc spiraling even further out of control.

Though this scenario represents a severe threat to the ecological conditions that have dominated the planet since the end of the last ice age, its evocation occurs in the context of occasionally muddled understandings of the characteristics of frozen earth. There is the common but inaccurate description of permafrost »melting« rather than thawing, as if the process is similar to an ice cube turning into a puddle of water rather than a hard material becoming an unstable mush.[1] Current discourse about permafrost and what is happening to it in a warming world also results in depictions of the Arctic as a previously ahistorical and timeless place that is only now unfreezing in the face of modernity's onslaught.[2] Such a framing implicitly obscures the complexities and dynamism of Indigenous livelihoods in both the past and the present as well as the varied experience of imperial conquerors, mercurial merchants, exploratory scientists, and settler colonists. The cold, frost, and ice have an underappreciated history, as recent work in the environmental humanities has shown.[3]

In the case of permafrost, the contested disciplinary history of the study of frozen ground is much thornier than an assumed scientific consensus. There have been many approaches to the study of permafrost since it emerged as a scientific discipline in the first half of the twentieth century. Historian Pey-Yi Chu describes a dialectic involving a concentration on either structure or system that has characterized the field of knowledge surrounding frozen ground and its formation, properties, distribution, and dynamics. The issue of whether the substance of frozen materials in the earth or the process of freezing and changing under cold conditions constitutes the primary vector of the discipline has been the subject of cyclical and sometime acrimonious debate, even if many in the past and present have sought to reconcile these two standpoints. The very concept of permafrost first appeared as the German *Boden-Eis* (ground ice) and *Eis-Boden* (frozen soil) in the nineteenth century and later emerged as the Russian *vechnaia merzlota* (eternally frozen earth). As the Soviet Union expanded its industry into the coldest regions of the north in the 1920s and 1930s, it sought engineering solutions to the problems it faced with building infrastructure upon frozen ground. In order to assist these construction projects, scientist Mikhail Sumgin led an effort to institutionalize the study of frozen earth. This discipline came to be known as *merzlotovedenie*, focusing

1 For example, Thane Gustafson's book on climate politics in Russia repeatedly refers to permafrost melt. Thane Gustafson: *Klimat: Russia in the Age of Climate Change*, Cambridge, MA: Harvard University Press, 2021.

2 Countering the ›timelessness‹ of the Arctic, see Andrew Stuhl: *Unfreezing the Arctic: Science, Colonialism, and the Transformation of Inuit Lands*, Chicago: University of Chicago Press 2016. On the need to view the present and future of permafrost from the stance of multiple discontinuities, see Charlotte Wrigley: *Earth, Ice, Bone, Blood: Permafrost and Extinction in the Russian Arctic*, Minneapolis, MN: University of Minnesota Press 2023.

3 Julia Herzberg/Andreas Renner/Ingrid Schierle (eds.): *The Russian Cold: Histories of Frost, Snow, and Ice*, New York: Berghahn 2021. Julia Herzberg/Christian Kehrt/Franziska Torma (eds.): *Ice and Snow in the Cold War: Histories of Extreme Climatic Environments*, New York: Berghahn 2018.

on the study of the substance of *vechnaia merzlota*, which Sumgin defined as a physical structure in the ground continuously frozen for at least two years.[4]

Only in the 1940s was the Russian *vechnaia merzlota* translated into English as »permafrost«. The combination of an adjective (*vechnaia*, eternal or perpetual) and an ambiguous noun without a direct equivalent (*merzlota*, frozen earth) resulted in the single noun permafrost, which conceptually reinforced the notion that it was a substance rather than a process. Sumgin's assembly of a new scientific edifice faced challenges in his lifetime and beyond. In the 1930s, Ukrainian geographer Sergei Parkhomenko polemicized against the Sumgin's conceptions, calling them sloppy and incoherent.[5] Although Sumgin's ideas persisted, they were reconsidered after Sumgin's death in the 1950s. Inspired by systems thinking and dialectical materialism, hydrogeologist Petr Shvetsov sought to establish a new paradigm for the study of frozen earth that focused on the dynamics affecting the space of the cryolithozone rather than on the substance of permafrost. Instead of *merzlotovedenie*, which was often translated as permafrost studies, he proposed calling the discipline *geokriologiia* or geocryology.[6]

The book under review represents a mature contemporary overview of the discipline of geocryology. Authored by an international team consisting of British-Canadian Stuart Harris, Anatoli Brouchkov from Russia, and Cheng Guodong from China, *Geocryology: Characteristics and Use of Frozen Ground and Permafrost Landforms* was published in 2018. It seeks to provide a comprehensive manual of the »young science« of geocryology.[7] Exquisitely illustrated (especially in the electronic version with color photographs), the volume consists of three parts with numerous chapters, spanning more than eight-hundred pages including the front and end matter. Broad in scope and accessible to non-experts hoping to understand the discipline's main contours and terminology, the book aims to elaborate on varied concepts employed by frozen earth scientists while also making those from different national scientific traditions comprehensible to each other. Thus, even for a scientific textbook far from the humanities and social sciences, it presents a wealth of material for conceptual historians to consider. In my review, I will highlight some of these dimensions of the book while leaving an assessment of the merits of its presentation of the science to others.[8]

In the preface and the introduction to Part 1, the authors offer two slightly different definitions of geocryology. They first characterize it as »the study of permafrost, its nature, characteristics, processes and distribution« and later as »the science studying the effect of ground temperatures below 0°C on the surface layers of the crust of the Earth« (1, xv). These two definitions encompass a continued dialectic between system and structure that Chu highlights, as does the parenthetical equation of the two fields – »*geokriologiia (merzlotovedenie)*« – in the Russian version of the book.[9] The volume reflects the emergence of a systems approach in contemporary science, even as it maintains an overall orientation toward engineering problems. In this sense it can be seen as an attempt at a synthesis of the field that strives to resolve tensions but does not always succeed in doing so.

The first part describes the general characteristics of the formation of permafrost, the cryogenic processes regulating it, and its distribution. Early on, the authors introduce the notion of layers of the cryolithozone distinguishing an active layer of the ground that seasonally thaws and refreezes from permafrost that remains perennially frozen ground. There may be unfrozen segments among and beneath these layers that could be called »taliks«, though the naming practices vary among regions and languages. The study of frozen earth features a number of Russian terms from earlier periods used to describe parts of permafrost layers that do not appear in the Western literature. One is *pereletok,* which refers to seasonally frozen soil that does not melt for a few years. Paying particular attention to heat flows, the authors outline

4 Pey-Yi Chu: *The Life of Permafrost: A History of Frozen Earth in Russian and Soviet Science*, Toronto: University of Toronto Press 2020.

5 Ibid., pp. 69–103.

6 Ibid., pp. 127–163.

7 Stuart A. Harris/Anatoli Brouchkov/Cheng Guodong: *Geocryology: Characteristics and Use of Frozen Ground and Permafrost Landforms*, London: CRC Press 2018, p. xv. Hereafter cited with page number in brackets.

8 Readers seeking a review of the book from within the field might consult: Ming-ko Woo: »Review of Geocryology: Characteristics and Use of Frozen Ground and Permafrost Landforms«, in: *Arctic: Journal of the Arctic Institute of North America* 71 (June 2018), no. 2, pp. 233–235; Shemin Ge: »Review of Geocryology: Characteristics and Use of Frozen Ground and Permafrost Landforms«, in. *Arctic, Antarctic, and Alpine Research* 51 (2019), no. 1, pp. 313–314.

9 Stiuart A. Kharris/Anatolii Brushkov/Chėn Guodong: *Geokriologiia: kharakteristiki i ispol'zovanie vechnoi merzloty* [Geocryology: Characteristics and Utilization of Permafrost], vol. 1, Moscow: DirectMedia 2020, p. 11. On this convention in Russian language works, see Chu: *The Life of Permafrost* (note 4), p. 159.

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the cryogenic processes that affect the freezing, thawing, cracking, and upheaving of ground and thus determine the emergence and extent of permafrost zones and other features of frozen landscapes. The distribution of permafrost depends on an array of climatic, geographic, and terrain-related factors. As the authors note, permafrost »occurs on all continents except perhaps Australia« (xv), but beyond Eurasia (including the Qinghai-Tibetan plateau) and North America, it primarily appears in patches in the highlands. A belt that extends around most of the Arctic and subarctic is interspersed with continuous and discontinuous permafrost and contains areas of meters-thick, perennially frozen ground. A chapter in this part outlines current techniques for mapping, modeling, and monitoring permafrost zones.

In Part 2, Harris, Brouchkov, and Cheng provide an extensive overview of the landforms that occur in permafrost regions. They begin with ice wedges and tessellons that can produce patterns of polygons on the surface and, in the case of the former, often begin the process of permafrost formation. In a chapter devoted to massive ground ice in lowland areas, they discuss how some but not all subterranean icy beds might be remnants from previous glaciation and outline various processes such as cryosuction that might have contributed to their formation. Alternative processes of origin are particularly important for *yedoma* (also called ice complexes), an ice-rich type of permafrost that extends back to the Pleistocene in territories not glaciated during the last ice age. Chapters also cover mounds (including pingo domes and peaty palsas), slush flows and avalanches, blocky materials and landforms in cold climates, cryogenic patterned ground (including the appearance of circles, polygons, and stripes), and a variety of pits, heaps, streams, lakes, and *alas* (or *alaas*) connected to thermokarst and other effects of thermal erosion. The authors note that despite a more restricted usage when it was introduced in the Soviet Union in 1930s, »the term thermokarst has now expanded to cover any modification of the ground surface by all processes involving melting of all kinds of ground ice« (398). Anthropogenic and non-anthropogenic thermokarst processes in permafrost regions have been the subject of much discussion in the literature on climate change.

The third part of *Geocryology* »examines how engineers have developed techniques to enable development in permafrost areas« (443). It opens with praise of the Russians who »conquered the northern part of Siberia between 1490 and 1692« and, like their successors in North America, eventually supplanted Indigenous knowledge with modern science (441). This part is oriented more toward an understanding of permafrost as an object to be confronted in the service of industry, overshadowing more process-based approaches to understanding the dynamics of the cryolithozone. The authors open the part with a chapter on the mechanics of frozen soils and another on general construction principles and practices that reviews the various types of foundations that can be employed. The rest of the book focuses on specific types of infrastructure (roads, railways, airfields, pipelines, water supplies, and sewage systems) and industries (oil and gas, mining, agriculture, and forestry). These chapters feature vivid illustrations of attempts to build on permafrost and include repeated evaluations of the problems related to thawing ground in a warming climate. At the very end, however, the potential effects of global warming are understood as possible catalysts to an expansion of agricultural lands, especially in Siberia, rather than as factors generating new precarities for the web of life.

If *Geocryology* aimed to synthesize disparate approaches and resolve the long-standing tensions in the study of frozen ground in the cryolithozone, it was at most only partially successful. A number of strains between structure and system reappear. Regardless of the manual's utility for geocryologists, the conceptual messiness of the science abides. A preface to the two-volume Russian translation of the book highlights the slipperiness of technical terms in different languages and outlines the editorial team's attempts at clarification. For the Russian version, Brouchkov provided additional commentary to elaborate on certain topics. While evincing pride in Russia's pioneering work in geocryology and establishing much of the terminology of the field, his team also found it necessary to introduce some novel terms from the Anglophone literature into the Russian scientific vocabulary. They cite the word *kasty* to capture the »ice wedge casts«, which refers to a residue of melted ice wedge formations that can appear in the ground.[10] Even eighty years after the ambiguous and contested *vechnaia merzlota* became the problematic, but often reified, permafrost, the transfer of concepts and the perennial risk of misinterpretation remains.

Different understandings of terms involve Indigenous knowledge as well. The authors of *Geocryology* respectfully comment on the cultural and economic

10 Ibid., p. 12.

significance of concepts such as *alaas* for the Sakha people. Still, their overview of this topic does not integrate Indigenous knowledge. From the perspective of geocryology, *Alaas* is a land formation that occurs when a thermokarst lake atop ice-rich permafrost drains and leaves flat arable valleys. The book explains a cycle of the stages as *alaas* fluctuates and matures. For the Sakha people, a geophysical conception of *alaas* only captures a small part of the term's significance. In their view, *alaas* represents something closer to homeland that provides sustenance and spiritual connection. Based on her decades of ethnographic work with Sakha people, anthropologist Susan Alexandra Crate emphasizes the importance of the notion of living »by the *alaas*« for the Sakha. This entails economic and cosmological connections to a physical and mental landscape. As Crate shows, Sakha knowledge of *alaas* includes important observations about the environment that cannot simply be subsumed by scientific epistemologies. It is necessary to operate at very local scales to enrich geocryology with Indigenous insight.[11]

A final tension appears in the approach to global warming among two of the authors: Stuart Harris and Anatoli Brouchkov. Although there is commentary on limiting environmental damage and considerable discussion of the effects of the climate in cold regions, the English version never clearly pins the recent warming trend on the anthropogenic emissions of greenhouse gases. Indeed, in a separate publication from 2022, Harris expresses doubt concerning the global character of the warming trend and its human causation, suggesting that temperature increases in the Northern Hemisphere can likely be traced back to shifts in deep-water thermohaline flows. He states that there »is no evidence to indicate that carbon dioxide is of any special importance in the processes so that the measures taken by governments to alleviate it as a problem are not needed«.[12] This claim sharply contradicts the strong consensus of the expert climatologists at the Intergovernmental Panel on Climate Change regarding the cause, character, impact, and urgency of addressing the warming trend. Harris's belief is also disputed by Brouchkov in one of his commentaries in the Russian edition of the book. There, Brouchkov asserts that »warming from the greenhouse effect dominates over other important factors« and describes those who deny this as mostly residing outside »the professional sphere«.[13] I wonder whether Brouchkov would apply this dismissal to his own co-author. A public that is aware of the risks of permafrost disappearance would benefit from a deeper understanding of geocryology. However, Harris's disconcerting denial of the existence of anthropogenic warming eliminates any confidence one may place in him as an appropriate expert.

11 Susan Alexandra Crate: *Once Upon the Permafrost: Knowing Culture and Climate Change in Siberia*, Tucson: University of Arizona Press 2021.

12 Stuart A. Harris: »Causes and Mechanism of Global Warming/Climate Change«, in: id. (ed.): *The Nature, Causes, Effects and Mitigation of Climate Change on the Environment*, London: IntechOpen 2022, pp. 17–44, https://www.intechopen.com/chapters/79908 (accessed on 01.03.2023).

13 Stiuart A. Kharris/Anatolii Brushkov/Chèn Guodong: *Geokriologiia: kharakteristiki i ispol´zovanie vechnoi merzloty*, vol. 2, Moscow: DirectMedia 2020, pp. 215–216.

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MÄRZGEFALLENE
ANMERKUNGEN ZUM PUBLIZISTISCHEN GEBRAUCH EINER POLITISCHEN BEZEICHNUNG 1848–1898

Christoph Hamann

Das Wort ›Märzgefallene‹ ist eine Bezeichnung, die in der wissenschaftlichen wie populären Literatur vor allem über die Geschichte der Berliner Märzrevolution von 1848 auftaucht. Die vorliegende Analyse untersucht die Verwendung der Bezeichnung in der Tagespresse in den 50 Jahren nach der Revolution von 1848/49 bis zum 50. Jubiläum im Jahr 1898.

