‘And all our classes turned into a flower garden again’: science education in Soviet schools in the 1920s and 1930s: the case of biology from Darwinism to Lysenkoism

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ABSTRACT

The purpose of this article is to outline the evolution of biology education in Soviet schools in the 1920s and 1930s. After some introductory consideration of the ideological changes taking place in the field of genetics that impacted on the teaching of science and led to botany being favoured over biology in schools, the first part outlines the development of the natural sciences curriculum in the context of the Soviet reform of the school, which, after the October Revolution, abolished traditional teaching methods in favour of the active methods of American schools. The second part reconstructs the evolution of the teaching of biology through analysis of the biological station for young naturalists, ‘K. A. Timiriazev’, a centre created in 1919 by the famous biologist Boris V. Vsesviatskii (1887− 1969). The third part illustrates the characteristics of botany educa- tion in schools of the 1930s, with a focus on the dissemination of the new scientific anti-genetic conception (known as Lysenkoism) and teaching practices in city and rural schools after the publication of Vsesviatskii’s textbook. The fourth demonstrates a progressive assimilation of the anti-genetic doctrine of Lysenkoism by teachers, with particular attention to the question of the natural sciences school curriculum and teacher training in the field of botany.

Introduction

The history of science education in the Soviet Union of the 1920s and 1930s has some peculiar characteristics unknown in other European countries,[1] as there were important changes in communist ideology regarding schooling and the hegemony of Marxism in the natural sciences. The first change concerns the evolution of the school science curriculum. The influence of a new type of active teaching had circulated on a

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[1] N. Hulin, *L’enseignement et les sciences. L’exemple français au début du XX^e siècle*, preface by D. Jiulia (Paris: Vuibert, 2005); N. Hulin, *Les sciences naturelles. Histoire d’une discipline du XIX^e au XX^e siècle*, preface by M. Morange (Paris: L’Harmattan, 2014), 38–51; S. G. Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890–1930* (Chicago: University of Chicago Press, 2010); and P. Savaton, ‘L’Union des naturalistes: la construction d’une identité disciplinaire et professionnelle (1911–1964)’, in *Les associations de spécialistes: militantisme et identités professionnelles (XX^e–XXI^e siècles)*, ed. C. Cardon-Quint, R. d’Enfert and E. Picard, *Histoire de l’éducation* 142 (2014): 53–81.

transnational level,[2] and this American method was used in some school years, accompanied by publications of new textbooks based on Marxist interpretations. The second change was a shift in communist ideology regarding the scientific theories of Darwinian natural selection and of Mendelian genetics, considered revolutionary at the time of their discovery but now interpreted through the schemata of dialectic materialism.

For this reason, this article focuses on the practices of teaching biology and how they mediate ideological conceptions of nature, in spite of ethical differences concerning the interpretation of the origin of life and the creation of the world – it does not focus on the wide field of natural sciences, whose task is to mediate scientific knowledge on the world of nature from a theoretical point of view to new generations, informing them of new scientific discoveries carried out in laboratories.[3] Teachers had to present biology not only in an anti-religious way but also in a Marxist framework; consequently, the material was given a dialectical materialist interpretation, transforming this subject into an ideological narration of the mutation of natural species.

The October Revolution, with its atheistic and materialistic culture, accepted both evolutionism and Mendelism, and research conducted in the genetic field benefited from the support of the Bolshevik regime, which recognised its implications for agricultural development. The famous geneticist Nikolai I. Vavilov (1887–1943) travelled from the United States to Europe, Asia Minor and the Middle East to collect 25,000 samples of wheat in order to try experimental plantings in various parts of the Soviet Union. Vavilov recognised that 'the new and improved varieties of economic plants can be created only by combining together valuable genes',[4] and combined his seminal investigations concerning the origin of crop plants with comparative cytogenetic studies aimed at investigating the speciation process.[5] However, since 1929 Mendelian genetics was progressively disavowed by a conception of nature and its laws that corresponded to the demiurgic will of the new political regime, and in 1937–1938 agronomists were arrested as 'enemies of the people'.[6]

The protagonist of the scientific manipulation of so-called formal genetics was the agrobiologist Trofim D. Lysenko (1898–1976), who introduced into the world of nature the laws of dialectical materialism and changes in nature in the same way as the regime had done for social sciences – aiming at shaping the communist, collective 'new man' devoted to socialist interests. Famous for his theory, defined by the term Lysenkoism, this agrobiologist influenced the study of natural sciences and botany in Soviet schools, where the presence of land plots offered the possibility of cultivating a vegetable garden

[2]See M. del Mar del Pozo Andrés, 'The Transnational and National Dimensions of Pedagogical Ideas: The Case of the Project Method, 1918–1939', *Paedagogica Historica* 45, nos 4–5 (2009): 561–84.

[3]See the biology textbook edited in 2017: G. A. Voronina, T. V. Ivanova, and G. S. Kalinova (eds.), *Biologiia, Planiruemye rezultaty. Sistema zadanii. 5–9 klass: ucheb. posobie dlia obshcheobrazovat. organizacii*, 3rd ed. (Moscow: Prosveshchenie, 2017). See also G. S. Kalinova and E. A. Nikoshova, 'Istorija razvitiia metodiki obucheniia biologii v sisteme obshchego srednego obrazovaniia', *Otechestvennaia i zarubezhnaia pedagogika* 2, nos 1/14 (2018): 131–42.

[4]Th. Dobzhansky, 'N. I. Vavilov: A Martyr of Genetics, 1887–1942', in *Death of a Science in Russia: The Fate of Genetics as Described in Pravda and Elsewhere*, ed. C. Zirkle (Philadelphia: University of Pennsylvania Press, 1949), 82–3.

[5]E. Cittadino, 'Botany', in *The Cambridge History of Science*, vol. 6: *The Modern Biological and Earth Sciences*, Cambridge Histories Online, History of Science, ed. P. J. Bowler and J. V. Pickstone (Cambridge: Cambridge University Press, 2009), 225–42 (see 240).

[6]N. I. Vavilov is author of a monumental work, *The Centers of Origin of Cultivated Plants* (*Centry Proiskhozhedniia kul'turnykh rastenii*, 1926), considered second only to de Candolle's botanical book. In this work, Vavilov developed his 'theory of several principal centers of origin and of concentration of genetic diversity in cultivated plant species', see Dobzhansky, 'N. I. Vavilov', 81.

that became a sort of 'botanical garden' for the learning of botany. Moreover, from 1936 until 1964, the regime supported Lysenko's anti-genetic doctrine, as shown by the arrests and convictions of non-Marxist geneticists who had not adapted to the new canons of interpretation of natural laws. This anti-genetic doctrine experienced a transnational circulation in socialist countries,[7] where its Lamarckian presuppositions were usually combined with social reforms.

Conceptually, this doctrine was the origin of the natural science curriculum's growing focus on botany at the expense of a more general consideration of biology, contrary to what was happening in Europe: 'Although botany certainly has persisted as a discipline, a new trend toward the consolidation of various life sciences specialties under the more comprehensive term "biology" was already in place by the end of the nineteenth century.'[8]

The purpose of this article is to analyse the evolution of the teaching of biology – which combined the methods of American activism with the educational models of new schools that had already influenced some institutions before the October Revolution[9] –as it was transformed into theoretical and practical lessons on botany. It looks at how this involved a change in teaching methods and how teachers mediated the new anti-genetic concepts, at theoretical and practical levels, with some comparative elements concerning urban and country schools.

The presence of natural sciences in the curricula of Tsarist and Soviet schools had a different meaning in each: Tsarist schools were concerned with the 'danger' of secularisation, while Soviet schools, as well as becoming places of atheistic and materialistic education, celebrated the supremacy of science/culture over nature.[10]

The political will to introduce a Marxist and polytechnic education, based on practical work, shaped schools from the first years after the 1917 Revolution, dedicating an important space to pupil activity. Science education in Russian and Soviet schools was mainly based on active teaching, and not on the method of natural history that characterised, for example, the same subject in French schools,[11] although the latter too could enjoy active teaching practices. However, while in France a combination of content, including physics, was spreading, in Russia and in the Soviet Union science education focused on a set of school subjects, which ended up clustering around botany.