Das *Digitale Wörterbuch der deutschen Sprache* gibt in seiner Übersicht zwei Bedeutungen des Wortes »Märzgefallene« an.[1] Diese sind demnach erstens Personen, die im Zusammenhang mit der Märzrevolution von 1848 bei Demonstrationen oder Kämpfen zu Tode kamen. Zweitens wird auf die Bezeichnung von Mitgliedern der NSDAP verwiesen, die im Frühjahr 1933 allein persönlicher Vorteile wegen in die Partei eingetreten sind. Bei der zweiten Variante wird angemerkt, dass die Nutzung des Wortes »Märzgefallene« mit einer »ironischen« und »abwertenden« Bedeutung verbunden ist. Als exemplarische Belege für beide Bedeutungen werden kurze Texte aus der bundesdeutschen Presse und aus zwei Autobiographien zitiert. Für den zeitlichen Kontext von 1848 wird mit der *Neuen Rheinischen Zeitung* eine zeitgenössische Quelle verwendet.

Diese Angaben legen eine Lesart nahe, der zufolge die erstgenannte Bedeutungsvariante seit der Märzrevolution von 1848 gängige sprachliche Praxis gewesen sei, die Variante der ironischen Abwertung dagegen aus dem NS-Kontext stamme.[2] Die exemplarische Analyse von Zeitungen und Zeitschriften aus dem Zeitraum von 1848 bis 1898 zeigt jedoch: Beide Annahmen treffen nicht zu. Die Opfer des März 1848 als Märzgefallene zu bezeichnen, war keineswegs von 1848 an eine sprachliche Konvention. Diese etablierte sich erst Jahrzehnte später. Und: Der diskreditierende Gebrauch der Bezeichnung hat eine Geschichte im 19. Jahrhundert. Er lässt sich schon in den 1860er-Jahren nachweisen. Den Anstoß für diese Analyse lieferte die eher beiläufige Beobachtung, dass in zwei zeitgenössischen Romanen über die Revolution von 1848/49 die Bezeichnung ›Märzgefallene‹ keine Verwendung findet: weder in Louise Astons *Revolution und Contrerevolution* (1849) noch in Friedrich Spielhagens *Die von Hohenstein* (1864).[3]

I. DER NAME DER OPFER – INTERESSE, METHODE

In linguistischer Hinsicht und in historischer Perspektive kann die Bezeichnung ›Märzgefallene‹ als ein zeitgenössisches Schlagwort der öffentlichen Kom-

1 »Märzgefallene«, in: *DWDS – Digitales Wörterbuch der deutschen Sprache*, hg. von der Berlin-Brandenburgischen Akademie der Wissenschaften, https://www.dwds.de/wb/märzgefallene (aufgerufen am 28.09.2022).

2 In seiner begriffshistorischen Recherche über die Nutzung des Schlagworts ›Märzgefallene‹ um 1933 resümiert Stefan Scholl, dass dieses in der »nationalsozialistischen Presse« anscheinend »nicht oft vorgekommen sei« und es sich vermutlich um einen »inoffiziellen Parteijargon« gehandelt habe. Dies erscheint naheliegend, hätte doch andernfalls die Parteispitze der NSDAP mit dem Gebrauch der Bezeichnung eingeräumt, dass auch Opportunisten in die Partei eintreten. Stefan Scholl: »An den Rändern der Zugehörigkeit verorten: *Meckerer* und *Märzgefallene* als Grenzfiguren der ›Volksgemeinschaft‹«, in: Heidrun Kämper/Britt-Marie Schuster (Hg.): *Im Nationalsozialismus. Praktiken – Kommunikation – Diskurse*, Teil 1. Göttingen 2022, S. 103–144, hier S. 131. Dies korrespondiert mit Christian Schottmanns Untersuchung zu Schlagwörtern zwischen 1929 und 1934 – die Bezeichnung ›Märzgefallene‹ wird hier nicht thematisiert. Vgl. Christian Schottmann: *Politische Schlagwörter zwischen 1929 und 1934*, Stuttgart 1997.

3 Louise Aston: *Revolution und Contrerevolution*, Mannheim 1849; Friedrich Spielhagen: *Die von Hohenstein*, Leipzig 1913 [EA 1864]. Jörg Bong urteilt dagegen: Märzgefallene »nennt man sie sofort«, vgl. Jörg Bong: *Die Flamme der Freiheit. Die deutsche Revolution 1848/49*, Köln 2022, S. 312. Ich danke Rüdiger Hachtmann (Berlin) für seine freundlichen Hinweise.

munikation verstanden werden.[4] Solche Schlagwörter sind »insofern besonders auffällige […] sprachliche Einheiten, als sie über einen bestimmten Zeitraum hinweg in öffentlicher politischer Kommunikation häufig auftreten, mit ihnen oft ein ganzes politisches Programm kondensiert erfasst und gleichzeitig die positive oder negative Einstellung gegenüber dem bezeichneten Programm transportiert wird. Mithilfe von Schlagwörtern werden Programme, Ideen oder Sachverhalte verkürzt ausgedrückt«. Schlagwörter weisen erstens »diskursspezifische Frequenzverläufe« auf, das heißt, ihre Verwendungshäufigkeit variiert im zeitlichen Verlauf. Schlagwörter sind zweitens abhängig von der »Brisanz und Relevanz des betreffenden Diskurses«, welcher im Schlagwort seinen Ausdruck findet. Schließlich ist drittens die »Semantik von Schlagwörtern diskursiv determiniert […], ihre Schlagwortbedeutung [ergibt sich] aus ihrem Gebrauch in spezifischen Diskurszusammenhängen«. Diese Definition ist nützlich auch für die historische Analyse. Mit der Ausdifferenzierung der Kategorie Schlagwort in die Unterkategorien Fahnenwörter und Stigmawörter werden zudem weitere terminologische Instrumente an die Hand gegeben, die in hohem Maße anschlussfähig sind. Fahnenwörter dienen der positiven Selbstdarstellung, Stigmawörter der negativen Bewertung konkurrierender Darstellungen. Das Charakteristische beim Schlagwort ›Märzgefallene‹ ist, dass es sowohl Fahnen- als auch Stigmawort sein kann, abhängig von der Position der Autorin/des Autors und vom jeweiligen Diskurs.

Als Gegenstand einer Politikgeschichte und von Untersuchungen zu deren sozialer Herkunft fanden die sogenannten Märzgefallenen wiederholt Beachtung. Auch in der Rezeptionsgeschichte der Märzrevolution gibt es Untersuchungen, darunter auch solche zur Geschichte des Friedhofs der Märzgefallenen.[5] Die Geschichte der Bezeichnung ›Märzgefallene‹ wurde nach Kenntnis des Autors jedoch noch nicht thematisiert. Wenn die Bezeichnung ›Märzgefallene‹ selbst Gegenstand von historischen Reflexionen wird, dann in aller Regel mit einem engen historischen Fokus auf den ursprünglich parteiinternen Gebrauch durch vor 1933 eingetretene NSDAP-Mitglieder, die die Neueingetretenen von 1933 auf diese Weise als Opportunisten charakterisiert haben sollen.[6]

Die Analyse erfolgt in temporaler, quantitativer und qualitativer Hinsicht. Untersucht werden das erste Auftreten, die Häufigkeiten im Wandel der Jahrzehnte, Synonyme des Wortes sowie seine metaphorische Verwendung. Dadurch werden implizit auch eine Geschichte der Rezeption der Revolution von 1848/49 skizziert und die unterschiedlichen semantischen Varianten uneigentlichen Sprechens der Bezeichnung ›Märzgefallene‹ aufgezeigt.

Als Untersuchungskorpus dienen zeitgenössische Zeitungen und Zeitschriften, die in drei digitalen Zeitungsportalen mit einer Suchfunktion im Volltext zugänglich sind. Dadurch kann die publizistische Verwendung der Bezeichnung präzise erfasst und in seiner kommunikativen Praxis kontextualisiert werden. Ausgewertet wird das Zeitungsportal *zeit.punktNRW*, welches aus dem Gebiet des heutigen Nordrhein-Westfalen insgesamt 49 historische Zeitungen für das Jahr 1848 und 115 für das Jahr 1898 erfasst. Damit können große Teile der Presselandschaft der damaligen preußischen Rheinprovinz ausgewertet werden.[7] Auffallend an diesen Zeitungen ist, dass sie trotz obrigkeitlicher Einschränkungen durch die Zensur immer wieder über die geschichtskulturellen Praktiken im Anschluss an die Revolution von 1848/49 berichteten.

4 Zur Definition des Begriffs »Schlagwort« und den zitierten Textstellen siehe Melani Schroeter: »Besondere Wörter III: Schlagwörter in der öffentlich-politischen Auseinandersetzung«, in: Ulrike Haß/Petra Storjohann (Hg.): *Handbuch Wort und Wortschatz*, Berlin 2015, S. 394–412, http://centaur.reading.ac.uk/37443 (aufgerufen am 02.10.2022; Seitenzählung hier S. 1–22). Die folgenden Zitate ebd., S. 4–6, 8f.

5 Stellvertretend vgl. Claudia Klemm: *Erinnert – umstritten – gefeiert. Die Revolution von 1848/49 in der deutschen Gedenkkultur*, Göttingen 2007; ebenso Günter Wollstein: »Gedenken an 1848. Tradition im Wandel der Zeit«, in: Bernd Rill (Hg.): *1848. Epochenjahr für Demokratie und Rechtsstaat in Deutschland*, München 1998, S. 311–345. Stellvertretend für die neuere Literatur zum Friedhof der Märzgefallenen vgl. Kurt Laser u. a.: *Der Friedhof der Märzgefallenen im Berliner Friedrichshain – die Begräbnisstätte der Opfer zweier Revolutionen*, hg. von der Geschichtskommission Friedrichshain-Kreuzberg der Partei Die LINKE, Berlin 2015; Susanne Kitschun/Elisabeth Thalhofer (Hg.): *Die Revolution von 1848/49. Wie nach 175 Jahren an den Meilenstein der Demokratiegeschichte erinnern*?, Berlin 2021; zuletzt: Rüdiger Hachtmann: *1848. Revolution in Berlin*, Berlin 2022, S. 209–220.

6 Vgl. Björn Weigel: »›Märzgefallene‹ und der Aufnahmestopp im Frühjahr 1933«, in: Wolfgang Benz (Hg.): *Wie wurde man Parteigenosse? Die NSDAP und ihre Mitglieder*, Frankfurt a. M. 2009, S. 91–109; zuletzt Jürgen W. Falter: *Hitlers Parteigenossen. Die Mitglieder der NSDAP 1919–1945*, Frankfurt a. M./New York 2020. Siehe auch Scholl: »An den Rändern« (Anm. 2); Schottmann: *Schlagwörter* (Anm. 2).

7 Zeitungsportal NRW, *zeit.punktNRW*, https://zeitpunkt.nrw/. Das Portal wird stetig ausgebaut, die Zahl der digitalisierten Zeitungen wächst. Der Schluss der Recherche für die vorliegende Analyse war der Oktober 2022.

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Ergänzend dazu wird mit dem Portal *ANNO* der österreichischen Nationalbibliothek gearbeitet, welches für 1848 insgesamt 51 und für 1898 dann 102 Zeitungen aus Österreich dokumentiert.[8] Dieses Portal ist vor allem deswegen wichtig, weil die 35 Wiener Revolutionsopfer vom 13. März 1848 ebenfalls als ›Märzgefallene‹ bezeichnet wurden. Anders als das Portal *zeit.punktNRW* führt *ANNO* auch Zeitschriften und Satireblätter auf – dies erweist sich bei der Recherche zum ironisierenden Wortgebrauch als ausgesprochen ertragreich.[9] Schließlich wird auch das von der Friedrich-Ebert-Stiftung betreute Portal *Historische Presse der deutschen Sozialdemokratie online* genutzt. Dieses listet für das Jahr 1848 keinen und für 1898 vier Titel.[10] Dieses Portal setzt den Schwerpunkt auf die Presse der organisierten Arbeiterbewegung. Es ist deswegen relevant, weil die Erinnerung an die Märzrevolution lange von eben dieser getragen wurde. Die Erhebung statistischer Angaben auf der Grundlage dieses Portals ist jedoch nur eingeschränkt möglich, da zum Beispiel die Zeitung Social-Demokrat (1864–1871) erst ab dem Jahrgang 1865 und die Zeitung Neuer Social-Demokrat (1871–1876) erst ab dem Jahrgang 1874 digitalisiert vorliegt. Das 25. Jubiläum der Revolution von 1848/49 kann also mithilfe einer Volltextsuche begriffsgeschichtlich hier nicht untersucht werden.

II. EINSCHRÄNKUNGEN DER PRESSEFREIHEIT

Die Veröffentlichungspraxis der Tagespresse unterlag den zeitgenössischen »Preßgesetzen«, die hier am Beispiel Preußens knapp skizziert werden sollen. In Berlin mussten sich die Verantwortlichen der *Vossischen Zeitung* schon während des achtmonatigen Belagerungszustandes ab November 1848 verpflichten, keine Artikel zu veröffentlichen, die »frechen, unehrerbietigen Tadel oder Verspottung der Anordnungen im Staate enthielten, die Missvergnügen und Unzufriedenheit gegen die Regierung oder Maßregeln des Oberhauptes«[11] hätten provozieren können. Die Preußische Verfassung von 1850 verbot zwar explizit die Einführung einer allgemeinen Zensur durch den Gesetzgeber, ließ aber dennoch gesetzliche Beschränkungen der Pressefreiheit zu.[12] Zu diesen gehörten die Bestimmungen des Preußischen »Preßgesetzes« vom 12. Mai 1851, welche staatliche Konzessionen von Gewerbebetrieben (Drucker, Händler) ebenso vorsahen wie deren Kautionspflicht (1.000 bis 5.000 Reichstaler), die Nennung des Druckers/Verlegers, die Vorlage von Belegexemplaren bei der Ortspolizei, bei Pressevergehen Strafen wie den Einzug der gedruckten Exemplare, der Druckplatten und -formen und den Entzug der Konzession. Ende 1851 wurde zudem eine »Zentralstelle für Preßangelegenheiten« zur »sorgfältigen Überwachung der gesamten Presse« eingerichtet.[13] Die »Preßordonnanz« vom Juni 1863 schließlich verschärfte die Möglichkeit des Verbots von Zeitungen mithilfe einer ganzen Reihe von ›Kautschukparagraphen‹, die eine Handhabe für willkürliches Vorgehen legitimierten. Strafbar waren zum Beispiel die Untergrabung der Ehrfurcht und Treue gegenüber dem König, Hass und Verachtung gegen die Einrichtungen des Staates oder die Aufreizung zum Ungehorsam gegen die Gesetze und Anordnungen der Obrigkeit.

8 *ANNO (AustriaN Newspaper Online). Historische Zeitungen und Zeitschriften; Österreichische Nationalbibliothek*, https://anno.onb.ac.at/.

9 Eine Volltextsuche in Digitalisaten in Frakturschrift ist in den zahlreichen Digitalisaten der UB Heidelberg nur sehr eingeschränkt möglich, da Schriftbilder – technisch bedingt – dort nur unzureichend erkannt werden. Deshalb können Satirezeitschriften wie z. B. der *Kladderadatsch* und *Der Wahre Jacob* hier nur punktuell ausgewertet werden. Für die Identifizierung von abwertenden Bedeutungsvarianten wurden deshalb vor allem Zeitschriften aus Österreich ausgewertet. Dies schließt nicht aus, dass auch in der deutschsprachigen Presse die Bezeichnung ›Märzgefallener‹ pejorativ verwendet wurde. Einzelne Beispiele lassen vermuten, dass dies schon vor 1914 auch im Deutschen Reich Praxis war (Zum Beispiel *Der wahre Jacob*, Nr. 302, 15.2.1898, S. 2662; ebd., Nr. 356, 13.3.1900, S. 3204; Nr. 591, 16.3.1900, S. 6149). Ich danke Bettina Müller, UB Heidelberg, für ihre Information; E-Mail vom 29.08.2022, https://www.ub.uni-heidelberg.de/helios/fachinfo/www/kunst/digilit/artjournals/dt_zs.html. Die von der Berliner Staatsbibliothek angebotene Sammlung digitalisierter Zeitungen u. a. aus Berlin und der Region wird hier ebenfalls nur punktuell genutzt, ihr fehlt die Suchfunktion im Volltext für den Untersuchungszeitraum.

10 *Historische Presse der deutschen Sozialdemokratie online*; Zeitungsportal der Bibliothek der Friedrich-Ebert-Stiftung, https://fes.imageware.de/fes/web/.

11 Veit Valentin: *Geschichte der deutschen Revolution 1848–1849*, *Bd. II: Bis zum Ende der Volksbewegung von 1849*, Berlin 1931, S. 275; zur Pressezensur in Berlin auch Günter Richter: »Zwischen Revolution und Reichsregierung«, in: Wolfgang Ribbe (Hg.): *Geschichte Berlins*, *Bd. 2: Von der Märzrevolution bis zur Gegenwart*, München 1987, S. 636–644.

12 Zu Folgendem siehe Ernst Rudolf Huber*: Deutsche Verfassungsgeschichte seit 1789*, *Bd. III: Bismarck und das Reich*, 3., überarb. Auflage, Stuttgart u. a. 1988, S, 46 f., 108, 171, 318 f., hier S. 108. Knapp zusammenfassend auch Ursula E. Koch: *Berliner Presse und europäisches Geschehen 1871. Eine Untersuchung über die Rezeption der großen Ereignisse im ersten Halbjahr 1871 in den politischen Tageszeitungen der deutschen Reichshauptstadt*, Berlin 1978, S. 36–41. Zuletzt Hachtmann: *1848* (Anm. 5), S. 199–201.

13 Huber: *Verfassungsgeschichte* (Anm. 12), S. 171.

III. ›MÄRZGEFALLENE‹ ALS FAHNENWORT

Mit dem substantivierten Partizip »Gefallene« werden Angehörige des Militärs benannt, die im Kampf ihr Leben verloren haben.[14] Etymologisch geht dies auf die historische Praxis zurück, stehend in einer Formation zu kämpfen. Ein Getroffener ›fällt‹ dann im konkreten Sinne des Wortes.[15] Die Gefallenen eines Krieges und die im März 1848 Gefallenen starben jeweils, zumindest semantisch, im Dienst eines überindividuellen gemeinsamen Zieles: im Krieg für die Interessen des eigenen Landes, in der Revolution für die politischen, wirtschaftlichen und sozialen Rechte von Menschen in der Zukunft. Kriegs- und Revolutionsopfer werden zu solchen aufgrund uneigennützigen Handelns. Ihr Handeln adelt sie deswegen in moralischer Weise: Sie sind integer und werden als ›Helden‹ oder ›Märtyrer‹ betrachtet. Von ›Märzgefallenen‹ zu sprechen, wertet die Getöteten daher auf, es ist eine Bezeichnung aus der Perspektive der Anhänger der Revolution. Sie hat zugleich einen weiteren Vorteil: Die getöteten Barrikadenkämpfer werden getöteten Soldaten gleichgestellt und ihr Handeln erfährt semantisch eine Legitimität. Sie sind in dieser Hinsicht ebenbürtige Gegner der Soldaten des Königs und nicht etwa ›Pöbel‹, Unruhestifter oder Aufrührer.[16] Ursächlich für ihr ›Fallen‹ im physischen Sinne ist jeweils die Stärke des Gegners, die Stärke und Integrität des Getöteten ist dadurch nicht infrage gestellt: denn ihr Tod ist das Opfer für die gemeinsame Sache.

IV. VIELFALT DER BEZEICHNUNGEN, EXIL UND REMIGRATION

Die Bezeichnung ›Märzgefallene‹ taucht sehr früh auf. Vom »Denkmal für die Märzgefallenen« war in Berlin schon am 23. März 1848 die Rede, wenige Tage nach den Barrikadenkämpfen vom 18./19. März.[17] Sie ist auch auf einem Grabstein der Märzopfer Simon Barthold und Alexander Goldmann eingraviert, der sich auf dem jüdischen Friedhof an der Schönhauser Allee in Berlin befindet.[18] Einen ersten publizistischen Hinweis findet man in der *Neuen Rheinischen Zeitung* in der Ausgabe vom 6. Juni 1848.[19] Hier sprechen Friedrich Engels und Karl Marx mit Bezug auf den Friedrichshain vom »Grabe der März-Gefallenen«, eine verknappende Form der Formulierung »der im März Gefallenen«.[20] Diese frühen Verwendungen der Bezeichnung waren aber die Ausnahme. Die Titel der Listen bzw. Übersichten über die Märzopfer, welche die Berliner Verwaltung 1848 und 1850 angefertigt hatten, gebrauchen das Wort zum Beispiel nicht.[21] Verwendet werden hier die Bezeichnungen »Freiheitskämpfer«, »Gefallene« oder »gefallene Brüder«. In der Presse (hier das Portal: *zeit.punktNRW*) wiederum wurde die Bezeichnung ›Märzgefallene‹ 1848 nicht, 1849 sechs Mal und 1851 zwei Mal verwendet, dann bis 1861 nicht mehr: In den 1860er-Jahren nahm die Okkurrenz zu, bleibt aber auf einem niedrigen Niveau.[22] Stattdessen wurden andere Bezeichnungen benutzt, bei denen sich vor allem im unmittelbaren zeitlichen Kontext die politische Parteinahme für die Revolution in einem emphatisch-affektiven Sprachgebrauch zeigte. In der Folge wurde der Ton dann mitunter nüchterner, mit Bezeichnungen wie »Straßenkampf« wurde die Revolution schließlich entpolitisiert und verkümmert zum gewalttätigen Tumult ohne Ziel, und die genannten »Civilisten« waren eben bloß solche und nicht mehr. Für die Toten der Barrikadenkämpfe wurden also sehr unterschiedliche Bezeichnungen verwendet. Die folgenden Beispiele aus dem Jahr 1848 zeigen dies: die für die Freiheit/das Vaterland »gefallenen Helden/Bürger«,[23] »ge-

14 Vgl. »Gefallene«, in: *DWDS* = (Anm. 1), https://www.dwds.de/wb/Gefallene (aufgerufen am 28.09.2022).

15 »Gefallener«, in: *Wikipedia*, https://de.wikipedia.org/wiki/Gefallener (aufgerufen am 18.10.2022).

16 Zur konservativen Charakterisierung der Revolutionäre vgl. Rüdiger Hachtmann: »Wandel und Kontinuität. Zum Revolutionsbegriff in der europäischen Revolution von 1848/49«, in: Rill: *1848* (Anm. 5), S. 110–114.

17 Zit. in Heinz Krieger: *Die Kämpfe um ein Märzdenkmal (1848-1898). Ein Beitrag zur Kulturgeschichte. Im Auftrag des Denkmal-Comités von 1896*, Berlin 1899, S. 10.

18 Barthold und Goldmann waren am 22. März 1848 ihren Verletzungen erlegen. Auch die Bildlegende von Menzels Gemälde *Aufbahrung der Märzgefallenen* nimmt darauf Bezug. Unklar ist allerdings, von wann der Titel stammt.

19 Friedrich Engels/Karl Marx: »Comité de sûreté générale zu Berlin«, in: *Neue Rheinische Zeitung* (= *NRhZ*), Nr. 6, 6. Juni 1848, in: *Marx-Engels Gesamtausgabe (= MEGA)*, Band I/7, Amsterdam 2016, S. 70, 71.

20 Ebd., S. 770.

21 Bestände im Landesarchiv Berlin (LAB): a) *Nachweisung der nachträglich an den erhaltenen Wunden verstorbenen und bestatteten Freiheitskämpfer*, o. D.; LAB, A Rep. 001-02, GB Nr. 2441, Bl. 68–72; b) *Uebersicht der in Berlin gefallenen Freiheitskämpfer*, 1. April 1848; LAB, A Rep. 001-02, GB Nr. 2441, Bl. 73–78; c) *Verzeichniß der an den Märztagen in Berlin Gefallenen*, o. D.; LAB, F Rep. 310, GB Nr. 383b ; siehe auch *Vossische Zeitung* (= *VZ*), Nr. 71, 24.3.1848; d) *Dem Andenken unserer am 18. Maerz 1848 im Kampfe für die Freiheit gefallenen Brüder*, 18. März 1850; LAB, F Rep. 310, GB Nr. 119b. Ich danke Moisés Pietro (Zürich) recht herzlich für die freundliche Unterstützung.

22 Siehe Statistik im Anhang.

23 *Neue Bonner Zeitung* (= *NBZ*), Nr. 38, 14.6.1848.

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fallene bürgerliche Streiter«,[24] »Freiheitskämpfer«,[25] »unsterbliche Kampfgenossen«[26] oder »Freiheitsmärtyrer«;[27] später wurden dann Wendungen benutzt wie »gefallene Brüder«[28] (1849/1850), »Märzhelden«[29] (1850), »im Straßenkampf von 1848 Gefallene«[30] (1850), »sogenannte März-Helden«[31] (1853), »Barrikadenkämpfer«[32] (1855), »sogenannte Märzkämpfer«[33] (1857), »Barrikadenhelden«[34] (1858), »die im Revolutionskampfe Gefallenen«[35] (1862), »Märzhelden der ›glorreichen‹ Revolution gehen lieber in die Kneipe«[36] (1867) oder »im Straßenkampf gefallene Civilisten«[37] (1878).

Legt man das Portal *zeit.punktNRW* zugrunde, dann wurde zwischen 1849 und 1865 in Bezug auf die Berliner Barrikadenopfer die Bezeichnung ›Märzgefallene‹ zwei Mal benutzt (1849). Erst 1866, beginnend mit einem Bericht über einen »Fonds zur Errichtung eines Denkmals für die Märzgefallenen«,[38] taucht er wieder auf.

Auffallend ist aber, dass über den Friedhof der Märzgefallenen während der Reaktionsphase der 1850er-Jahre durchaus berichtet wurde. Dies allerdings meist, ohne die Bezeichnung ›Märzgefallene‹ zu verwenden. Als Metonym für den Friedhof wurde dafür vor allem die Ortsbezeichnung »Friedrichshain« genutzt, also der Name des kommunalen Volksparks, in dem sich der Friedhof befindet. Dies lässt sich statistisch belegen. Für die Jahre 1848 bis 1850 addiert das Portal *zeit.punktNRW* 156 Erwähnungen des Wortes »Friedrichshain«.[39] Davon beziehen sich 138 auf den Friedhof – das sind rund 88 % aller Verwendungen. Auch im Jahrzehnt von 1851 bis 1860 lag die Quote des metonymen Gebrauchs, bei sinkenden absoluten Zahlen, immer noch bei 77 %.

Der übergreifende topographische Begriff für den sozialen Raum der Erholung steht hier also stellvertretend für das Besondere: den Friedhof.

Im Portal *zeit.punktNRW* ist das Schlagwort ›Märzgefallene‹ zwischen 1849 und 1865 dennoch insgesamt 23-mal nachweisbar. Bis auf zwei Ausnahmen[40] beziehen sich die jeweiligen Artikel jedoch alle auf die 35 Märzgefallenen aus Wien vom 13. März 1848 und dies selbst in der preußischen Rheinprovinz in den dort erscheinenden Lokalblättern wie zum Beispiel dem *Crefelder Anzeiger* oder dem *Iserlohner Kreisblatt*. Deutlich zentrieren sich die Veröffentlichungen um das Jahr 1849 einerseits und um die 1860er-Jahre andererseits.[41] Die preußische Berichterstattung über Wien drehte sich in den Jahren 1861 bis 1865 nahezu ausschließlich um die dortige Kontroverse, ob auf dem Schmelzer Friedhof in der Wiener Vorstadt ein »Denkmal für die Märzgefallenen« aufgestellt werden sollte. Im März 1864 war dies vom Magistrat der Stadt Wien und dem Ministerium des Inneren schließlich genehmigt worden, strittig war nur noch die Aufschrift. Während also die Bezeichnung ›Märzgefallene‹ zwischen 1850 und 1865 mit Bezug auf die Berliner Opfer nicht verwendet wurde, taucht sie seit den 1860er-Jahren in der Presse der preußischen Rheinprovinz wieder regelmäßig auf.[42] So wurde im März 1866 von den Berliner »Gräbern der Märzgefallenen«[43] gesprochen. Erst in den 1890er-Jahren setzte sich der Name ›Märzgefallene‹ jedoch durch (1891–1898: 938).

Auch im Portal *ANNO* findet sich das Wort ›Märzgefallene‹ zwischen 1848 und 1859 nur selten (16), 1848 zwei Mal, die meisten Nennungen erfolgten 1849, nämlich elf Mal, in den 1850er-Jahren kam es zu drei Erwähnungen.[44] Zu zwei Dritteln wurde damit auf Wien Bezug genommen, zu einem Drittel auf Berlin. Zwischen 1860 und 1866 vervielfachte sich der Gebrauch des der Bezeichnung (522) dann aber. Dies ist begründet in der bereits erwähnten österreichischen Diskussion um die Errichtung des Denkmals der Märzgefallenen auf den Schmelzer

24 *Aachener Zeitung* (= *AZ*), Nr. 86, 26.3.1848.
25 *Bonner Wochenblatt* (= *BW*), Nr. 155, 6.6.1848.
26 *BW* (Anm. 25), Nr. 89, 30.3.1848.
27 *NBZ* (Anm. 23), Nr. 174, 15.11.1848.
28 *NRhZ* (Anm. 19), Nr. 250, 20.3.1849; *Intelligenzblatt für die Kreise Prüm, Bitburg und Daun und den ehemaligen Kreis St. Vith* (= *IPBD*), Nr. 25, 5.3.1850.
29 *NBZ* (Anm. 23), Nr. 45, 17.4.1850.
30 *Neuwiedische Zeitung* (= *NZ*), Nr. 23, 26.3.1850.
31 *Echo der Gegenwart* (= *EdG*), Nr. 94, 22.4.1853.
32 Ebd., Nr. 159, 12.6.1855.
33 *AZ* (Anm. 24), Nr. 339, 9.12.1857.
34 *EdG* (Anm. 31), Nr. 259, 20.9.1858.
35 Ebd., Nr. 70, 11.3.1862.
36 *Allgemeine Zeitung* (= *AlZ*), Nr. 37, 26.3.1867.
37 *Lippische Landeszeitung* (= *LZ*), Nr. 68, 21.3.1878.
38 *AZ* (Anm. 24), Nr. 72, 13.3.1866.
39 Es handelt sich dabei nicht um 156 unterschiedliche Nachrichten, sondern um die Summe der zum Teil auch identischen in verschiedenen Zeitungen gebrachten Nachrichten.
40 *AZ* (Anm. 24), Nr. 69, 24.3.1849: »Begräbnisfeier der Märzgefallenen«; *NBZ* (Anm. 23), Nr. 66, 21.3.1849.
41 Nur eine Ausgabe weicht davon ab, nämlich die *Bonner Zeitung* (= *BZ*), Nr. 70, 23.3.1851.
42 Im Jahr 1868 wird auch ein »Grab der Märzgefallenen« in Prag erwähnt; siehe *Rhein- und Ruhrzeitung (= RRZ)*, Nr. 266, 12.11.1868.
43 *BZ* (Anm. 41), Nr. 68, 23.3.1866; *AZ* (Anm. 24), Nr. 81, 22.3.1866.
44 Siehe Statistik; nicht gezählt werden die Opfer der Märzrevolten in Budapest und Mailand.