The active method, already used in the Tsarist school, and also in the school founded by Lev Tolstoy – Jasnaia Poliana – after his visit to the Museum of South Kensington in London and to schools in Iena (Germany), was applied after the October Revolution both in schools and in extracurricular activities.[12] It was a method that Marxist theorists

[7]W. deJong-Lambert, *The Cold War Politics of Genetic Research: An Introduction to the Lysenko Affair* (Dordrecht: Springer, 2012); D. Stanchevici, *Stalinist Genetics: The Constitutional Rhetoric of T. D. Lysenko* (Abingdon: Routledge, 2012); and W. deJong-Lambert and N. Krementsov (eds.), *The Lysenko Controversy as a Global Phenomenon*, vol. 2: *Genetics and Agriculture in the Soviet Union and Beyond* (Dordrecht: Palgrave Macmillan, 2017).

[8]Cittadino, 'Botany', 226.

[9]D. Caroli and G. B. Kornetov, 'The New School Movement in Russia: Konstantin N. Venttsel (1857–1947), the Concept of Free Upbringing and the Declaration of the Rights of the Child', *History of Education & Children's Literature* 12, no. 2 (2017): 9–45.

[10]I. Halfin, *From Darkness to Light: Class, Consciousness, and Salvation in Revolutionary Russia* (Pittsburgh: University of Pittsburgh Press, 2000), 6–9; D. L. Hoffmann, *Stalinist Values: The Cultural Norms of Soviet Modernity, 1917–1941* (Ithaca, NY: Cornell University Press, 2003); and D. L. Hoffmann, *Cultivating the Masses: Modern State Practices and Soviet Socialism, 1914–1939* (Ithaca, NY: Cornell University Press, 2011), 1–16.

[11]N. Hulin, *L'enseignement et les sciences*, 38–51.

[12]D. Maroger, *Les idées pédagogiques de Tolstoï* (Lausanne: L'Age d'Homme, 1974), 182–5.

of education drew from America, combined with the experimental educational models of the new schools, which probably tried to adopt active methods, without actually having the children cultivate school fruit and vegetable gardens.

From a theoretical and methodological point of view, studying school subjects calls for a hermeneutic analysis of textbooks in relation to school practices, the science curriculum and teachers' attitudes,[13] in the broader context of school politics.[14] The peculiarity of the Soviet case, marked by a progressive denial of the role of genetics in the development of nature, requires a more complex analysis. Indeed, the comparison between the main textbook of botany, *Botany: Textbook for the 5th and the 6th Class of the Incomplete Secondary School and of the Secondary School*[15] – published in 1936 by Boris V. Vsesviatskii (1887–1969), a biologist and theoretician of the teaching of botany (and adopted by the Soviet schools until the mid-1960s) – and school practices highlights not only to what extent pupils were trained in the theories of Lysenkoism in botany both in and outside the classroom, but also another important aspect of school politics of the interwar period – that is, the progressive intertwining of biology with botany, aimed at providing a practical training in agriculture.

The importance of teaching biology is clear thanks to the wealth of teaching, scholastic and extra-scholastic practices described in the Archives of the Academy of Pedagogical Science of the Russian Federation (Archiv APN) and in the State Archives of the Russian Federation (GARF). The latter also contains material on the background of Vsesviatskii, author of the 1936 botany textbook that was used for about 40 years. He was also editor of the journal *Biology at School* (founded in 1927), which published the reports of teachers, and will be analysed in this article by comparing changes in the curriculum and teaching of biology, or botany, with teaching practices and teacher training. This approach allows us to understand the heterogeneity of the teaching practices of natural sciences – a subject that, in several fields under Stalin's rule, lost its universal laws.

This article is composed of two parts (each divided into two sections) that reconstruct the evolution of science education from the October Revolution to the end of the 1930s, with some consideration of the post-Second World War years.

Part 1. Revolutionary changes of soviet school reform and active learning of natural sciences

The first part is constituted of two sections, the first of which presents, from one angle, the history of science education in the context of Soviet reforms that led to the abolition of traditional school subjects as such and which were based on the 'method of the complex' drawn from the American active school. From another angle it shows in which way science education involved a debate concerning the aim of science education between the famous biologist Boris V. Vsesviatskii (1887–1969), author of the first Soviet botany textbook, and

[13]M. Depaepe and A. Van Gorp, *Auf der Suche nach der Wahren Art von Textbüchern* (Bad Heilbrunn: Klinkhardt, 2009), 1–23; J. P. Gee, *An Introduction to Discourse Analysis: Theory and Method* (London: Routledge, 2014); and E. Fuchs, I. Niehaus and A. Stoletzki, *Das Schulbuch in der Forschung. Analysen und Empfehlungen für die Bildungspraxis* (Göttingen: V&R Unipress, 2014).

[14]See, for example, A. Viñao, 'Les disciplines scolaires dans l'historiographie européenne. Angleterre, France, Espagne', *Histoire de l'éducation* 125 (2010): 73–98.

[15]B. V. Vsesviatskii, *Botanika. Uchebnik dlia 5 i 6 klassov nepolnoi srednei i srednei shkoly*, Utverzhdeno Narkomprosom RSFSR (Moscow: Gosizdat, 1936).

Boris E. Raikov (1880–1966), biology teacher and founder of the Society for the Promotion of Natural-Science Education (OREO) at the beginning of the century. The second section analyses the extra-school activities of the biology station 'K.A. Timiriazev' for young naturalists (*Biostanciia iunykh naturalistov 'K.A. Timiriazev'*) directed by biologist Boris V. Vsesviatskii, author of the first Soviet botany textbook, published in 1936. In the 1920s the biologist applied in experimental form 'the method of the complexes', which was particularly suited to the study of biology with its character of active observation and constant discovery of natural phenomena, while from the end of the decade Vsesviatski's work reveals a progressive adherence to the ideological vision of anti-genetics in biology lessons known as Lysenkoism that prevailed in the next decade.

1A. From the abolition of traditional school subjects to the return of textbook-centred lessons

In Tsarist Russia, schools gave only a marginal role to the natural sciences, although it had tried to renew its method of teaching, thanks to the introduction of direct observation, drawing and fieldwork by Aleksandr Ia. Gerd (1841–1888) in the 1860s; he introduced 'co-education, student self-government, and progressive teaching methods' in commercial schools. Science education was held in high regard in the curriculum of the Lesnoe Commercial School, founded in 1904 and sponsored by Count Sergei Witte. Following Gerd, Boris E. Raikov (1880–1966), teacher at the Lesnoe Commercial School and E. M. Gedda Women's Gymnasium since 1905, founded the Society for the Promotion of Natural-Science Education (OREO) in 1907, with the aim of spreading science education.[16] Furthermore, in 1904, for agricultural schools, the Russian academician I. P. Borodin published the first systematic botanic work, *Brief Textbook of Botany* (*Kratkii uchebnik botaniki*), which presented the geography, mor-phology, systematics (that is taxonomy), anatomy and physiology of plants.[17]

Another important change was visible from 1915: the subject of natural sciences, which was commonly taught only in the first three years of elementary education, was also extended to middle schools and, in particular, to Russian high schools.[18] Nevertheless, the general biology course dealt exclusively with plants and animals, expunging the human species from the lessons, as this would have involved the teaching of evolutionary theory[19] questioning the authority of orthodoxy.[20]

The new political climate, with the coming to power of the Bolshevik regime and the establishment of the United Labor School (30 September 1918), permitted the

[16]D. R. Weiner, 'Struggle over Soviet Future: Science Education versus Vocationalism during the 1920s', *Russian Review* 65 (2006): 72–97 (see 74–91).

[17]I. P. Borodin, *Kratkii Uchebnik botaniki*. S' 393 risunkami. 8th ed. (St Petersburg: A. F. Devriena, 1904). This was the result of the transference of the model of the book edited by Julius Sachs (1832–1897), A. W. Bennett (1833–1902), and T. W. Thiselton-Dyer (1843–1928), translated into several languages (including into English in 1875): and J. Sachs, A. W. Bennett and T. W. Thiselton-Dyer, *Text-Book of Botany: Morphological and Physiological* (Oxford: Clarendon Press, 1875). Concerning Sach's German 'new botany' conception, see Cittadino, 'Botany', 236.