Friedhof. Schließlich wird in der Sonntagspost vom April 1868 resümiert: »Auch den Toten ist endlich Amnestie erteilt worden. Dem Namen Märzkämpfer haftet nicht mehr das Kainsmal brudermörderischer Schande an. […] Wo wären wir heut, wenn nicht die Revolution, oder die Erhebung des Volkes von 1848 vorangegangen wäre«. Die Bezeichnung ›Märzgefallener‹ war in gewissem Sinne also rehabilitiert und wurde in der Folge auch wieder verwendet. In der Presse Österreichs wurden die Märzgefallen in den 1850er-Jahren wohl aufgrund der Zensur also nahezu verschwiegen; im folgenden Jahrzehnt erfuhren sie dagegen durch die Denkmalsdebatte und die beginnende liberale Ära in Österreich große Aufmerksamkeit. Ab Mitte der 1860er-Jahre halbierte sich die Häufigkeit der Verwendung des Namens dann aber, und die 1870er- und 1880er-Jahre waren von der Klage des Vergessens bestimmt, es war von einer »Theilnahmslosigkeit für die Märzgefallenen«[45] die Rede. In den 1890er-Jahren wiederum erreichte die Verwendung einen Höchststand (Märzgefallenen 1894–1898: 677 Nennungen; Märzgefallene 1891–1898: 60 Nennungen).

Im Zeitungsportal *Historische Presse der deutschen Sozialdemokratie online* beginnt die Dokumentation sozialdemokratischer Zeitungen mit dem Jahr 1865.[46] Die erste Verwendung des Wortes ›Märzgefallene‹ stammt aus dem gleichen Jahr und bezieht sich auf die Wiener Märzopfer.[47] Erst fünf Jahre später wird die Bezeichnung wieder verwendet – diesmal in Bezug auf Berlin.[48] Die Frequenz stieg zwar, blieb aber zunächst auf niedrigem Niveau (1870–1879: 9; 1880–1889: 22) und erhöhte sich dann in den 1890er-Jahren nach der Aufhebung des Sozialistengesetzes und rund um das 50. Jubiläum der Märzrevolution im Jahr 1898 stark (1890–1899: 306).[49]

V. DER FRIEDHOF ALS HETEROTOPIE

Abb. 1: Bildautor unbekannt: »Die Polizeiorgane beim März-Monument«, in: *Kikeriki. Humoristisches Volksblatt*, Nr. 21, 12.3.1876, Titelseite; ANNO/Österreichische Nationalbibliothek

Die Bezeichnung »*Friedhof* der Märzgefallenen« wiederum wurde publizistisch erst Jahrzehnte nach der faktischen Anlegung des Friedhofs verwendet: nämlich 1870 und 1879.[50] Diese Erwähnungen waren jedoch eine Ausnahme, zuvor und in der Folge wurden weiterhin andere, wechselnde Bezeichnungen verwendet, wobei solche in Kombination mit dem Ortsnamen ›Friedrichshain‹ häufiger waren. Da war die Rede vom »Begräbnisplatz«, vom »Begräbnisort« und von der »Begräbnisstätte«. Da wurde von einer »Gruft« oder »Gruftstätte« ebenso geschrieben wie von dem »Grab« bzw. den »Gräbern«, von einer »Ruhestätte« oder gar von einem »Kirchhof«, obwohl der Friedhof überkonfessionell angelegt war.[51] Zunächst setzten sich Bezeichnungen mit den

45 *Kikeriki* (= *KKK*), Nr. 72, 7.9.1879; siehe dazu auch *KKK*, Nr. 21, 12.3.1876; Nr. 53, 2.7.1876; Nr. 3, 10.1.1878; Nr. 21, 14.3.1878; Nr. 22, 16.3.1882; *Figaro* (= *FG*), Nr. 13, 21.3.1874; Nr. 13, 20.3.1875; Nr. 11, 17.3.1883. *Der Floh* (= *DFl*), Nr. 12, 19.3.1882.

46 Siehe Statistik im Anhang.

47 *Social-Demokrat (= SD)*, Nr. 160, 4.10.1865.

48 Ebd., Nr. 34, 20.3.1870.

49 Im *Digitalen Wörterbuch der deutschen Sprache* wird durch die Ermittlung von Rohfrequenzen ausgewiesen, in welchen Jahren das Wort ›Märzgefallene‹ wie häufig publiziert wurde. Grundlage dafür ist die Auswertung der Korpusse DTA-Gesamt (1598–1913) und *DWDS*-Kernkorpus (1900–1999). Dabei zeigt sich eine ausgesprochen niedrige Frequenz der Verwendung des Wortes ›Märzgefallene‹ (davon 1848–1994: 21 Nennungen; 1848: 2). Die Daten des *DWDS* sind deswegen wenig aussagekräftig. »Märzgefallene«, in: *DWDS* (Anm. 1), https://www.dwds.de/wb/märzgefallene (aufgerufen am 28.09.2022). Ich danke Frau Nojack (Berlin-Brandenburgische Akademie für Wissenschaften) für die freundlichen Auskünfte (E-Mails vom 13. und 17.10.2022).

50 *Düsseldorfer Volksblatt* (= *DV*), Nr. 76, 19.3.1879; *Central-Volksblatt für den Regierungsbezirk Arnsberg* (= *CVRA*), N. 34, 22.3.1879; *SD* (Anm. 47) aus Prag, Nr. 34, 20.3.1870. Die Suche im Portal *ANNO* der österreichischen Nationalbibliothek findet den Begriff zum ersten Mal in *Die Presse* (=*DP*), Nr. 78, 19.3.1882.

51 Als ein »Kirchhof« kann die Begräbnisstätte nur in einem allgemein-überkonfessionellen Sinne verstanden werden, denn weder existierte hier eine Kirche noch waren die Beer-

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Bestandteilen »Begräbnis« und »Grab« durch; Wörter also, die präzise, vor allem aber neutral die soziale und religiöse Funktion des Raumes bezeichneten. Die semantische Praxis weicht unter Umgehung der politischen Bezeichnung also einerseits aus in die Abstraktion der Orts-Metonymie, andererseits in die Konkretion der sozialen bzw. religiösen Funktion des Raumes.

Wie schon die Bezeichnung ›Märzgefallene‹ selbst, so etablierte sich auch der Name ›Friedhof der Märzgefallenen‹ erst in den 1890er-Jahren, nach der Aufhebung des Sozialistengesetzes im September 1890.[52] Zwischen 1891 und 1898 wurde er 104-mal verwendet (hier: *zeit.punktNRW*), häufiger wurde aber immer noch von den »Gräbern der Märzgefallenen« gesprochen (215); selbst vom »Kirchhof der Märzgefallenen« war noch die Rede (59) und sogar die Verbindung »Kirchhof Friedrichshain«[53] taucht auf. Vollkommen durchgesetzt hatte sich der Name ›Friedhof der Märzgefallenen‹ also selbst fünf Jahrzehnte nach seiner Anlegung noch nicht. Diese Entwicklung vollzog sich erst nach dem Jubiläum von 1898 im Zeitraum bis 1914.[54]

Wie lässt sich nun diese späte Etablierung des Namens ›Friedhof der Märzgefallenen‹ begründen? Gemessen an der Taxonomie der Berliner Friedhöfe nahm der Friedhof der Märzgefallenen – in formaler Hinsicht – eine zweifache Sonderstellung ein. Dies lag nicht daran, dass er allein Angehörigen einer bestimmten Personengruppe vorbehalten war, denn dies galt auch für andere Ruhestätten: So lagen auf den Parochialfriedhöfen die Mitglieder der jeweiligen Kirchengemeinde, auf den Militär-, Armen-, Siechen- oder Cholerafriedhöfen diejenigen Verstorbenen, die eben jenen Gruppen angehörten. Ein zentrales Merkmal konventioneller Friedhöfe ist aber deren dauerhafte Funktion, den jeweils jüngst Verstorbenen eine Ruhestätte zu geben. Anders beim Friedhof der Märzgefallenen: Bei ihm war die Anzahl der Beigesetzten von Anbeginn an begrenzt. Schon bei der Beerdigung selbst wurde auf diesen Umstand hingewiesen, indem vom »gleich mit dem Anfang schon geschlossenen Kirchhof«[55] gesprochen wurde. Es sollte eben nur jene numerisch endliche Anzahl von Opfern des März 1848 in Berlin bestattet werden.[56]

Schließlich lässt sich in Anlehnung an Foucaults Konzept der »Heterotopie«[57] für den Friedhof der Märzgefallenen ein weiteres Alleinstellungsmerkmal identifizieren. Als ein Ort »außerhalb aller Orte«[58] ist ein Friedhof grundsätzlich ein Grenzort gesellschaftlichen Lebens. Die Verstorbenen sind ›leibhaftig‹ gleichermaßen an- wie abwesend. Als Orte des Todes inmitten des Lebens, als räumliches Scharnier zwischen dem Diesseitigen und dem Jenseitigen sind Friedhöfe generell Heterotopien. Der Friedhof der Märzgefallenen repräsentiert den Status von Friedhöfen als Heterotopie aber darüber hinaus durch seine speziellen Nutzungen, die für einen Friedhof »an sich unvereinbar sind«[59] und andernorts in der Regel eben nicht gepflegt werden. Denn er ist einerseits ein Ort der individuellen Trauer und zugleich ein politischer Wallfahrtsort der demokratischen Opposition gegen den preußischen Obrigkeitsstaat.[60] Diese Doppelfunktion spiegelt sich auch in der oben aufgeführten Vielfalt und Uneindeutigkeit seiner Bezeichnungen, die selbst noch den »Kirchhof« miteinschließt.

In der Tat war der Begräbnisort beides. Die Opposition sah ihn wie die Obrigkeit als Unruhestätte, mit der sich vor allem – befürwortete oder abgelehnte – politische Ziele für die Zukunft verbanden. Anders als bei den Märzgefallenen in Wien, an die auf dem dortigen Schmelzer Friedhof seit 1864 ein Obelisk erinnerte, wurde in Berlin der Friedhof selbst zum Denkmal. Seine Funktion als Ort des politischen

digten Angehörige nur einer Konfession.

52 Die erste Nennung des »Friedhofs der Märzgefallenen« im Portal *zeit.punkt.nrw* nach 1879 erfolgte erst wieder in der *Westfälischen Zeitung* (= *WZ*), Nr. 66, 19.3.1891.

53 *Der Volksstaat* (= *VSt*), Nr. 29.3.1873.

54 Im Zeitraum von 1899 bis 1914 wurden bei *zeit.punkteNRW* gefunden: »Friedhof der Märzgefallenen«: 567-mal; »Gräber der Märzgefallenen«: 130-mal; »Kirchhof der Märzgefallenen«: 33-mal.

55 Krieger: *Märzdenkmal* (Anm. 17), S. 10. Nicht alle Barrikadenkämpfer erlagen schon am 18./19. März ihren Verwundungen, daher kam es auch noch in den Wochen und Monaten danach zu Grablegungen.

56 Davon unbenommen war die Belegung mit Toten der Novemberrevolution sechs Jahrzehnte später. Diese konnten nicht Teil des 1848 entwickelten Konzepts sein.

57 Michel Foucault: »Andere Räume«, in: Karlheinz Barck u. a. (Hg.): *Aisthesis. Wahrnehmung heute oder Perspektiven einer anderen Ästhetik*, Leipzig 1992, S. 34–46. Ich danke Nina Kreibig (Berlin) recht herzlich für diesen Hinweis.

58 Ebd., S. 39.

59 Ebd., S. 42.

60 In Wien lagen die Gräber der Märzgefallenen auf dem kommunalen Schmelzer Friedhof. Auch hier wurden jährlich im März politische Kundgebungen durchgeführt. Auf die Doppelfunktion, Ort der Trauer und der Demonstration zu sein, verweist auch Susanne Kitschun: »Der Friedhof der Märzgefallenen in Berlin. Ein unscheinbarer Ort von großer demokratiegeschichtlicher Bedeutung«, in: Kitschun/Thalhofer (Hg.): *Revolution* (Anm. 5), S. 71–79, hier S. 72.

Erinnerns zeigte sich zum Beispiel in den Bezeichnungen der Presse als »heilige Erinnerungsstätte«,[61] »schmerzliche Erinnerungsstätte«[62] oder »Denkmal der Geschiedenen«.[63] Am Ort der »ewigen Ruhe« kam es jährlich rund um den 18. März zu politischer Unruhe. Für die Angehörigen der Opfer war aber der Begräbnisplatz, selbst wenn sie die politischen Ziele der Märzopfer teilten, doch immer *auch* eine Ruhestätte, ein Ort ihrer persönlichen Trauer um die Toten. Der Trauer musste also auch Raum gegeben werden für ein Totengedenken, für Gefühle und Rückzug.