[18]M. I. Demkov', *Nachal'naia narodnaia shkola, eia istoriia, didaktika i metodika*, 2nd ed. (Moscow: Tipografiia Sytina, 1916), 254–8.

[19]D. A. Sudovskii, 'Prepodavanie biologii v trudovoi shkole', *Estestvoznanie v shkole* 3 (1924): 1–11.

[20]Concerning the debates on Darwinism in Tsarist Russia, see A. Vucinich, *Darwin in Russian Thought* (Berkeley: University of California Press, 1988); and D. P. Todes, *Darwin without Malthus: The Struggle for Existence in Russian Evolutionary Thought* (New York: Oxford University Press, 1989).

extension of the natural sciences curriculum.[21] An echo of the French debate also reached the Soviet Union, linking the role of scientific subjects to the debate on the single school and the reform of the two degrees of primary education.[22] In 1918, biology was introduced as a subject in secondary schools in class V (for two hours per week), and merged into one of the three 'complexes' (nature, work, society) after the new programmes of the United Labor School, edited by the State Scientific Council (GUS) – part of the People's Commissariat of Enlightenment in May 1923 – abolished many traditional school subjects and introduced the so-called 'complex' of nature, which also included physics and chemistry, in classes V and VI, that is, in the first two years of secondary school (for children aged 12–15).[23] The special institute for the elaboration of post-revolutionary teaching, the Scientific-Pedagogical Institute of the Methods of the School (*Nauchno-pedagogicheskii institut metodov shkol'noi raboty*), created as an offshoot of the People's Commissariat for Enlightenment, was charged with elaborating teaching methodologies, and privileged applied knowledge to the detriment of speculative knowledge, enhancing the trend that privileged polytechnic education.[24]

The Soviet reform of schools allowed revolutionary pedagogues to use the methods of American activism, in particular the 'method of complexes' developed by American pedagogue William H. Kilpatrick (1871–1965), which was based on modern active teaching methods: the so-called 'complexes' were teaching units that were not organised via a teacher's explanation but through a schoolchild's research activities, and were supposed to develop better individual skills.[25] In particular, the natural sciences (*estest-voznanie*) were part of the 'complex of nature' with mathematics and physics, although this combination did not imply recourse to the historical method of teaching. In practice, these complexes translated into extra-school teaching characterised mainly by excursions and observations of nature. These practices presented several risks. The first was that in some cases the teachers practised this new teaching as a shortcut to a professional job. Another anomaly consisted in the lack of reference textbooks around which to build a 'lesson of things', as was the case in America.[26] Random publications on evolutionism, treatises on botany and zoology, and notebooks in which pupils could write down their lessons were used to educate children in the observation of natural laws and phenomena.[27]

The Kilpatrick 'complex method', however, due to the lack of a precise teaching framework, had not spread throughout the whole country, and was even ignored in 1926 (such as in the regions of Tver, Tula, Vladimir, Astrakan and Uljanovsk).[28] It was

[21]Sh. I. Ganeli, M. N. Saltykova and O. E. Syrkina, *Osnovnye voprosy sovetskoi didaktiki* (Moscow: Rabotnik Prosveshcheniia, 1929), 131.
[22]Hulin, *L'enseignement et les sciences*, 19–37.
[23]Ganeli, Saltykova and Syrkina, *Osnovnye voprosy sovetskoi didaktiki*, 131.
[24]Kalinova and Nikoshova, 'Istorija razvitiia metodiki obucheniia biologii v sisteme obshchego srednego obrazovaniia', 131–42.
[25]S. Fitzpatrick, *The Commissariat of Enlightenment: Soviet Organisation of Education and the Arts under Lunacharsky, October 1917–1921* (Cambridge: Cambridge University Press, 1970), 159–79; and L. E. Holmes, *The Kremlin and the Schoolhouse: Reforming Education in Soviet Russia, 1917–1931* (Bloomington: Indiana University Press, 1991): 32–4 39–40, 128–9.
[26]See, for example, C. B. Scott, *Nature Study and the Child* (1900; Boston, MA: D.C. Heath, 2012).
[27]Sudovskii, 'Prepodavanie biologii v trudovoi shkole', 1–11.
[28]E. N. Medynskii, 'Soderzhanie uchebnoi raboty (plany i programmy) sovetskoi shkoly za 25 let', *Sovetskaia Pedagogika* 10 (1942): 17.

rejected by the 1927 programmes, which proclaimed the return to traditional subjects and the study of textbooks, with the exception of primary and seven-year vocational schools that still used the active method, probably because it involved a practical means of learning.[29] Among the detractors of this American method was science teacher Raikov, who 'blasted away at the pure version of the complex method, calling the situation "a real madhouse." Raikov was probably vocalising the opinion of a majority of rank-and-file teachers and local administrators.'[30] In particular, compared with the new 1927 programmes elaborated by GUS, which oriented the curriculum towards production, distancing itself from the original polytechnic principle that offered a kind of global education without specific vocational specialisation, Raikov believed that science education had to instil critical reasoning skills – a view that most likely would have denied the anti-genetic doctrine.[31]

The 1929 programmes for secondary grade schools increased the hours allocated to the natural sciences such as chemistry and physics to a total of 17 (for classes V and VII)[32] in order to improve the general level of secondary school education on the eve of the industrialisation and collectivisation of the country. Further changes took place in the 1930s, following a greater diffusion of the 10-year middle schools, launched after the introduction of compulsory primary education on 25 July 1930.[33] This decree was the first step for the stabilisation of elementary and middle schools (5 September 1931), with the consequent recovery of traditional school subjects that became generalised in the second half of the decade, and it marked the beginning of the production of new school textbooks of Marxist orientation from 1936.[34]

1B. Vsesviatskii: from active teaching of biology to botany lessons based on anti-genetic principles

The history of the foundation of the biology station 'K.A. Timiriazev' for young naturalists (*Biostanciia iunykh naturalistov 'K.A. Timiriazev'*) near the forest of Sokol'niki (Moscow) is one of the most interesting aspects of science education in Russia in the 1920s. At the beginning, it was an institution that organised extra-school activities in contact with nature. The centre was founded in the spring of 1918 by the biologist Vsesviatskii, with the support of the president of the local communist council of Ivan V. Rusakov,[35] in order to develop natural science education and children's skills of observation, thanks to a 'research method' (in

[29]Weiner, 'Struggle over Soviet Future', 74, 78, 91.
[30]Weiner, 'Struggle over Soviet Future', 79.
[31]See the chapter on higher education in Fitzpatrick, *The Commissariat of Enlightenment*.
[32]Medynskii, 'Soderzhanie uchebnoi raboty (plany i programmy) sovetskoi shkoly za 25 let', 17.
[33]E. T. Ewing, *The Teachers of Stalinism: Policy, Practice, and Power in Soviet Schools of the 1930s* (New York: Peter Lang, 2002), 53–82.
[34]D. Caroli, 'New Sources for the Teaching of History and of the Constitution in the Soviet Union: Textbooks and School Exercise Books (1945–1965)', *History of Education & Children's Literature* 4, no. 2 (2009): 251–78; and D. Caroli, 'The Depiction of Political Leaders in School History Textbooks between the Rise and Fall of the Cult of Personality (1938–1962)', in *Globalisation and Historiography of National Leaders: Symbolic Representations in School Textbooks*, ed. J. Zajda, T. Tsyrlina and M. Lovorn (Dordrecht: Springer, 2017), 35–52.
[35]L. K. Baliasnaia, 'Predislovie', *U istokov junatskogo dvizheniia*, ed. V. G. Kholostov (Moskow: Prosveshchenie, 1972), 3–7.

Russian, *issledovatel'skii method*) similar to that of 'the complexes' adopted in schools at the beginning of the 1920s.[36]

After completing his studies in mathematics and physics, Vsesviatskii distinguished himself for his research in the field of biology teaching in the 1920s, and in the 1930s he aligned himself with the new canons of the interpretation of scientific laws that led him to favour botany in science education. From 1919 he devoted himself to teaching biology and science education in the centre, which offered the possibility of adopting new active methods, focusing on the observation of nature and meteorological phenomena, on the direct experience of cultivation of ornamental plants, and on contact with pets and other animals. In the summer of the same year, Vsesviatskii also established a permanent colony (for 35 children), which was inspired by Lev Tolstoy's 'pedagogical laboratory' and by the experimental colonies created by Stanislav T. and B. N. Shatsky,[37] active in the Settlement Group in Moscow, and followed the principles of the new schools movement. Children were involved in active work and in contact with the world of nature with the aim of improving their characters and, through them, renewing the whole of society. The colony was to be 'the main pedagogical laboratory for work in the experimental station' in the sense that it had to organise its activities according to the observation of nature and agricultural work, progressively transforming itself into a second-grade experimental school for agricultural vocational guidance.

The centre promoted young naturalist circles in Soviet schools and held training courses for elementary and middle-school teachers with the aim of further disseminating the new active methods of natural science teaching. In 1922, the centre was included in the network of experimental institutions (in Russian, *opytno-pokazatel'-nye uchrezhdeniia*) of the People's Commissariat for Enlightenment.[38] After nature became one of the three 'complexes' of primary education in 1923 school programmes, the colony also abolished traditional school subjects in favour of complex knowledge. Vsesviatskii argued that: 'the complex' was intended to be the reflection of a 'piece of [real] life' and was to dissolve any complexity or confusion. By studying surrounding reality we can only work in a complex way, because between the different aspects of life there is always a strong internal bond, a given reciprocal relationship.[39]

[36]Born in Klina (Moscow region) in 1887, Vsesviatskii completed studies at the Faculty of Physics and Mathematics at Moscow University and became a biology teacher; after founding the biology station in 1919, he studied the teaching of natural science. In 1932, after the restructuring of the centre, Vsesviatskii held numerous positions: as Director of the Natural Sciences Department of the Institute of Scientific Research Programmes, then at the Institute of Polytechnic Education (1933), at the Institute of the Secondary School (1937), and at the State Institute for Scientific Research of Schools (1939). At the same time, he taught natural science didactics at the Faculty of Biology, University of Moscow. See Rossiiskii Gosudarstvennyi Arkhiv Rossiiskoi Federacii (GARF) [Russian State Archive of the Russian Federation]; Fond A-542 (*Boris V. Vsesviatskii*), op. 1, delo 133, ll. 1–4 and dela 242–6. *Fond* means Fund, *op*. (*opis'*) inventory, *delo* act (*dela* acts) and *l*. (*list*), page (*ll*. pages). See D. Caroli, 'I quaderni di scuola e la didattica della lingua, della letteratura e delle scienze naturali in Russia e in Unione Sovietica (1860–1940)', in *School Exercise Books: A Complex Source for a History of the Approach to Schooling and Education in the 19th and 20th Centuries*, vol. 2, ed. D. Montino, J. Meda and R. Sani (Florence: Edizioni Polistampa, 2010), 1078–83.

[37]F. A. Fradkin, 'Soviet Experimentalism Routed: S. T. Shatsky's Last Years', in *School and Society in Tsarist and Soviet Russia*, Selected Papers from the Fourth World Congress for the Soviet and East European Studies, ed. B. Eklof (Harrogate, 1990; New York: St Martin's Press, 1993), 154–75.

[38]B. V. Vsesviatskii, *Issledovatel'skii podkhod k prirode i zhizni. Idei i praktika Biostancii junykh naturalistov im. K.A. Timiriazeva* (Moscow: Rabotnik Prosveshcheniia, 1926), 24.

[39]Ibid., 26–7.

These 'complexes' varied according to the age of the pupils and proposed, for example, activities concerning 'the local territory' for those in the first year of middle school (pupils aged 12–13), 'the countryside and the city' for those in the second year, and 'the USSR economy and its prospects' for those in the third year. For each group different summer activities were planned: in 1922 there were 545 activities and 8300 students participated.[40]

The colony therefore adopted American active teaching methods not only for the study of nature but for the whole surrounding environment because: 'In both cases, the attention of children is not attracted to abstract theoretical doctrines, from historical and geographical concepts far from children, or from different systems of knowledge (school subjects), but from concrete facts and phenomena.'[41] The archive of Vsesviatskii contains the first observations of the children, conducted in the spring of 1919, on domestic and wild animals;[42] they gradually moved from literary and fairy-tale models to become more and more faithful to nature – and were the first step of an ongoing educational renewal in the learning of biology.

In the years 1924–1925 Vsesviatskii pledged to extend his teaching methodology to Soviet schools and youth communist organisations. The starting point was the linking of the activities of the young naturalist circles of the centre with the Communist Youth Organisation (*Komsomol*) by setting up an office for young naturalists to disseminate their practices in schools across the country. The second step was to introduce the obligation for schools to have plots of land for experiments and research on animal and plant life.[43]

In 1926, Vsesviatskii wrote that the centre was 'an experimental institution whose task is to apply the research method to the surrounding reality and to educate a reflection on research in the young generation'. The station was a sort of 'intermediate link between the research and economic institutions on the one hand and the mass –school, and consequently the young generation'.[44] This description represented Vsesviatskii's defence against Raikov and his group's attacks: Vsesviatskii receiving official support for realigning education in science education towards production aims, Raikov criticising the distortion of the aim of biology teaching, that should be more theoretical than practical. They were both losers because the first adhered to Lysenkoism and the second was arrested in 1930. Indeed, the People's Commissar of Enlightenment, Anatolii Lunacharskii, argued against Raikov, saying that 'the polytech-nic ideal would lead to naked vocationalism', perseverating on the role of science education in the middle school that was not yet realised.[45]

Subsequently, in 1929, the station underwent a profound change and became the Nature and Methodology Section of Agricultural Science of the Scientific Research Institute of Polytechnic Education, while the colony became a vocational agricultural school during the 1930s.[46] In 1932, after the merger of the 'V. P. Potemkin' Moscow Municipal Pedagogical Institute and the 'V.I. Lenin' Moscow State Pedagogical

[40]Ibid., 25–6.
[41]Ibid., 25.
[42]GARF, A-542, op. 1, delo 245, ll. 5–53.
[43]GARF, A-542, op. 1, delo 245, ll. 26–7.
[44]Vsesviatskii, *Issledovatel'skii podkhod k prirode i zhizni*, 7.
[45]Weiner, 'Struggle over Soviet Future', 87.
[46]GARF: Fond A-542, op. 2, delo 246, ll. 250–1.

Institute, Vsesviatskii retained the biology methodology chair at the Faculty of Biology of the University of Moscow (from 1944 until 1965), serving as a consultant until 1969.[47]

Vsesviatskii promoted science education and he also took part in anti-religious propaganda, orientating the study of biology towards Darwinism; however, after the mid-1930s he revealed his progressive adherence to the anti-genetic doctrine. In 1936 the biologist published the first botany manual for classes V and VI (of the middle school), *Botany: Textbook for the 5th and the 6th Class of the Incomplete Secondary School and of the Secondary School*.[48] Vsesviatskii was responsible for evaluating the coursework (in Russian, *kontrol'naia rabota*, supervisory work) produced by pupils during and after his lessons. The lessons often mirrored the topics presented in his textbook, and some photographs showed groups of young pupils tasting new kinds of greenhouse fruits that were the product of experiments with the Michurin's hybridisation.[49]

The year 1936 marked an ideological turn towards the total liquidation of formal genetics at national and international level, which Vsesviatskii was engaged in. In 1937 he published a booklet, *Fundamentals of Darwinism*, which presented a compendium of natural history on plants and concluded with the fundamental role played by Ivan V. Michurin in the 'discovery' of the inheritance of characters acquired in the ontological development process of the species,[50] a sort of neo-Lamarckian conception. This demonstrated that Vsesviatskii agreed with the destruction of genetics that was being carried out in agricultural experimentation after Michurin and his follower Lysenko.[51]