Aus der widersprüchlichen Doppelfunktion, Trauer- wie Demonstrationsort zu sein, resultierte ein spannungsgeladener Konflikt. Das obrigkeitliche Ziel der politischen Neutralisierung des Ortes realisierte sich zunächst in verschiedenen Maßnahmen, die u. a. auch eine Trennung von Trauernden und Demonstranten vorsahen. 1849 sollten am 18. März zum Beispiel nur solche Personen Zugang bekommen, die nachweisen konnten, dass ein Angehöriger von Ihnen auf dem Friedhof ruht. Diese Beschränkung fiel im Laufe des Tages wegen des massenhaften Andrangs der Berlinerinnen und Berlinern weg.[64] Dies zeigt, dass den Behörden der Gegensatz zwischen dem legitimen Wunsch von Angehörigen der Opfer, am Grab trauern zu können, einerseits und der politisch motivierten Abriegelung des Ortes andererseits durchaus bewusst war. Weil diese Regelungen politische Demonstrationen nicht verhindert haben, erfolgte 1853 schließlich die vollständige Abriegelung des Ortes durch eine sechs Fuß hohe Bretterwand und eine dichte Hecke. Die Zugangswege wurden zu Kartoffeläckern.[65] Aus dem Friedhof wurde gleichsam ein ortloser Ort, ein Ort, der gleichermaßen da und nicht da war, ein Raum außerhalb aller Räume, der möglichst vergessen werden sollte. Diese Maßnahme löste aber keine Probleme, sie schuf zwangsläufig neue. Dies kann folgende Episode belegen: 1856 traf, so ein Bericht der Tagespresse, ein »alter Jude aus Stettin hier ein und wandte sich an die Behörde mit dem Gesuche: ihm den Zutritt zum Friedrichshain zu gestatten. Er fühle sich seinem Ende nahe, wolle aber vor seinem Tode das Grab seines Sohnes, das sich da draußen befinde, aufsuchen«.[66] Nachdem dies vom Berliner Polizeipräsidenten abgelehnt worden war, hat sich der Vater an Berlins Oberbürgermeister Heinrich Wilhelm Krausnick (1797–1882) gewendet, der erreichen konnte, ihm einen »schmalen Durchgang durch die Hecke zu brechen, der alte Jude betete auf dem Grab seines Sohnes und hinter ihm wurde die Integrität der Dornenhecke wieder hergestellt«.[67]

Gerüchte spielten bei der politischen Neutralisierung des Friedhofs eine große Rolle. 1850 wurde folgender Verdacht geäußert: »Man scheint mit einer gewissen Absichtlichkeit hier in der Stadt das Gerücht rege zu halten, als stehe eine Ausgrabung der Leichen auf dem Friedrichshain und deren Wiederbeerdigung auf ihren resp. Kirchhöfen bevor. […] [A]ls wolle man dadurch nur nach und nach den Boden für diesen Gedanken reif machen und die öffentliche Meinung vorbereiten«.[68] In der Tat machten solche Gerüchte immer wieder die Runde. 1850 wurde gemeldet, an der Stelle des Begräbnisplatzes solle ein Bahnhof und eine Kaserne gebaut werden.[69] Im Jahr 1856 sollte dem Vernehmen nach der Volkspark Friedrichshain erweitert werden, um so den Raum des Friedhofs als einen Ort der Entspannung für die Erholung Suchenden wieder zugänglich zu machen. Die Ruhestätte, so das Gerücht, solle deswegen aufgelöst werden.[70] Auch das Eisenbahngerücht von 1850 wurde 1854 und 1857 noch einmal publizistisch verbreitet. Dies war verbunden mit der Meldung, Umbettungen würden auch ohne Zustimmung der Angehörigen erfolgen.[71] Diese Nachrichten beschäftigten »die

61 *IPBD* (Anm. 28), Nr. 25, 5.3.1850.
62 *Kölnische Zeitung* (= *KZt*), Nr. 140, 22.5.1861.
63 *IPBD* (Anm. 28), Nr. 25, 28.03.1850.
64 *Ruhr Zeitung* (= *RZ*), Nr. 67, 21.3.1849; Aachener Anzeiger (= *AA*), Nr. 65, 20.3.1849; zur Sperrung und Kontrolle des Friedhofs siehe auch Christoph Hamann: (K)ein Denkmal für die 1848er? in: Geschichte, Erziehung, Politik, 8. Jg. (1997), Heft 4, S. 213–221, hier S. 215 f.; Paul Singer Verein u. a. (Hg.): *Am Grundstein der Demokratie. Die Revolution 1848 und der Friedhof der Märzgefallenen. Broschüre zur Ausstellung*, Berlin 2011, S. 20 f.; Laser: *Friedhof* (Anm. 5), S. 100–104.
65 *Düsseldorfer Journal und Kreisblatt* (= *DJ*), Nr. 95, 21.4.1853; *EdG* (Anm. 31), Nr. 94, 22.4.1853.
66 *EdG* (Anm. 31), Nr. 289, 19.10.1856; vermutlich handelt es sich um den Vater von Lewin Weiß. Der Bruder von Lewin, Siegfried Weiß, bemühte sich um die Pflege der Grabstellen. Siehe Heinz Warnecke, »Der Student aus Danzig«, in: *Berlinische Monatsschrift*, 1998, Heft 3, S. 35.
67 Ebd.
68 *AZ* (Anm. 24), Nr. 88, 29.3.1850. Zur Rolle des Gerüchts während der Revolution vgl. Rüdiger Hachtmann: »Die Macht des Gerüchts in der Revolution von 1848 – Das Berliner Beispiel«, in: *Geschichte und Emanzipation. Festschrift für Reinhard Rürup*, hg. von Michael Grüttner/Rüdiger Hachtmann/Heinz-Gerhard Haupt, Frankfurt a. M. 1999, S. 189–216.
69 *NBZ* (Anm. 23), Nr. 45, 17.4.1850; *VZ* (Anm. 21), Nr. 68, 22.3.1850; *Westfälischer Merkur* (= *WK*), Nr. 106, 3.5.1850.
70 *KZt* (Anm. 62), Nr. 315, 12.11.1856; *EdG* (Anm. 31), Nr. 311, 11.11.1856.
71 *EdG* (Anm. 31), Nr. 336, 7.12.1857; *KZt* (Anm. 62), Nr. 339, 7.12.1857; *Haude und Spenersche Zeitung* (= *HS*), 4.2.1854.

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Berliner Bevölkerung lebhaft«,[72] wurden aber stets vom Magistrat der Stadt Berlin dementiert.[73] Auch im Zusammenhang mit dem 50. Jubiläum 1898 wurde von erfolgten Umbettungen berichtet.

Am 17. März 1861 sollen sich trotz des Verbots »große Massen« auf dem Friedhof der Märzgefallenen »angesammelt haben, welche sich durch Demolierung der Hecke den Eingang freimachten«.[74] Tags darauf sei der Friedhof von »zahlreichen Constablertrupps« besetzt gewesen. Wenig später aber erfolgte eine Abkehr von der restriktiven Politik der Schließung des Friedhofs. Der Zugang zum Friedrichshain sei seit »einiger Zeit«[75] wieder gestattet.

Obrigkeit und Opposition hatten den Trauerort also politisiert. Die Praxis der Ausgrenzung Trauernder durch das Polizeipräsidium negierte die Funktion des Friedhofs als Begräbnisstätte. Die oppositionelle Praxis des demonstrierenden Bekenntnisses wiederum unterwarf die Trauerstätte dem Willen zur politischen Demonstration. Seine Funktion als Ort der persönlichen Trauer wurde frühestens dann obsolet, als keine Verwandten der Bestatteten mehr existierten, die ihn für sich hätten reklamieren können.[76] Betrauert wurden dann nicht mehr Angehörige der eigenen Familie, sondern Menschen, die von der sozialdemokratischen Opposition zur eigenen politischen Familie gezählt wurden. Das individuelle Trauern wich dem politisch organisierten Erinnern.

VI. ›MÄRZGEFALLENE‹ ALS STIGMAWORT: SEMANTIKEN DER ABWEHR UND IRONIE

Neben den oben (Kapitel III) ausgeführten dominanten Wortbedeutung der Bezeichnung ›Gefallene‹ aus dem Kontext des Krieges gibt es auch eine zweite, heute als veraltet empfundene Variante, etymologisch gesehen in abwertender Intention zunächst mit religiöser, später dann säkularisiert mit moralischer Bedeutung. Daran knüpfte der politisch abwertende Gebrauch in der Folge an und machte aus der Bezeichnung ›Märzgefallener‹ ein Stigmawort. Ursache für das Fallen ist in dieser semantischen Konvention die eigene Schwäche. Zur Illustration und etymologischen Herleitung dazu ein Textbeispiel – zur Funktion der Beichte (1721): »Denn die Vergebung oder Erlassung der Sünden […] bestände darin, dass die Kirche das ihr angethane Unrecht, wenn solches durch öffentliche Busse getilget worden, vergessen, und Gefallenen wieder in ihren Schooß aufgenommen hat«.[77] Gefallene sind also vom rechten Glauben abgefallen, haben der Kirche »Unrecht« getan und können dies durch Buße wieder gutmachen. Die Säkularisierung verweltlichte in der Folge die Vorgaben religiöser Dogmatik, verwandelte diese in postreligiöse Maximen moralischer Lebensführung und multiplizierte damit die Möglichkeiten bzw. Gefahren, als Gefallene*r zu gelten. Bürgerlich geprägte Anforderungen wie Selbstkontrolle, Disziplinierung der Affekte und des Körpers, stete Orientierung an Moral: all dies multiplizierte die Gefahr zu ›fallen‹.[78] Aus dem theologisch definierten ›gefallenen Engel‹ wurde so das moralisch definierte ›gefallene Mädchen‹, so zum Beispiel Mütter unehelicher Kinder oder Vergewaltigungsopfer.[79] So kritisierte Karl Kraus 1906 den »österreichischen Polizeigeist«, der seine Legitimität nicht mehr aus der Verfolgung von »Märzgefallenen« ziehen würde, sondern sich stattdessen zu den moralisch »Gefallenen hinüberrettet und […] sich jetzt darauf verlegt, junge Mädchen« vermeintlicher Prostitution wegen ins Gefängnis zu stecken.[80]

72 *EdG* (Anm. 31), Nr. 339, 11.12.1857.
73 *BZ* (Anm. 41), Nr. 267, 13.11.1856; *EdG* (Anm. 31), Nr. 313, 13.11.1856; *AZ* (Anm. 24), Nr. 339, 9.12.1857; *KZt* (Anm. 62), Nr. 342, 10.12.1857.
74 *Das Vaterland* (= *DVt*), Nr. 64, 17.3.1861.
75 *Crefelder Anzeiger* (= *CV*), Nr. 116, 17.5.1861; *VZ* (Anm. 21), Nr. 111, 15.5.1861.
76 Jedoch: Auch im Jubiläumsjahr 1898 wird davon berichtet, dass die Gräber »zum Theil noch von den Angehörigen der Verstorbenen gepflegt« wurden, vgl. *Vorwärts* (= *VW*), Nr. 10, 13.1.1898.
77 Johann Georg Pertsch: *Das Recht Der Beicht-Stühle*, Halle, 1721, S. 200, https://www.deutschestextarchiv.de/book/view/pertsch_recht_1721?p=119 (aufgerufen am 24.08.2022).
78 Zur bürgerlichen Kultur und ihren Codes vgl. Andreas Reckwitz: *Das hybride Subjekt. Eine Theorie der Subjektkulturen von der bürgerlichen Moderne zur Postmoderne*, überarb. Neuauflage Berlin 2020, S. 111–145, 185–205.
79 »Und gleichwie wir nicht wissen/ wie Viel der Gefallenen seynd: also ist uns ebenfalls unbewust so wol die Anzahl/ als Qualitet und Beschaffenheit derer Engel/ so allda gewesen. Gleichwie aber solche Gefallene Engel/ von dem Glantze deß göttlichen Liechts/ verblendt und mit Finsterniß umgeben worden«, in: Erasmus Francisci: *Das eröffnete Lust-Haus Der Ober- und Nieder-Welt:* Bey Mehrmaliger Unterredung/ Vor dißmal so wol/ Von *der Natur/ Welt/ Himmel/ und dem Gestirn/ insgemein/ Als auch insonderheit von dem Mond/ der Sonnen/ und allen übrigen wandelbaren Sternen*, Nürnberg 1676, S. 104, https://www.deutschestextarchiv.de/book/view/francisci_lusthaus_1676?p=130 (aufgerufen am 24.08.2022).
80 Karl Kraus: »Aus dem dunkelsten Österreich«, in: *Die Fackel* (= *DFA*), 8. Jg. (1906), Nr. 214–215 (Dezember 1906), https://www.textlog.de/38958 (aufgerufen am 02.10.2022).

Die Bindung dieser Moral an eine theologische Begründung erschwerte wiederum eine liberale Haltung und gab diesem ›Fallen‹ aller Säkularisierung zum Trotz immer noch eine existentielle Bedeutung als ein Vergehen wider die Ordnung Gottes. Die Reichweite dieser moralischen Bindung der Lebensführung brachte es mit sich, dass Gefallene auch in anderen Bereichen zu finden waren. Das *Handbuch der Schulgesetzgebung Preußens* aus dem Jahr 1847 fordert zum Beispiel alle pädagogischen Akteure auf, die »Reinen und Unverdorbenen zu bewahren und zu befestigen, die Leichtsinnigen und Schwankenden zu warnen und zu ermahnen, und Gefallene wieder aufzurichten und zu leiten«.[81] Weil mit alldem die Selbstverpflichtung auf Werte und zugleich deren Internalisierung einherging, wurde das ›Fallen‹ auch ein Scheitern an sich selbst. Verstöße gegen Selbstkonzepte können gegen jene verwendet werden, die diese begehen. Sich in die Tradition der ›Märzgefallenen‹ zu stellen, bedeutete also auch, sich moralisch sehr leicht angreifbar und, zum Beispiel mit Verweis auf eine Doppelmoral, wohlfeil kritisierbar zu machen.

Mitte des 19. Jahrhunderts hatte das Wort ›Gefallene‹ also eine doppelte Konnotation: eine positiv besetzte militärische Bedeutungsebene, die die Gefallenen als Opfer der gemeinsamen Sache sah (Kapitel III) , und eine moralische Bedeutungsebene, die Gefallene als Schwache kennzeichnete, welche durch ihre individuellen (religiösen, moralischen) Defizite in ihrer Lebensführung von der sozial erwünschten Norm abwichen.

Mit zunehmendem zeitlichem Abstand zu den historischen Ereignissen wurde das Schlagwort ›Märzgefallener‹ in der öffentlichen Kommunikation dann zur Markierung politischer Positionen und Lager verwendet. Entweder man sah sich selbst in dieser Tradition, dann wurde die Bezeichnung als Fahnenwort verwendet. Oder politische Gegenspieler verorteten die anderen in abwertendem Sinne in dieser Tradition, dann diente die Bezeichnung als Stigmawort. Vor allem im Korpus des Zeitungsportals *ANNO* finden sich Beispiele der Schmähung mit der Bezeichnung ›Märzgefallene‹. Diese werden im Folgenden als unterschiedliche Varianten des negativ konnotierten uneigentlichen Sprechens analysiert und in Typen zusammengefasst.