Vsesviatskii assimilated this official doctrine until the regime condemned it in 1964. But different aspects should be taken into consideration in order to grasp its political meaning, at both the national and transnational level. Because of the dispute over genetic law, the Seventh International Genetics Congress that was planned in Moscow in August 1937 was postponed for two years, finally taking place in Edinburgh, 23–30 August 1939.[52] According to the famous biologist and geneticist Cyril Dean Darlington (1903–1981), who discovered the mechanics of chromosomal crossover, its role in inheritance and therefore its importance to evolution, the 'Revolution in Soviet science' was an effect of Hitler's ideology, as Hitler had 'assumed the permanent, and homogeneous, genetic superiority of a particular group of people, those speaking his own language';[53] 'Soviet hostility to Mendelian genetics is due at least in part to the fact that genetics is concerned with problems of inheritance in man as well as in plants and animals'.[54] Indeed, 'genetics itself was incompatible with Marxist revolutionary

[47]Fond A-542 (*Boris V. Vsesviatskii*), op. 1, dela 133 and 242, ll. 1–4.
[48]Vsesvjatskii, *Botanika. Uchebnik dlia 5 i 6 klassov*.
[49]*Dokumenty o provedenii v 5–9 klassov shkol urokov k ekzamenov po botanike, osnova darvinizma, biologii/uchebnye plany, kontrol'bye raboty, ekzaminacionnye bilety, normy otsenok, 1935–1941* [Documents about the lessons in school classes 5th–9th for the examination in botany, fundaments of Darwinism and biology, teaching plans, control works, evaluation standards, 1935–1941], Fond A-542 (*Boris V. Vsesvjatskii*), op. 2, dela 243, ll. 99–113.
[50]B. V. Vsesviatskii, V. N. Vuchetich and I. V. Kozyr', *Nauka o rasteniiakh i religiia* (Moscow: Uchpedgiz, 1937).
[51]Also, the translation into Russian of Erwin S. Bauer's *Theoretical Biology* (1935), inventor of the 'principle of the permanent inequilibrium of living matter', presented at the end elements of dialectic materialism, describing new forms of variability of the environment. Bauer (1890–1938) (a Russian physician who emigrated to Hungary) was a victim of the Great Terror; and see E. S. Bauer, *Teoreticheskaia biologiia* (Moscow: Izd. Vsesojuznogo Instituta Eksperimental'noi Mediciny (VIEM), 1935).
[52]Zh. Medvedev, *Vzlet i padenie Lysenko. Istoriia biologicheskoi diskussii v SSSR (1929–1966)* (Moscow: Kniga, 1993), 76.
[53]See the introduction by Zirkle, ed., *Death of a Science in Russia*, 29.
[54]Zirkle, ed., *Death of a Science in Russia*, 29.

philosophy and dialectic materialism'.[55] The Soviet response to German racist ideology was therefore just as ideological because Lamarckism spread also in the human sciences, thus education corresponded to this political project of human regeneration thanks to the positive influence of the Soviet communist collective society.[56]

Among the protagonists of the so-called destruction of genetics was the agronomist and agrobiologist Lysenko, who, from 1928, had undertaken some experiments of so-called 'vernalisation' (equivalent to iarovisation), which consisted of storing cereal seeds at low temperatures for prolonged periods in order to intensify production, that is, 'with treatments of germinated seeds which altered the direction of their subsequent growth. It has been extended to include also treatments which break the rest periods of seeds so that by speeding up their germination less time is needed between seeding and harvesting.'[57] Lysenko declared he was inspired by the biologist I. V. Michurin (1855–1935), who had rejected 'formal genetics' (the inheritance science of Mendelians and Morganists) and had tried to elaborate genetic selection criteria through the vegetative hybrid and the mentor systems.[58]

Although starting from a Darwinian conception of genetics, Michurin experimented with the hybridisation of fruit trees from distant locations, without scientific bases, and tended to overestimate the role of the environment and the manipulation of Marxist science in changing hereditary traits of organisms. In fact, in the footsteps of the American botanist Luther Burbank (1849–1926):

> Michurin claimed to have shifted the northward limit of cultivated fruits in Russia. Saunders in Ottawa began his breeding work at the same time,[59] in 1887, with the same object and with some better authenticated success, using accepted scientific methods. Michurin simply admitted having received fruit trees from Canada and the United States.[60]

Following Michurin's experiments, Lysenko elaborated a theory of genetics according to which:

> the plant, both in respect to species and individual forms, is not something unchangeable; that is has no absolutely unchanging characteristics; that all its characteristics are subject to change in the course of the evolution of the organism; that in this evolution not only the sex cell or its component elements play a part, but the organism as a whole and the cell as a whole; that in the course of its evolution, not only the external characteristics of the organism, but also its hereditary base are subject to change; that man can, by means of his active intervention, his deliberate creation of definite environmental conditions, influence the evolution of the organism, directing its development into channels useful to him – all these important theses of Academician Lysenko are not only in harmony with the teaching of Darwin, but represent a further development of a whole series of Darwinian doctrines as well as an extension of the method of dialectical materialism in biological science.[61]

[55]M. B. Adams, *Eugenics in Russia 1900–1940*, in *The Wellborn Science: Eugenics in Germany, France, Brazil, and Russia*, ed. M. B. Adams (Oxford: Oxford University Press, 1990), 176–83.
[56]D. Caroli, *L'enfance abandonnée et délinquante dans la Russie soviétique (1917–1937)*, preface by Jutta Scherrer (Paris: L'Harmattan, 2004), 188–202.
[57]See the introduction by Zirkle, ed., *Death of a Science in Russia*, 26.
[58]The vegetative hybrid was the result of grafting together two plants of different types and thus producing a plant possessing the characteristics of the two types, while the mentor was a method of modifying young plants by grafting the petioles of another type into them with the purpose of transmitting different characteristics to them; see T. D. Lysenko, 'Trudy Michurina: Osnova sovetskoi genetiki', *Biologiia v shkole* 4, nos. 1–5 (1938): 3.
[59]William Saunders (1822–1900), responsible for having introduced many fruits and vegetables to American agriculture.
[60]C. D. Darlington, 'The Retreat from Science in Soviet Russia', in *Death of a Science in Russia*, ed. Zirkle, 67–79 (see 71).
[61]M. B. Mitin, 'Toward the Advancement of Soviet Genetics', in *Death of a Science in Russia*, ed. Zirkle, 36–46 (see 37–9).

On the basis of these ideas, and in contrast to Michurin:

> Lysenko developed a method of vegetable hybridisation and proved the existence of a series of consecutive stages in the growth of plants. He showed that such characteristics of the yearly growth as a summer or winter maturation, adaptability to a short or a long day are not changeless or unmodifiable.[62]

Furthermore, Lysenko proposed new methods of cultivation (the shearing of the cotton plant and the application of mineral mixtures), among which the most famous were those of vernalisation or iarovisation – which had, however, already been tested in the United States – which consisted of subjecting cereal seeds to low temperatures for prolonged periods in order to intensify production, a sort of treatment of 'germinated seeds which altered the direction of their subsequent growth.'

Although there is no link between genetics and vernalisation, which altered the phylogenetic development of plants, according to Lysenko through this process winter wheat could be influenced to produce a crop if sown in the spring. He claimed that 'vernalisation inaugurated a new era in soviet agriculture, permitting among other things, the culture of cereal crops much farther north that was formerly possible'.[63]

Actually, Lysenko's theory represented a denial of Mendelian genetics (and Morganist, in which Lysenko also identified Weismanism), claiming that heredity was a physiological and not a biological factor within chromosomes and that genetic variability was the result of drastic environmental changes. Lysenko's methods, used on the cultivation of wheat in the *kolkhozes* since the spring of 1930, were also applied to potatoes and, more extensively with the beginning of the second five-year plan, also in cotton cultivation in 1936.[64]

Lysenko gained the support of the regime very likely as a result of the echo that had cultivated hybrid corn in the United States and the transnational impact of the economic crisis of the 1930s.[65] At national level this meant that science teachers had to transmit this knowledge without exception.

Part 2. The diffusion of anti-genetic conception (Lysenkoism) in biology lessons at Stalinist schools of the 1930s

The second part of this article, also in two sections, deals with the profound changes that took place in science education in Soviet schools of the 1930s. The first section presents teaching practices and their progressive transformation into botany in class or in the open air, trying to grasp on one side the different subjective and ideological reasons for the assimilation by teachers of the concept of Lysenkoism and, on the other, the difference in these teaching practices as practised in urban and rural schools. The second section will try to analyse the reflections on programme changes and teacher training at a time when Lysenkoism had established itself in botany teaching following the subjugation (and even arrest) of biologists and describes the process of cultivating

[62]Ibid., 37.
[63]Dobzhansky, 'N. I. Vavilov', 85.
[64]I. E. Glushchenko, 'Uchenyi iz naroda: T. D. Lysenko', *Biologiia v shkole* 5 (1937): 32–3.
[65]See the introduction by Zirkle, ed., *Death of a Science in Russia*, 25; Caroli, 'I quaderni di scuola e la didattica della lingua', 1078–83.

the school plots of land or gardens according to Lysenko's principles, which were supported by Communist ideology until the 1960s.

2A. Lysenkoism: taught out of fear or faith in science?

In consideration of the school reforms initiated at the beginning of the 1930s, according to the provision of 5 September 1931, the natural sciences curriculum was organised in a more articulate way in the elementary and secondary schools: as well as botany in classes V and VI, it was planned that physics would be taught in class VII, zoology in classes VIII and IX, and anatomy in class IX.

The new programmes, revised in 1932 and in force until 1937/1938, already reflected a new political and scientific attitude, according to which the main purpose of the natural sciences was:

> to widen children's horizons with knowledge of the facts of living and inanimate nature, unveil the simplest laws of the development of dialectical-materialistic nature, show the process of domination of the forces of nature in the process of socialist construction, awaken an interest in nature and equip pupils with the basic tools for studying nature.[66]

At the beginning of the 1930s, the rapid spread of Marxist genetics was due, on the one hand, to the impact of the experiments carried out in the *kolkhozes* by the agronomist Lysenko and, on the other, to the botanical textbook of Vsesviatskii, who complained that, in peripheral localities, the lack of teaching material gave rise to low literacy rates and poor schooling generally, which consequently affected the diffusion of natural science knowledge so important to the principles of dialectical materialism.[67]

After the publication of this textbook in 1936 many teachers began to teach botany according to the new principles, which implied the abandonment of official genetics. On the surface the new principles were accepted without question, but, beyond official speeches on the dissemination of Lysenkoism in botany lessons, we will try to grasp the different problems that arose in urban and rural schools around the teaching of this subject.

To understand why many teachers jumped on the bandwagon of Lysenkoism we must take into consideration many factors. It is very likely that this movement was dictated by an interest in nature that Vsesviatskii had instilled in the hearts of young naturalists and by a general desire to avert new famine, as the cultivation of fruit and vegetables could have been considered a survival strategy. It is, however, possible that among teachers there was a fear of layoffs that resembled the purges of counter-revolutionary elements or 'enemies of the people': since May 1930 Raikov and 11 members of the OREO had been arrested;[68] and between 1936 and 1940 22,000 people left teaching for the same reason.[69] In his in-depth study, Thomas E. Ewing notes that 'using terror to politicize schools had the unintended effect of encouraging teachers to act apolitically'.[70]

[66]Medynskii, 'Soderzhanie uchebnoi raboty (plany i programmy) sovetskoi shkoly za 25 let', 20.
[67]GARF, A-542, op. 1, delo 55, ll. 34–42; and Medynskii, 'Soderzhanie uchebnoi raboty (plany i programmy) sovetskoi shkoly za 25 let', 22.
[68]Raikov remained in a Gulag until 1934, see Weiner, 'Struggle over Soviet Future', 93–4.
[69]Ewing, *The Teachers of Stalinism*, 240–4.
[70]Ibid., 247.

Was the dissemination of Lysenkoism during botany lessons a shield against purges, or was it simply a compromise – teaching how to cultivate a plot of land to guarantee some food while legitimising one's role in anti-religious propaganda? Or can the teachers' submission be explained by the fact that botany could replace labour education, which progressively abandoned the polytechnic principle in 1937,[71] to provide an earlier specialisation for pupils who achieved secondary school education? Furthermore, botany was perhaps a means of disciplining particularly rebellious students, combatting scholastic disorder, and contributing to a general improvement of pupils' performances thanks to the presence of young naturalists, who were often part of the pioneers' sections (present in the school since 1924).

These were all plausible reasons for experimenting and spreading Lysenkoism, whatever an individual's inner convictions, in school outdoor activities that applied Lysenko's theory. Thanks to the reports that biology teachers wrote in the second half of the 1930s in the journal *Biology at School*, it is possible to grasp two important trends under the official narration of botany lessons: it emerges that there was a difference between urban and rural schools, as well as a progressive intertwining of the teaching of biology and botany. Theoretical textbook-centred lessons did not provide any results, or very few, due to a lack of teacher training or adequate school equipment. Perhaps some lessons thus reduced botany to the cultivation of seeds in jars that even today can be found on the windowsills of schools. Seeing shoots and leaves develop gave a clearer picture of the stages of different plant species (from cereals to ornamental plants). Some teachers complained of shortcomings, especially where lessons were theoretical and exclusively classroom-based, as in the textbooks, a combination of books and land were put forward as the only way to teach botany. The well-known lack of discipline in Stalinist schools was probably also a conse-quence both of the boredom of the students and the lack of motivation of the teachers.[72]

In general, Lysenko's concept had spread widely across schools since 1937 and the advantage of a firm structure in the teaching of science disciplines was underlined. In an instructive letter dated 17 October 1937, P. A. Zavitaev, collaborator with the Central Research Institute on the methods used by elementary schools, said that:

> in the lessons of natural sciences, there is a need for a union capable of different teaching methods; the methods adopted by the teacher also change depending on the content of the teaching material: the demonstration of the teaching aids, the pupil's lab work, the excursion, the interview, the teacher's explication. The main essence of all science education is the concreteness of learning. The comprehension of objects and phenomena of nature is to be achieved on the basis of concrete perceptions that are received by children directly in the study of these objects and phenomena.[73]

On the other hand, the new didactics of the natural sciences not only via textbooks but via working plots of land helped improve pupils' knowledge and discipline.[74] *Biology at*

[71] A. Gock, *Polytechnische Bildung und Erziehung in der Sowjetunion bis 1937: Bildungspolitische und pädagogische Diskussionen und Lösungsversuche* (Berlin: In Kommission bei Otto Harrassowitz, 1985); and L. E. Holmes, 'Magic into Hocus-pocus: The Decline of Labor Education in Soviet Russia's Schools, 1931–1937', *Russian Review* 51, no. 4 (1992): 545–65.

[72] E. T. Ewing, *Separate Schools: Gender, Policy, and Practices in Postwar Soviet Union* (DeKalb: Northern Illinois University Press, 2010), 24–9, 130–46.

[73] *Plan raboty kabineta estestvoznaniia na srok s 1/10/1937 po 31/XII/1938g*. [Work Plan of the natural science lab for the period 1 October–31 December 1938] from the Archives of the Akademiia Pedagogicheskich Nauk RSFSR (APN RSFSR) [Academy of Pedagogical Science of the Russian Republic]; Fond 10: Tsentral'nyi Nauchnyi Issledovatel'skii Institut Nachal'noi shkoly [Central Scientific and Research Institute of the Primary School], op. 1, delo 88, l. 170.

[74] Glushchenko, 'Uchenyi iz naroda', 32–3.

School constituted the sounding board of teaching practices and teachers certainly gave good examples of how to train teaching staff to improve lessons using the new methods. In general, in urban schools, the presence of teaching materials made all the difference. From a report on the teaching of biology in a middle school in the Kalinin region, it emerged that knowledge in this discipline was much higher in those schools where the intuitive method was adopted, thanks to the teaching aids.[75] Both laboratory exercises and work on illustrations (live objects, herbaria, tables and paintings) were practised extensively in class V of school no. 7 of Kalinin, while in schools nos. 8, 12 and 4 of Rzhev, pupils learnt their lessons very thoroughly.