81 Adolf Harkort (Hg.): *Handbuch der Schulgesetzgebung Preußens*, Berlin 1847, S. 271.

ERBEN

In der Tradition des Heroischen standen diejenigen, die sich als politische Erben der Ziele von 1848 verstanden. In Österreich sahen sie sich auf der Seite der (moralischen) Gewinner. Nach dem im März 1894 erfolgten Übertritt des liberalen Vizebürgermeisters von Wien, Dr. Albert Richter (1843–1897), zum Katholizismus und dem Tod des Journalisten und Philanthropen Ludwig August Frankl (1810–1894) im gleichen Monat erschien folgende Meldung: »Unsere Liberalen haben jetzt außer den anderen Achtundvierziger ›Märzgefallenen‹ zwei neue ›Märzgefallene‹ zu betrauern«.[82] In einem anderen Beispiel wurden die politischen Erben von 1848 durch die Restriktionen der Obrigkeit zu »neuen Märzgefallenen« geadelt, als der Wiener Polizeipräsident 1877 einen »Verein zur Wahrung der Menschenrechte« wegen »staatsgefährlicher Tendenzen« auflöste. Der Berichterstattung in der Zeitung *Das Vaterland* galt das »Auflösungsdecret« als ein »passendes Monument« für diese »neuen Märzgefallenen«.[83] Zu den Erben von 1848 zählte der sozialdemokratische *Vorwärts* in Berlin 1899 auch den Nationalliberalen Martin Kirschner (1842–1912). Er sei »der Märzgefallene des Jahres 1899«[84] und zum nachträglichen Opfer der 48er-Revolution geworden. Kirschner war 1898 zum Oberbürgermeister der Reichshauptstadt gewählt worden, die Bestätigung seiner Wahl durch den König erfolgte aber erst eineinhalb Jahr später im Dezember 1899. Diese Missachtung des Wahlergebnisses richtete sich vermutlich nicht gegen die Person Kirschners, sondern gegen die Versammlung der Stadtverordneten und auch gegen den Magistrat von Berlin und den Plan dieser beiden Institutionen, im Jubiläumsjahr 1898 die Gräber auf dem Friedhof der Märzgefallenen in Erinnerung an die Märzrevolution würdig wiederherstellen zu lassen.[85]

VERLIERER

Historische Verlierer: Verschiedene Beispiele deuten darauf hin, dass die Praxis der uneigentlichen Nutzung des Schlagwortes ›Märzgefallene‹ zur Abwertung des politischen Gegenspielers erstmals

82 *FG* (Anm. 45), Nr. 12, 24.3.1894.
83 *DV*t (Anm. 74), Nr. 74, 17.3.1877.
84 *VW* (Anm. 76), Nr. 128, 4.6.1899.
85 Gerhard Kutzsch: »Kirschner, Martin«, in: *Neue Deutsche Biographie* 11 (1977), S. 675 [Online-Version], https://www.deutsche-biographie.de/pnd116189568.html#ndbconten (aufgerufen am 03.10.2022). Im Gegensatz zur Stadtverordnetenversammlung wirkte der Magistrat von Berlin aber eher als Bremser dieser Bemühungen.

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von Liberalen genutzt wurde, in Österreich also von denen, die sich selbst in der Tradition der Märzgefallenen sahen. Nach der Phase der politischen Reaktion in den 1850er-Jahren konnte der Liberalismus in Österreich bis Ende der 1870er-Jahre zunehmend politischen Erfolg erzielen. Die Deutschliberalen hatten von 1867 bis 1879 im Reichsrat Österreichs die Mehrheit der Mandate inne. 1867 wurde Österreich-Ungarn mit der Dezemberverfassung eine konstitutionelle Monarchie, womit eine zentrale Forderung eines Teils der liberalen 1848er erfüllt war. Folgende Textbeispiele aus dieser Ära demonstrieren das politische Selbstbewusstsein und die historische Zuversicht der Liberalen. Sie sahen sich zu diesem Zeitpunkt als Sieger der Geschichte und ihre politischen Gegenspieler als historische Verlierer. ›Märzgefallene‹ – das waren aus der Perspektive der Liberalen nunmehr auch die damaligen Repräsentanten der ›absolutistischen‹ Reaktion, nämlich Clemens Fürst von Metternich (1773–1859) sowie Josef von Sedlnitzky (1778–1855), Letzterer von 1817 bis 1848 Präsident der obersten Polizei- und Zensurhofstelle in Wien, zuständig für die Zensur und Überwachung der Bevölkerung und Vertreter vormärzlich-repressiver Herrschaft. 1862 befand das Satireblatt *Kikeriki*: »Ruhe herrschte am Grabe der Märzgefallenen! […] [N]icht jene allein sind Märzgefallene, welche im Handgemenge den Tod fanden – auch Jene sind Märzgefallene, welche fielen im Kampf der Zeit! Auch Metternich und Sedlnitzky sind im März gefallen! Und so wie die Toten des Volkes eingingen zur Ruhe, so sei auch mit den Toten eines gebrochenen Systems ewiger Friede!«[86]

Auf der Titelseite vom 6. Juli 1861 platzierte die Redaktion des liberalen *Figaro* eine Karikatur, welche Vertreter des Adels zeigen, die – ausgestattet mit Perücken, Kniebundhosen, in den Armen eine eiserne Fußfessel und in der Hand eine Zensur-Schere – über einen Haufen Bücher fallen. Die Bildlegende lautet: »Wäre es vielleicht gestattet, diesen *Märzgefallenen* ein Denkmal zu setzen, nachdem das für die anderen verweigert worden ist?«[87] Angespielt wurde auf die oben bereits erwähnte Kontroverse um den Bau eines Denkmals für die Wiener Märzgefallenen vom 13. März 1848 auf dem Schmelzer Friedhof. Die Repräsentanten der absolutistischen Ordnung erscheinen als vollkommen aus der Zeit gefallene Reaktionäre; sie fallen über Bücher, Symbole für Wissen, Vernunft und Aufklärung. Das Wort ›Märzgefallene‹ bezeichnet hier nicht zu jedweder Anpassung bereite Opportunisten, sondern im Gegenteil: einen gesellschaftlichen Stand, der nicht mit der Zeit geht, sondern dies verweigert und das Rad der Geschichte anhalten, wenn nicht zurückdrehen will. Man könne, wenn man nicht den wahren Märzgefallenen ein Denkmal bauen wolle, dies dann zumindest für die Gestrigen tun, für die Verlierer des historischen Fortschritts.

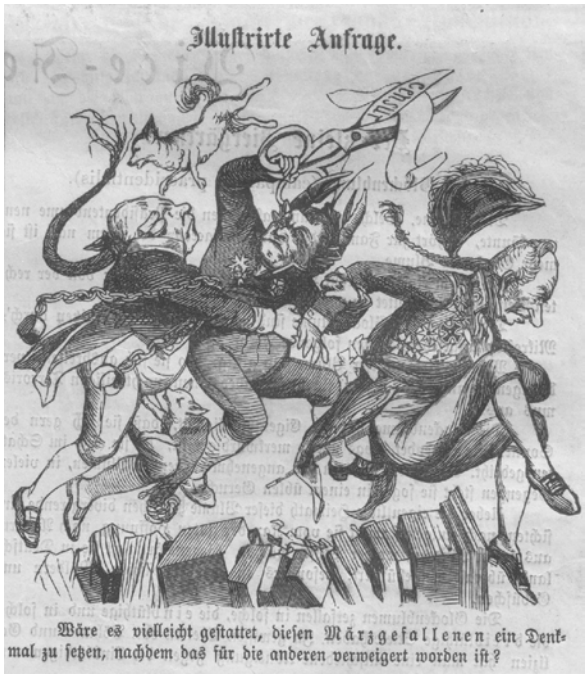

Abb. 2: Bildautor unbekannt: »Illustrierte Anfrage«, in: *Figaro. Humoristisches Wochenblatt*, Nr. 27, 6.7.1861, Titelseite; ANNO/Österreichische Nationalbibliothek

Ökonomische Verlierer: Wie sehr die Bezeichnung ›Märzgefallene‹ in Österreich einerseits Teil des alltäglichen Wortschatzes war und wie sehr er andererseits mit dem Odium des Verlierens verbunden wurde, dies zeigte sich im volkstümlichen Witz. Als es 1882 zu einer Baisse an der Wiener Börse und zum Fall der Kurse gekommen war, kritisierte die *Neue Freie Presse* die Politik des liberalen Finanzministers Julian von Dunajewski (1821–1907) massiv. Beklagt wurden unter anderem die geringen Renditen österreichischer Staatspapiere. Im Volksmund würden diese »die Märzgefallenen« genannt.[88]

Politische Verlierer: Die Wahlen zum Reichstag im Landesteil Österreich der K.u.K.-Monarchie fanden in den Jahren 1891 und 1897 jeweils im März statt. Die Wahlprognosen der Tagespresse waren vor beiden Wahlen eindeutig. Das seit den 1880er-Jahren

86 *KKK* (Anm. 45), Nr. 45, 6.11.1862.
87 *FG* (Anm. 45), Nr. 27, 6.7.1861; Herv. im Original.
88 *Neue Freie Presse* (= *NFP*), Nr. 6259, 29.1.1882; Nr. 6271, 10.2.1882.

konservativ orientierte Blatt *Kikeriki*, antisemitisches Sprachrohr der Christlichsozialen Partei, prophezeite Folgendes: »Von den Märzgefallenen. Nachdem diesmal die Wahlen im Monat März stattfinden, so wird es zweierlei Märzgefallene geben: die Einen, an die man sich jedes Jahr erinnert, die Anderen, nach denen kein Hahn mehr kräht«.[89] Die sozialdemokratisch orientierte humoristisch-satirische Zeitschrift *Die Glühlichter* sah den Ausgang der Wahlen zum Reichstag 1897 ähnlich: »Die Reichstagswahlen finden im März statt. Da werden am Ende gar unsere Liberalen – Märzgefallene werden«.[90] Diese Wahl fiel aber auch für die Sozialdemokratie ausgesprochen schlecht aus. *Kikeriki* ernannte daraufhin die sozialdemokratischen Verlierer zu den »Märzgefallenen des Jahres 1897«.[91] Mit Viktor Adler (1852–1918) und Engelbert Pernerstorfer (1850–1918) werden der Begründer der Sozialdemokratischen Arbeiterpartei Österreichs (SPÖ) und ein weiteres prominentes Mitglied der SPÖ abgebildet.

Abb. 3: Bildautor unbekannt: »Die Märzgefallenen vom Jahre 1897«, in: Kikeriki. Humoristisches Volksblatt, Nr. 22, 18.3.1897, Titelseite; ANNO/Österreichische Nationalbibliothek

In derselben Ausgabe des *Kikeriki* wurden die Wahlverlierer in einer Karikatur auch bildlich als ›Märzgefallene‹ dargestellt. Es ist ein ›Märzgefallener‹ zu sehen, mit ungebändigtem Haar und Bart in vernachlässigter und schadhafter Kleidung mit einem Kalabreser-Hut, dem Symbol für eine republikanische Haltung. Die Darstellung des Gesichts ist deutlich antisemitisch konnotiert. In der linken Tasche glimmt die Lunte einer Bombe. Der ›Märzgefallene‹ weicht ängstlich und erschreckt zurück. Ein Schild mit der Aufschrift »Deutsch-christlicher Wählerwald« verweist auf die Wahl vom März 1897 und zugleich darauf, wer sich dem ›Märzgefallenen‹ entgegenstellt: Unzählige Pflanzen mit Blüten in Form einer Feigenhand (Daumen zwischen Zeige- und Mittelfinger) stellen sich ihm in den Weg. Die Geste der Feigenhand symbolisiert die Abwehr von Unheil und Zumutungen und ist zugleich sexuell konnotiert (etwa im Sinne von: »Fick dich ins Knie!«). Diese doppelte Konnotation zeigt sich auch in der Bildüber- und -unterschrift. Der Bildautor spielt mit den Begriffen »Feigerln« und »Veigerln«. Ersteres ist ein Synonym für ›verspotten‹, ›ärgern‹. Zweites spielt – ebenso wie die Feigenhand – auf derbe Weise auf den Geschlechtsverkehr an.

Abb. 4: Bildautor unbekannt: »Märzen-Veigerln«, in: Kikeriki. Humoristisches Volksblatt, Nr. 22, 18.3.1897, ohne Pag. (S. 4); ANNO/Österreichische Nationalbibliothek

Moralische Verlierer: Hinweise auf den Genuss von Alkohol dienten nicht allein der sozialen Abwertung, sondern auch dazu, den politischen Gegner als Heuchler mit praktizierter Doppelmoral zu entlarven. So sei am 13. März 1868 in einem Versammlungslokal der Demokraten »der Märzgefallenen mit

89 *KKK* (Anm. 45), Nr. 12, 8.2.1891; bis 1896 galt ein Zensuswahlrecht für Männer mit einer jährlichen Mindeststeuerleitung. Erst 1896 wurde der Zensus abgeschafft und das allgemeine, gleiche (Männer-)Wahlrecht wurde eingeführt.

90 *Die Glühlichter* (= *DG*), Nr. 23, 18.2.1897; siehe auch *FG* (Anm. 45), Nr. 12, 20.3.1897.

91 *KKK* (Anm. 45), Nr. 22, 18.3.1897.

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Champagnertoasten gedacht«[92] worden. Eine Karikatur der humoristischen Zeitschrift *Der Floh* zeigt wiederum einen Verehrer, der seine Angebetete fragt, warum sie ihn am 13. März, dem Tag der Märzrevolution in Wien, zum Rendezvous an das »Grab der Märzgefallenen« bestelle. Sie verweist auf ihren Vater, einen »Demokraten«, und sagt: »Hierher kommt er heute gewiss nicht«.[93] Ein Jahr später veröffentlichte der *Figaro* eine fiktive Anzeige, die das mangelnde Engagement der Sozialisten bei der Erinnerung an die Revolution von 1848 kritisierte. Letztere würden per Inserat »mehrere alte Grabweiber« suchen, die – an ihrer Stelle – »am Grab der Märzgefallenen stille Gebete« verrichten sollten.[94]

Zur Abwertung des politischen Gegners wurde auch das Mittel der satirischen Erzählung genutzt. So erzählt in einer Ausgabe des *Kikeriki* ein fiktiver Augenzeuge aus Anlass des 50. Jubiläums der Märzrevolution im Jahr 1898, wie der politisch ausgesprochen lebendige »Ferdl« am 13. März 1848 in Wien zum *eigentlichen* Märzgefallenen schon ante mortem wurde. Die karikierende Darstellung bezieht sich auf Dr. Ferdinand Kronawetter (1838–1913), einen linksliberalen Politiker in Wien, der regelmäßig an den Jahrestagen der Wiener Märzrevolution am Grab der Märzgefallenen Reden gehalten hat. In der satirischen Erzählung rennt der damals zehnjährige Gymnasialschüler Ferdl 1848 nach den ersten Schüssen vor Furcht schreiend zu seiner Mutter nach Hause und wird von seinem Vater versohlt. Die halbseitige »Erzählung eines alten Achtundvierzigers« mit dem Titel *Der lebende Märzgefallene* resümiert: »A Achtavierziger bist, Ferdl, a echter. Die Andern Achtavierziger, die was no leb'n müass'n si verstecken vor Deiner. Denn eigentlich bist Du a Märzgefallener!«[95]

Nach der Wahlniederlage für die Liberalen bei der Wahl zum Reichsrat im März 1897 kritisiert *Kikeriki* die publizistische Konkurrenz: »Die Zeitungsschmöcke, die in letzter Zeit wie aus allen Wolken gefallen sind, scheinen unschlüssig zu sein, ob sie sich nicht auch zu den Märzgefallenen zählen sollen«.[96]

OPPORTUNISTEN

Eine ähnliche Unentschiedenheit konstatierte Karl Kraus wenige Jahre später: »Die Journaille fühlt demokratisch«, formulierte der um Sarkasmus nie verlegene Publizist in der *Fackel* scharfzüngig und meinte damit seine Kollegen aus den liberalen Blättern Wiens. »Die »Journaille […] bekämpft die Monarchie als ›Institution‹, sie hasst den Adel als ›Kaste‹, sie steckt an Festtagen die zerschlissenen Ideale der Gleichheit aus. Aber diese märzgefallene Dame pflegt ihre Grundsätze nicht zu persönlichen Antipathien zu missbrauchen, und bei aller programmäßigen Abneigung gegen die Classe hat sie sich noch stets zärtlicher Beziehungen zu deren Angehörigen überführen lassen«.[97] Aus dem professionell begründeten Kontakt zum sozialen und politischen Establishment resultiere eine – gemessen am journalistischen Auftrag wie am eigenen politischen Selbstverständnis – ebenso dysfunktionale wie unangemessene Nähe und Korrumpierbarkeit. Die liberale Wiener Presse des Bürgertums sei also den Adligen gegenüber stets gefällig und immer zu Diensten – und sie habe beim Kuscheln mit der Macht ihre politische Jungfräulichkeit verloren, sie sei eine verführte ›Märzgefallene‹.

Wiederholt nutzte der *Kikeriki* den Topos vom Verrat an Idealen aus opportunistischen Motiven. In dem Gedicht *Die Übertragung der Märzgefallenen* (1888) heißt es: »Die Freiheit und die Gleichheit, um die man hat gekämpft,/Sind in der Flucht der Zeiten so ziemlich abgedämpft,/S'hat Mancher sich gemästet, jedoch die große Schaar,/Die hungert noch bis heute, wird hungern immerdar«.[98] Ein Text mit dem Titel *Bei den Märzgefallenen* kritisiert, dass die liberalen Parlamentarier nicht mehr bei der Märzfeier zugegen seien, weil sie befürchteten, keinen Regierungsposten mehr zu bekommen.[99] Auch die toten Märzgefallenen von 1848 selbst werden in einer fiktionalen Szene bemüht. Diese hätten an die »lebenden Märzgefallenen« geschrieben, statt Tote wären sie nun lieber »lebendige wohlgenährte Verwaltungsbeamte«.[100]

Ähnlich argumentierte fünf Jahre zuvor auch das *Mährische Tagblatt*. Es warf dem politischen Liberalismus den Verrat an den Idealen von 1848 um des bloßen Machterhalts willen vor. Nachdem die Liberalen sich im Alltag der politischen Praxis ihrer eigenen politischen Überzeugungen entledigt hätten, seien sie vom Wähler bei den Wahlen zum Abgeordnetenhaus im Reichsrat 1897 in Österreich abgestraft worden.

92 *Neues Fremdenblatt* (= *NF*), Nr. 76, 17.3.1858.
93 *DFl* (Anm. 45), Nr. 12, 19.3.1882.
94 *FG* (Anm. 45), Nr. 11, 17.3.1883.
95 *KKK* (Anm. 45), Nr. 19, 6.3.1898.
96 *KKK* (Anm. 45), Nr. 22, 17.3.1898.
97 Karl Kraus: ohne Titel, in: *DFA* (Anm. 80), 1902, Nr. 105,1 (Mai).
98 *KKK* (Anm. 45), Nr. 66, 16.8.1888; mit dem Begriff »Übertragung« ist die Umbettung der Märzgefallenen gemeint.
99 *KKK* (Anm. 45), Nr. 23, 19.3.1893.
100 *KKK* (Anm. 45), Nr. 24, 24.3.1898.

So heißt es im *Mährischen Tagblatt*: »der Märzgefallene in Österreich ist heuer der Liberalismus«. Es sei so,

»dass die österreichischen Liberalen, die ja auch im Jahre 1867 zur Regierung kamen, den Zeitraum von da ab nicht so prinzipientreu und entschieden ausnützten. […] an eine Fortentwicklung des freiheitlichen Gedankens, schon um sich wiederstandsfähiger [sic] zu machen, wagte man sich nicht heran, wurde gar nicht gedacht und so musste die Halbheit zur Stagnation, die Stagnation zum Rückschritt führen. Der Todtencultus der Märzgefallenen wurde ihnen gleichgiltig, so haben die Todten dem Liberalismus in Österreich das Leben genommen«.[101]

FEINDE

Das Gedicht *Am Grabe der Märzgefallenen*[102] (1895) berichtet von den Freigeistern der Märzrevolution, die im Überschwang des »tollen Jahres« das »Ghettotor« geöffnet und damit ein »Heer von Übeln« habe heraustreten lassen. So würden die Juden in Österreich als Parasiten in »Saus und Braus« leben, der Freiheit aber werde vom »Sem die Haut herabgeschunden«. Die Märzgefallenen von 1848 hätten Ideale gehabt, die Sozialdemokraten des Jahres 1895 aber könnten sich auf diese nicht berufen. Denn Folgendes hätten die Märzgefallenen von 1848 nicht beabsichtigt: »Wenn sie zur Gleichberechtigung / Der Konfessionen luden / So meinten sie doch nicht damit / Die Vorherrschaft der Juden«.[103] Nun aber stünden »Judensozi am Grab der Märzgefallenen«.[104] Juden hätten die Führung der österreichischen Sozialdemokratie übernommen. Artikuliert wird hier aus der politischen Position der Christlichsozialen Partei heraus das antisemitische Narrativ vom im Verborgenen agierenden Juden. Die Vertreter der Arbeiterbewegung am Grab der Märzgefallenen, die »Judensozi«, seien nicht die wahren Vertreter der Interessen der Arbeiterschaft, sie dienten allein ihren eigenen Interessen. Die Gleichberechtigung der Konfessionen als eine liberale Forderung und Ursache für die Vorherrschaft der Juden ist in dieser Argumentation ein nicht intendiertes, aber faktisches Ergebnis der Märzrevolution. Ein spätes radikalisiertes Echo fanden diese bürgerlichen Ideologeme in Hitlers *Mein Kampf*. In dessen Verschwörungstheorie werden Ursachen und Folge vertauscht. Ihm galt »unsichtbar im Hintergrund der Jude als Drahtzieher« der Märzrevolution.[105]

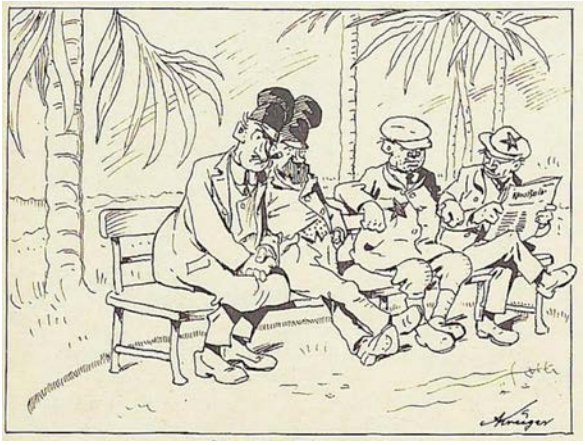

Abb. 5: Bildautor: Krüger, »Die März-Gefallenen«, in: *Kladderadatsch*, Nr. 19, 17. Mai 1933, S. 301; Karikaturist: vermutlich Carl August Arthur Krüger (*1866 – †nach 1933)

Im Mai 1933 veröffentlichte der konservative *Kladderadatsch* eine Karikatur des Zeichners Arthur Krüger (*1866) mit dem Titel *Die März-Gefallenen*. Sie zeigt vier Männer im Müßiggang auf einer Parkbank sitzend. Offensichtlich werden Vertreter des SPD und der KPD ohne politischen Einfluss und ohne Handlungsmöglichkeiten im südlichen Exil (Palmen im Hintergrund) gezeigt. Die politischen Erben werden hier, einmal mehr, als ›Märzgefallene‹ und als Verlierer wie als Feinde charakterisiert.

VII. MÄRZGEFALLENE ALS SYMBOLE – EINE EINORDUNG

Das *Linzer Tagblatt* resümierte 1892 den Stand der Erinnerung an 1848: »Zu großer Berühmtheit ist der ›März‹ […] seit dem Ausbruch des Völkerfrühlings 1848 gelangt. Wer erinnert sich aus der Geschichte des Revolutionsjahres nicht an fast mundgerechte Ausdrücke als: Märztage, Märzereignisse, Märzerrungenschaften, Märzverfassung, Märzgefallene, Märzstürme u. a.?«[106] Die verschiedenen Märzbegriffe werden hier als alltägliche Schlagworte der politischen Kommunikation interpretiert, als einge-

101 *Mährisches Tagblatt* (= *MT*), Nr. 62, 17.3.1897.
102 *KKK* (Anm. 45), Nr. 21, 14.3.1895.
103 *KKK* (Anm. 45), Nr. 23, 21.3.1897; siehe auch ebd., Nr. 21, 14.3.1895.
104 Angespielt wird hier auf eine Reihe führender Politiker der österreichischen Sozialdemokratie, die jüdischer Herkunft waren, allen voran Viktor Adler (1851–1918).
105 Adolf Hitler: *Mein Kampf. Eine kritische Edition*, hg. von Christian Hartmann u. a. im Auftrag des Instituts für Zeitgeschichte München/Berlin, Bd. 2, München/Berlin 2016, S. 137.
106 *Linzer Volksblatt* (= LV), Nr. 54, 6.3.1892.

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führte und geläufige »Erinnerungsmarken«,[107] als mentale Trigger für historische Narrative über das Revolutionsjahr 1848. Doch nicht allein dies – das Schlagwort ›Märzgefallene‹ entwickelt sich auch zum sprachlichen Symbol.[108] Analog dazu wurden der 13. März in Wien bzw. der 18. März in Berlin für die demokratische Opposition zu symbolischen Tagen in der politischen Choreographie des Jahres und der Friedhof der Märzgefallenen zum symbolischen Ort, zum nahezu sakralen Raum der Erinnerung an die Märtyrer der Revolution. Das Wort, der Tag, der Ort – alle drei stehen für das Symbolisierte, nämlich entweder auf Seiten der Arbeiterbewegung für das Narrativ der unvollendeten beziehungsweise erhofften zukünftigen Revolution oder auf Seiten der Konservativen für die Gefahr der Revolution. Das Symbolisierte muss wiederum immer wieder durch geschichtskulturelle Praktiken erneuert und bestätigt werden, denn ohne sie würde es seine symbolische Funktion verlieren. Zu diesen Praktiken gehört die kommunikative Präsenz des Schlagwortes ›Märzgefallene‹ ebenso wie die »Aktionsform«[109] des Symbols, das Ritual der alljährlichen politischen Wallfahrt mit Kranzniederlegungen am 18. März zum sakralen Ort.

Die Entwicklung, Etablierung und stete Erneuerung dieser symbolischen Bedeutungen waren in der formativen Phase der Arbeiterbewegung von grundlegender Bedeutung. Solche Symbole sind aus »Erfahrungs-, Erlebnis- und Traditionszusammenhängen hervorgegangen, und ihre Verwendung ruft Erfahrungs-, Erlebnis- und Traditionszusammenhänge wieder wach«.[110] Sie dienen als »soziales Erkennungszeichen für Zusammengehörigkeit, manifeste oder latente Verbundenheit und Gemeinsamkeit«.[111] Symbole fungieren also als Marker für Identität, Gemeinschaft und Orientierung. Mit der Verfasstheit des deutschen Kaiserreiches ab 1870/71 war eine politische Gleichberechtigung der Arbeiterschaft in Staat und Gesellschaft nicht vereinbar, eine ›innere Reichsgründung‹ unter Einbeziehung der demokratischen Opposition war strukturell ausgeschlossen. Dies hätte eine parlamentarische Demokratie vorausgesetzt.[112] Der symbolische Bezug auf 1848/49 und das Schlagwort ›Märzgefallene‹ kann auf diesem historischen Hintergrund verstanden werden als eine Antwort der Arbeiterschaft auf ihre Ausgrenzung von politischer Teilhabe. Der Traditionsbezug auf 1848 war in diesem Sinne ein kultureller Baustein der »negativen Integration«[113] der organisierten Arbeiterbewegung. Sie setzte dem »Staat und der bürgerlichen Gesellschaft eigene Organisationsmuster, eine eigene Subkultur, eine eigene Geschichtsphilosophie, eigene Verhaltensmuster und Loyalitäten, einen eigenen Vaterlandsbegriff und ein eigenes nationales Geschichtsbild«[114] entgegen. Die Genese und Verwendungshäufigkeit des Schlagworts ›Märzgefallene‹ kann so als ein Merkmal einer historischen Identitätsbildung verstanden werden und zugleich als Indikator für den sich entwickelnden Grad der damit einhergehenden politischen Vergemeinschaftung und Identitätsbildung.

Die gesellschaftliche Integration der Opposition fand ihre Grenze an der sozialen und gesellschaftlichen Reichweite der narrativen und politischen Geltungsansprüche, die mit den Märzsymbolen verbunden waren. Die Reichweite war politisch, sozial und gesellschaftlich von Anfang an begrenzt. Die Opposition und ihre Symbole wurden von den Trägern politischer und gesellschaftlicher Macht zurückgewiesen – durch Kritik, politische Repression, gesellschaftliche und geschichtskulturell-symbolische Ausgrenzung sowie Abwertung. ›Märzgefallene‹ wurde als Stigmawort und als Schmähbegriff verwendet.

Mit der Novemberrevolution von 1918 und der Etablierung der parlamentarischen Demokratie von Weimar verschob sich schließlich der geschichtskulturelle Bezug der SPD auf 1848. An die Stelle der Barrikade trat das Parlament, denn symbolkräftig etablierte sich

107 Hans-Georg Soeffner: *Symbolische Formung. Eine Soziologie des Symbols und des Rituals*, Weilerswist 2010, S. 26.

108 »Schlagworte sind Symbole für Meinungsgehalte und Stellungnahmen; in ihnen verdichten sich Programme, Wertungen u.a. bezüglich eines gesellschaftlich oder auch nur für eine bestimmte Gruppe relevanten und wichtigen Themas«. Schottmann: *Schlagwörter* (Anm. 2), S. 47.

109 Hans-Georg Soeffner: »›Auf dem Rücken des Tigers‹. Über die Hoffnung, Kollektivrituale als Ordnungsmächte in interkulturellen Gesellschaften kultivieren zu können«, in: ders.: *Gesellschaft ohne Baldachin. Über die Labilität von Ordnungskonstruktionen*, Weilerswist 2000, S. 262. Zur Funktion des Symbols siehe auch Manfred Hettling: »Erlebnisraum und Ritual. Die Geschichte des 18. März im Jahrhundert bis 1948«, in: Richard van Dülmen/Alf Lüdtke (Hg.): *Historische Anthropologie. Kultur, Gesellschaft, Alltag*, 5. Jg. (1997), H. 3, S. 317–334.

110 Soeffner: *Formung* (Anm. 107), S. 16.

111 Ebd., S. 17; so auch Klemm: *Erinnert* (Anm. 5), S. 62 f., 67, 69, 87.

112 Dieter Groh/Peter Brandt: *»Vaterlandslose Gesellen«. Sozialdemokratie und Nation 1860–1990*, München 1992, S. 22 f.

113 Dieter Groh: *Negative Integration und revolutionärer Attentismus. Die deutsche Sozialdemokratie am Vorabend des Ersten Weltkrieges*, Frankfurt a. M. u. a. 1973, S. 36–56.