Some teachers in Rzhev schools were compelled to follow the textbook for several reasons, both for lack of other teaching aids and because of gaps in pupils' knowledge; lack of discipline was also a problem here.[76] However, the new active teaching led to an improvement because: 'the knowledge of the students on the classification of flower plants (phanerogams) in the study of live botanical material has become more concrete, precise and stable than the previous year'.[77]

Having a plot of land next to the school made the teaching of botany more suited to anti-religious education, which the teacher had to impart in any case, but also presented other advantages, such as experiencing the laws of nature first-hand. In a 1937 report, a teacher from Moscow's secondary school 'Perov' wrote that during his biology lessons he engaged in anti-religious education. In particular, thanks to the observation of the plants in school plots, he could explain the relationship between man and nature and the use of nature by human forces; observe plants and cereals that provide food for man through cultivation; demonstrate how wild plants could be transformed into cultivated plants; show how flowering plants and their main organs may vary depending on the soil; discuss the fact that organs do not have a stable shape, contrary to what religious doctrine claims; and describe the cellular structure of the plants and their development, all presented through the study of the anatomy and morphology of plants.[78]

In relation to vegetative hybridisation, this teacher related to his pupils the biographies of the American botanist and horticulturist Burbank – who was censured by the American religious community for his creation of many new varieties and strains of plants – and of Michurin, who created new varieties of fruits and berries. He explained that:

> We are trying to realise I. V. Michurin's idea about the transformation of nature by means of work in the circle of young naturalists, and how I. V. Michurin has produced new varieties in the cultivation of fruits and berries. The experiments of lightening and light exposure (*iarovizaciia* and *fotoperiodizm*) have a great educational significance to explain the adaptation of plants to the vital struggle for existence.

In discussing these arguments, the teacher pointed out that Lysenko's ideas had also produced a great revolution in agriculture. During the class VI botany lesson on variety in the plant world, starting from concrete material, he made students understand the

[75][The Editorial Office], 'O prepodavanii biologicheskikh disciplin v srednei shkole. Kalininskaia oblast', *Biologiia v shkole* 1 (1937): 71–9.
[76][The Redaction], 'O prepodavanii biologicheskikh disciplin v srednei shkole', 71–2.
[77]Ibid., 78–9.
[78]A. N. Lavrov, 'Antireligioznye voprosy na uroke', *Biologiia v shkole* 4 (1937): 45–7.

unity of this diversity. In this sense, a plot of land helped to clarify the main taxonomic units.[79]

Teaching of the natural sciences progressively lost the aim of teaching about the world of nature, with its laws, evolution and genetics, to become, instead, an ideological narrative of the anti-genetic conceptions of Michurin and Lysenko.

2B. Botany lessons and teacher training in the 1930s

The sources relating to science education between the end of the 1930s and end of the 1940s demonstrate that biology education focused almost exclusively on botany. Teachers had to faithfully teach 'indigenous' Marxist genetics – to do so was a means to ensure self-preservation. This school experimentation did produce some positive results and a degree of motivation among pupils and teachers. The correspondence exchanged between M. N. Skatkin (1900–1991), in charge of the Office of Natural Sciences at the Central Scientific Research Institute of the primary school, and other teachers shows, on the one hand, the outlining of a new programme and, on the other, the problem of training teaching staff in this subject.[80]

The new natural science programme, elaborated by this office during 1937, had to provide a wealth of knowledge on inanimate nature, plants, animals and man. Skatkin argued that, until the end of the 1930s, it was based on the four-year curriculum that had led to an overload of topics. The introduction of the course on inanimate nature in class III, with the gap in class IV, meant that by the time they entered class V students had forgotten the foundations of the subject. The one-year time frame, from the third to the fifth grade in middle school, before dealing with botany, zoology, physics and physical geography, complicated the learning of these subjects:

> The result of all the flaws listed is that the elementary school does not create in the pupils precise knowledge of the elementary concepts of nature, indispensable both for the general development of the pupils and for the conscious assimilation of the principles of nature science in the following classes.[81]

Skatkin suggested organising the new curriculum by calculating seven years of compulsory education, so as to be able to offer a cycle of knowledge to pupils in the space of four years of elementary school. This was to be the basis of the seven-year school cycle, where the place for the elementary curriculum dealing with inorganic life, botany, zoology, anatomy and physiology of man should have been developed. Furthermore, the inorganic life programme should precede the study of botany and physical geography. The explanation of the systematic course of natural sciences should precede the formation in the pupils of a precise and concrete knowledge of elementary concepts in

[79]Lavrov, 'Antireligioznye vosprosy na uroke', 49–51.

[80]M. N. Skatkin was teacher at the so-called First Experimental Station of the People's Commissariat of Enlightenment organised by S. T. Shatsky in 1919 in Moscow and Kaluga. During the 1930s he was also the author of textbooks and teaching aids for the natural sciences; see S. Z. Zanaev, 'M.N. Skatkin kak avtor uchebnikov i uchebnikh posobii po estestvoznaniiu', *Istoriia i pedagogika estestvoznaniia* 3 (2014).

[81]*Predlozheniia k perestroike programmy po estestvoznaniiu dlia nachal'noi shkoly* [Proposals for the reorganisation of the natural science curriculum for the elementary school] (Fond 10: op. 1, delo 88, ll. 13–18), l. 13.

the field of living and dead nature.[82] To fill the indicated gaps, some new textbooks on natural sciences were published for elementary school (in two parts: 1939–1940), by V. A. Tetiurev, which presented the life of plants, animals and human beings.[83]

After the adoption of new programme in 1938/1939, one can note, on the one hand, the introduction of a new section on botany, during the biology lesson, dedicated to Lysenkoism and, on the other, very particular attention to teacher training, probably to test how they explained new conceptions of Soviet genetics.

K. Khamov, a teacher at the Moscow secondary school no. 59, for example, wrote that during the 1938/1939 course, after having heard of the results obtained in the Soviet Union in previous years, a pupil group following Lysenko's working methods was organised for the first time.[84] Furthermore, this teacher argued that 'the materials on T. D. Lysenko's activity, I. V. Michurin and other Darwinian scholars who reflect the nature of the organism has a great educational significance'.[85] His botany lesson was a mirror of Lysenko's Darwinist conception, considered as a part of Michurin's evolu-tionary theory, arguing that:

> development is a reciprocal relationship of the organism that has historically formed under certain conditions, with the external environment. Lysenko studies the body and conditions required for its development and gets the chance to direct evolutionary development. The close link with the *kolkhozes* gives Lysenko the opportunity to verify and correct his theory about millions of hectares of fields. At the end of the lesson, based on the chapter 'Principles of variability and inheritance', pupils were given a written task, which included the discussion topics:
> 1. Lysenko's study on plant stage development; 2. Michurin and Lysenko's works for the creation of new species arising from the choice of genital couple. 3. Works by Michurin and Lysenko on vegetative hybridisation and their meaning. 4. Darwin's findings on the degeneration of self-pollinating plants and Lysenko's work on the intersection of the species. 5. Lysenko and Michurin as Darwinists. 6. Michurin and Lysenko's work on plant transformation by combining conditions.[86]

Facing the ideological narration of genetics, both urban and rural schoolteachers needed help to improve science education, for two different reasons. The former were too theoretical for lack of a plot of land, the latter too practical. Moreover, they were confronted with the serious problem of school discipline, and so to motivate pupils and combat idleness the cultivation of the school's plot of land during botany lessons became a necessity.

During the summer of 1938, at the request of teachers who were also members of the Supreme Soviet of the Soviet Union, a group in Moscow, Leningrad and other cities attended lectures held in their districts in order to exchange teaching experiences, follow teacher training, and develop other forms of collaboration with rural teachers, among them so-called 'competition contracts' designed to motivate teachers to receive wage-related awards.