114 Groh/Brandt: *Gesellen* (Anm. 112), S. 22.

seit Beginn der Weimarer Republik das Schlagwort der ›Paulskirche‹. Die Sozialdemokratie vollzog nach 1918 mit ihrer Fokussierung auf die Paulskirche ihrerseits die symbolpolitische Abkehr vom Barrikadennarrativ und dem Bezug auf die Märzgefallenen.[115] In die Tradition des Parlaments stellte sich der Reichspräsident Friedrich Ebert mit seiner Rede auf dem 75. Jahrestag der Paulskirchenverfassung beim nationalen Festakt am 18. Mai 1923 in Frankfurt.[116] Am 18. März 1923 wiederum hielt Ebert keine Rede auf dem Friedhof der Märzgefallenen, sondern eine in Hamm/Westfalen vor Bergarbeitern.[117] Das demokratische Erinnern an die Wurzeln der Demokratie in Deutschland suchte nach 1918 also historisch anzuknüpfen an das, was ihr selbst ähnelt: die parlamentarische Debatte. Soweit, so nachvollziehbar. Es vernachlässigte dadurch dasjenige, was ihr selbst zwar unähnlich war, sie aber selbst erst ermöglicht hatte: die Revolution und den Barrikadenkampf. Denn erst der 18. März ermöglichte den 18. Mai 1848. Ohne die Barrikade hätte es kein Parlament gegeben.

115 Klemm: *Erinnert* (Anm. 5), S. 223 f., 243.

116 Walter Mühlhausen: *Friedrich Ebert 1871–1925. Reichspräsident der Weimarer Republik*, Bonn 2006, S. 836–840; vgl. auch Wollstein: »Gedenken«, (Anm. 5), S. 333–336.

117 Walter Mühlhausen: *Friedrich Ebert. Sein Leben in Bildern*, hg. von der Stiftung Reichspräsident-Friedrich-Ebert-Gedenkstätte, Ostfildern 2019, S. 176 f.

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ANHANG: STATISTIK HÄUFIGKEIT DER NENNUNGEN

ZEITUNGSPORTAL *zeit.punktNRW*

1848: 49 Zeitungen; 1898: 115 Zeitungen[118]

Zeitraum	»Friedrichshain«[119]	»Märzgefallene/n«	»Friedhof der Märzgefallenen«
1848–1850	138 von 156 (88 %)	6 (1848/50)	–
1851–1860	47 von 61 (77 %)	2	–
1861–1870	29 von 62 (47 %)	35	–
1871–1880	48 von 183 (26 %)	22	2 (1879)
1881–1890	39 von 522 (7 %)	48	–
1891–1898 (1891–1914)	–	938 (1628)	104

Erläuterung – Beispiel Zeile 1: Im Zeitraum von 1848 bis 1850 wurde das Wort »Friedrichshain« in der untersuchten Presse 156-mal verwendet; davon wurde es 138-mal als Synonym für die Begräbnisstätte der Märzopfer von 1848 verwendet. Dies entspricht einer Quote von 88 %. »Märzgefallene« wird dagegen nur 6-mal genutzt, »Friedhof der Märzgefallenen« kein einziges Mal.

ZEITUNGSPORTAL *ANNO* Österreich

1848: 51 Zeitungen/Zeitschriften; 1898: 102 Zeitungen/Zeitschriften

Zeitraum	»Märzgefallene«
1861–1875	48
1876–1890	38
1891–1898	60

Zeitraum	»Märzgefallenen«
1848–1853	15
1854–1859	1
1860–1866	522
1867–1872	241
1873–1880	220
1881–1886	209
1887–1893	361
1894–1898	677

ZEITUNGSPORTAL *Historische Presse der deutschen Sozialdemokratie online*

1848: keine Zeitung; 1898: 4 Zeitungen

Zeitraum	»Märzgefallene«/»Märzgefallenen«	»Friedhof der Märzgefallenen«[120]
1860–1869	1	–
1870–1879	9	1 (1870)
1880–1889	22	1 (1888)
1890–1899	306	35

118 In das Portal *zeit.punktNRW* werden stetig weitere digitalisierte Zeitungen aufgenommen. Dadurch verändern sich die hier (Stand: Oktober 2022) erhobenen absoluten Zahlen. Die Relationen scheinen jedoch erhalten zu bleiben. Eine Stichprobe (Juni 2023) ergab folgende folgende Zahlen für den Zeitraum 1891–1898: »Friedhof der Märzgefallenen«: 158; »Gräber der Märzgefallenen«: 336; »Kirchof der Märzgefallenen«: 87.

119 Die sukzessive (absolute/relative) Abnahme der synonymen Verwendung des Ortsnamens Friedrichshain für den Friedhof der Märzgefallenen erklärt sich auch mit der zunehmenden Berichterstattung über Institutionen in der wachsenden Vorstadt und deren Bedeutung (Brauerei, Krankenhaus etc.); für den Zeitraum 1891–1898 wurde aufgrund erwarteter geringer Aussagekraft keine Auszählung vorgenommen.

120 Gezählt wurde hier allein die Verbindung »Friedhof der Märzgefallenen«.

REZENSION

HENDRIKJE SCHAUER/MARCEL LEPPER (HG.): »NIGHT SHIFT. EIN WÖRTERBUCH UM MITTERNACHT«, MÜNCHEN/WEIMAR 2022 (WORKS & NIGHTS 7), 91 S.

Constantin Sinn

›Wenn die Nacht am tiefsten ist‹, bietet die Lektüre von *Night Shift. Ein Wörterbuch um Mitternacht* vielleicht keinen Ausgang aus ihr, aber sicherlich einen Zugang zu ihr. Das Wörterbuch (Bd. 7 der Works & Nights-Reihe), bei dem es sich laut den Herausgeber:innen Hendrikje Schauer und Marcel Lepper um ein »Titellexikon« (9) handelt, versammelt 25 Beiträge ebenso vieler Autor:innen über Werke in Literatur, Dichtung, Philosophie, Theater, Radio und Film, die die Nacht zum Gegenstand haben oder zumindest im Titel führen. Die Einträge sind alphabetisch geordnet von A wie *Abendbetrachtungen eines Nachtwächters* (Gotthelf Wilhelm Christoph Starke, 1794) bis V wie *Von morgens bis mitternachts* (Georg Kaiser, 1916). Der Schwerpunkt liegt auf Werken des 19. und 20. Jahrhunderts, daneben gibt es einige Ausreißer, wie die *Noctes Atticae* (*Attische Nächte*) des Aulus Gellius aus dem 2. Jhd. n. Chr. oder das Lied *Komm, Trost der Nacht, o Nachtigall* aus Grimmelshausens *Simplicissimus* (1668). Neben weiteren Titeln zum Thema Nacht, die im Vorwort ohne Anspruch auf Vollständigkeit aufgezählt werden, ist für einige Beiträge weiterführende Literatur angegeben. Zusätzlich findet sich online eine Auswahlbibliographie zum Thema Nacht. Die kleine Übersicht über die Beitragenden, wie sie in anderen Bänden der Reihe vorliegt, fehlt.

Was aber macht diese Textsammlung zu einem Wörterbuch? Das *Wörterbuch um Mitternacht* spielt mit dem Format. Eine Begründung der Herausgeber:innen, inwiefern es sich um ein klassisches Wörterbuch handelt, bleibt folgerichtig aus. Jedoch verweisen sie zur Erläuterung der Titelwahl auf den Bd. 3 der Reihe: *Titelpaare. Ein philosophisches und literarisches Wörterbuch* (2018). Dieser Vorgängerband untersucht die »spannungsreiche Kombinatorik«[1] von Titelpaaren wie z. B. Reinhart Kosellecks *Kritik und Krise*, die durch die Konjunktion ›und‹ erzeugt wird. So ließen sich »Ähnlichkeiten, Differenzen, Gattungen, Muster, Symmetrien erkennen, zuordnen, imitieren«.[2]

Die Idee der ›spannungsreichen Kombinatorik‹ von Begriffen in Titelpaaren lässt sich auch auf die beiden Works & Nights-Wörterbücher selbst übertragen. Auswahl und Arrangement der Beiträge im *Wörterbuch um Mitternacht* mögen weder umfassend noch systematisch sein, doch bei der Lektüre ergeben sich kombinatorische Synergien zwischen den »nachtaktive[n] Titel[n]« (8). So lassen sich Hegels Eule der Minerva (gleichnamiger Beitrag von Patrick Bahners) und Antoine de Saint-Exupérys Piloten (Beitrag *Vol de nuit* von Joseph Hanimann) gemeinsam hinaus zum Flug in die Nacht schicken: Während vor über 2000 Jahren die Eule »über das Schlachtfeld flatterte« und von den Athener Soldaten »als gutes Zeichen gelesen wurde« (63), ist es 1940 der französische Soldat Saint-Exupéry, der in seinem »Kriegspilotenbuch *Flug nach Arras*« (83) seinen militärischen Aufklärungsflug über die Trümmer der europäischen Aufklärung festhält. Die ›spannungsreiche Kombinatorik‹, die sich mit Perspektive auf die Nacht ergibt, betont also nicht nur die reproduktive Seite eines Wörterbuches, also die bloße Anordnung des Wissens, sondern auch ihre produktive: die Neuordnung des Wissens. Zu denken sei hierbei etwa an Novalis' *Das Allgemeine Brouillon. Materialien zur Enzyklopädistik* (1798/1799) und die »Kunst aus bekannten das Unbekannte zu finden«.[3]

1 Hendrikje Schauer/Marcel Lepper (Hg.): *Titelpaare. Ein philosophisches und literarisches Wörterbuch*, Stuttgart/Weimar ²2018 (Works & Nights 3), S. 16.

2 Ebd., S. 8.

3 Novalis: »98. Enc[yclopaedistik]«., aus: »Das Allgemeine Brouillon. Materialien zur Enzyklopädistik«, in: *Novalis. Werke, Tagebücher und Briefe Friedrich von Hardenbergs*, Bd. 2: *Das philosophisch-theoretische Werk*, hg. von Hans-Joachim Mähl/Richard Samuel, München/Wien 1978, S. 491. Ebenso sei in diesem Kontext verwiesen auf Hendrikje Schauer/Marcel Lepper (Hg.): *Neue Romantik. Eine kleine*

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Novalis begriff die Enzyklopädistik selbst als eine Art Kombinatorik.

Das alphabetische Ordnungsprinzip des Wörterbuchs wird durch drei Einträge aufgebrochen, was sich buchgestalterisch dadurch hervorhebt, dass sie in Negativschrift präsentiert werden, d. h. in weißen Lettern auf schwarzem Grund, und im Inhaltsverzeichnis kursiv statt recte stehen. Das Büchlein wird so visuell in drei Sektionen geteilt. Die Einträge im ›Dark Mode‹ beschäftigen sich mit dem vielleicht auch gedanklich ›Dunkelsten‹: Es sind der bereits oben erwähnte Beitrag zur *Eule der Minerva*, der Artikel *Weltmacht bei Mitternacht* von Sidonie Kellerer und *Lukubration, oder: A Hard Day's Lonely Night* von Stefan Rebenich. Es handelt sich bei diesen drei Einträgen nicht um Werktitel, sondern um ein Emblem (Eule), ein Zitat bei Heidegger (»Die ›Mitternacht der Weltmacht breitet ihre Finsternis aus‹«, 31) und eine Analyse des Wortes *lucubratio*.

Sidonie Kellerer rechnet in ihrem Beitrag auf fünf Seiten konzise mit Heideggers Geraune in *Wozu Dichter?* und den *Schwarzen Heften* ab. Es geht dabei um Heideggers »*Dog-Whistling*« und um die Verdunklung seiner Sprache, mit der er sich von einer angeblichen »Sprache der Machenschaft« abzusetzen versucht, die er mit den »Signalwörtern: die Wechsler, der Kaufmann, die Geschäfte, die Weltlosen, die Zersetzung, die rechnerische Vernunft« bestückt. (34) Diese Sprache wird von Kellerer als »xenophob[]« (ebd.) bezeichnet, womit sie – zumindest an dieser Stelle – versäumt zu benennen, dass es sich um eine dezidiert »antisemitische Semantik«[4] handelt. Die Sprachkritik, die Kellerer ansonsten überzeugend vornimmt, gibt eine Idee von einem weiter gefassten Verständnis eines Wörterbuches: historische Semantik wird nicht nur analysiert, sondern auch kritisiert.

Der Beitrag von Sidonie Kellerer liefert also eine erste Antwort auf die im Klappentext gestellte Frage des Wörterbuches: »Was suchen literarische, philosophische, filmische Konzepte im Schutz der Dunkelheit? Welche Schmuggelfracht, welche Aufklärungsergebnisse bringen sie über die Grenze zwischen den Tagen?« Im Falle Heideggers wäre die ›Schmuggelfracht‹ der verdeckte Antisemitismus. Trotz aller spielerischen Konzeption des Wörterbuches ist also ein Ernst bei der Sache, wenn es darum geht, die kulturgeschichtliche Bedeutung der Nacht auszuloten. Schon deshalb stehen viele der Beiträge nicht disparat für sich und sind weit mehr als eine Inhaltsangabe des jeweiligen Werkes, indem sie jeweils Antworten auf gemeinsame Fragen zu geben versuchen, die die Herausgeber:innen in ihrem kleinen Vorwort formulieren:

»Die Faszination für den Schlaf der Vernunft schwindet mit der Gewissheit, die monströsen Traumgestalten würden das Tageslicht scheuen. Waren sie je bescheidene Einwohner der Nachtseite der Aufklärung – oder schon immer skrupellose Agenten in gegenaufklärerischen Diensten? Hat die dialektische Beflissenheit sich gar dem nächtlichen Raunen zu lange angedient, ihre Spuktoleranz zu weit getrieben, ihr Opfer des Intellekts voreilig erbracht?« (7)

Unter Einbeziehung dieser Fragen realisieren sich auch Anspruch und Anliegen der Works & Nights-Reihe, »eine Expedition für die lesenden und schreibenden Fächer« zu sein, die »Gesellschaftsdiagnosen und Deutungskonflikte im 21. Jahrhundert« erkundet (Klappentext). Der für das *Wörterbuch um Mitternacht* gewählte Titel *Night Shift* (Nachtschicht) hieße also auch: sich an der Nacht und ihren dunklen Abgründen abzuarbeiten. Das wiederum tut man am besten nachts, denn, so die Herausgeber:innen, »[b]evor sich die lesenden und schreibenden Fächer für alle Fälle auf das Sonnendeck zurückziehen, müssen sie bedenken, dass sie der Dunkelheit ihre Arbeitsplatzbeschreibung verdanken« (7 f.). Das lateinische Wort *lucubratio* (Nachtarbeit), dem sich der abschließende Beitrag – in Negativschrift – von Stefan Rebenich widmet, »verweist auf eine kleine Öllampe, die man entzündete, um bei Dunkelheit lesen und schreiben zu können«. (89 f.) Programmatisch für die Reihe Works & Nights hält einen *Night Shift. Ein Wörterbuch um Mitternacht* im besten Sinne: wach.

Literaturgeschichte 1989–2019, Berlin/Weimar 2019 (Works & Nights 5).

4 Sidonie Kellerer zit. nach Peter Leusch: »Heideggers ›Schwarze Hefte‹. Enttäuschung und Entsetzen über den Antisemitismus«, *Deutschlandfunk*, 30.04.2015, https://www.deutschlandfunk.de/heideggers-schwarze-hefte-enttaeuschung-und-entsetzen-ueber-100.html (aufgerufen am 07.03.2023).