[82]*Predlozheniia k perestroike programmy*, 14.
[83]V. A. Tetiurev, *Estestvoznanie. Uchebnik dlia nachal'noi shkoly. Chast' pervaia* (Moscow: Uchpedgiz, 1939; Chast' vtoraja, 1940).
[84]K. Khamov, 'Izuchenie v shkole (IX klass) metodov raboty akad. T.D. Lysenko', *Biologiia v shkole* 6 (1939): 42–9.
[85]Khamov, 'Izuchenie v shkole (IX klass)', 42.
[86]Ibid., 48.

Among the most interesting experiences was that of I. D. Popov, a teacher in the city of Tula who organised an excursion with a group of colleagues to the plot of land adjacent to the school that he had been cultivating for five years. His school's plot of land could have served as a model, where up to 50 different species of Michurin fruit plants were growing and acclimatisation of a series of subtropical decorative plants was being carried out. A group of around 40 interested young naturalists worked on the school plot, performing different experiments such as crossing a watermelon with a pumpkin, potatoes with tomatoes, and other hybridisation and selection projects. The pupils' activities had a significant impact on their education and training, since they also actively involved undisciplined and negligent pupils, who became model naturalists and good students: 'It is moving to observe the attitude of care and attention to the plants and their fruits manifested by pupil-members of the section of young naturalists. In the plantation, a small nursery of Michurin plants was separated for the supply of other schools.' The teacher proposed to arrange an exhibition of his plants at the Pan-Russian Agriculture Exhibition.[87] He was also keen to move to other neighbourhood schools to organise plots of land, declaring that the biology lesson could in some cases be transformative, at least in good weather, when lessons were held in the open air in direct contact with nature.[88]

Urban schoolteachers, instead, had to settle for the traditional lesson in the classroom, using books and, when available, various types of teaching aids. In 1939, two teachers from schools nos. 143 and 87 in Moscow, who did not have a plot annexed to the school, devoted much attention to Michurin's life and activity during their explanation of the theme 'Principles of variability and inheritance', by hanging up Michurin's plates and showing wax models of fruits and berries. The teachers, E. Tseitlin and I. Shurgalina, recounted:

> what good taste and qualities the new kinds of berry crops introduced by him have, as they fit well to survive in newer conditions to the north in comparison with their land of origin. It must be clearly shown to students that Michurin has succeeded in transferring the south to Tambov and that the dream of his life is currently being realised – that is, 'to make Russia a flower garden'. Here is the main motto that emphasises 'Do not expect favours from nature but take it – it's our job'.[89]

This comparison between the experiences of city and country teachers was constantly discussed, as a second scientific and pedagogical conference was held on 20 June 1941, during which the educational results of previous years were described. Particularly interesting is the report of a teacher from the rural school of Romanovo (from Khermoz district). She described a process for the reorganisation of school life, participation in fieldwork by pupils, and involvement of parents and the whole community in children's education. The pupils at this school were very unruly, their educational performance was poor, and the surrounding population as well as the rural Soviets were prejudiced against both teachers and pupils. In a letter she wrote to the Central Scientific Institute of Research for the Primary School (collected by the Funds of the

[87]M. I. Mel'nikov, 'Ob avgustovskikh uchitel'skikh soveschaniiakh', *Biologiia v shkole* nos. 5–6 (1938): 9–10.
[88]Mel'nikov, 'Ob avgustovskikh uchitel'skikh soveschaniiakh', 10.
[89]E. S. Tseitlin and P. P. Shurgalina, 'Izuchenie v IX klasse zhizni i tvorchestva I.V. Michurina', *Biologiia v shkole* no.5 (1939): 31.

Russian Academy of Education founded in 1943) to describe her experience, she stated that 'I was not yet aware of Anton S. Makarenko but I knew that if there is a clear purpose in front of the man, then he is ready to overcome all the difficulties'[90]

The same teacher made an excursion with her students to observe the wheat harvest on the *kolkhoz*. Because abandoned ears of wheat attracted flocks of birds, the pupils proposed helping the *kolkhoz* members collect the remaining wheat, which became the first step in organising the growing of plants indoors at the school and led to the formation of a circle of young naturalists and the growing of watermelons and pumpkins on the *kolkhoz* for the school year 1938/1939. One pupil of class IV, Kim Juzhakov, having read in *Pioneer Truth* (*Pionerskaia Pravda*) about the activities of young naturalists in one of the incomplete secondary schools in the region, wrote a letter to the journal editorial office and received in return some seeds, among which were Michurin watermelons and pumpkins.[91] The pupils were able to cultivate pumpkins, watermelons, raspberries, currants and flowers on the plots of land attached to the school and on the *kolkhoz*:

> They watched with love and attention the growth and development of cultivated plants. During the harvest of the fruits, the boys weighed and measured the crop produced with interest. In order to spread these crops such as pumpkins and watermelons in our Soviet village, we have given 80 seeds to 2 peasants of the *kolkhozes* and to many young naturalists, who planted them in the plots of land belonging to their homes.[92]

At an exhibition in autumn 1937 a pupil exhibited a 2.5-pound watermelon and two pumpkins weighing 18 and 20 kg. In the winter of 1939, the school's plants did not survive the cold, so a group of young naturalists in Obvinsk sent letters and seeds at the end of April:

> we set to work with new energy. On the advice of young naturalists in Obvinsk [Perm region] we ordered seeds from the central station of young naturalists, we prepared the soil, planted tomatoes, pumpkins, melons, watermelons and flowers. Thanks to the loving care and attention of young seedling naturalists, plantings have grown well. By the end of April all our classes had turned into a flower garden again.[93]

In their written compositions, moreover, the children noted that they wanted to become agronomists or peasants of the *kolkhoz*. According to the teacher, this experience, which ended when most of the pupils entered secondary school, should not be measured from the point of view of the quantity of the crop but on its pedagogical effect on pupils.[94]

In this account there is no mention of growing experiments using Lysenko's methods, only a description of outdoor activities as a means to solve the problem of indiscipline and hooliganism among boys that affected the schools in the 1930s. Most likely, with the arrival of summer, this active learning was the only opportunity to

[90]Tseitlin and Shurgalina, 'Izuchenie v IX klasse', 1.
[91]*Materialy Vtoroi Oblastnoi Nauchno-Pedagogicheskoi konferencii 20 iunia 1941 (Molotovskii oblastnoi institut usovershenstvovaniia uchitelei)* [Materials of the Second Regional Scientific and Pedagogical conference of 20 June 1941 (Molotov Institute for the improvement of teacher training)], APN, Fond 15, op. 1, delo 1416, ll. 1–21, see 4.
[92]*Materialy Vtoroi Oblastnoi Nauchno-Pedagogicheskoi konferencii 20 iunia 1941*, 5.
[93]See note 92 above.
[94]*Materialy Vtoroi Oblastnoi Nauchno-Pedagogicheskoi konferencii 20 iunia 1941*, 21.

create a good atmosphere in the classroom, to cultivate some produce to eat and to transmit some useful vocational knowledge for the future.

Nevertheless, Lysenkoism had triumphed by now and dominated biology until Stalin's death (1953) and even until the 1960s. Vavilov himself ceased his activity. During an expedition in August 1940 he was taken directly from the camps and arrested; some of his collaborators were arrested shortly thereafter.[95] The arrests marked the end of Mendelian genetics.[96]

Numerous official sources testify to the spread of Lysenkoism among teachers in schools in Moscow and the large industrial centres, to which a new handbook devoted to the teaching of botany published by Vsesviatskii in 1941 also contributed. After having meticulously explained how a biology lesson had to be conducted, far away from the revolutionary 'complex method', in this textbook Vsesviatskii recommended that teachers transmit a particular Soviet consciousness to their students to become 'fighters for the conquest of nature', and he continued that 'in the study of nature, for example, during excursions and activities in the plots of land adjacent to the school, to establish a look at nature as a source of the material well-being of workers'. He also stated that:

> it was necessary to show the inexhaustibility of resources [and] natural beauty of our great country. From here the education of pupils about a thoughtful relationship with nature, woods, parks, green plantations, [and] their protection as social property naturally emerges. It is necessary to raise students to think that a more rational use of nature and its planned change is necessary to meet the different needs of workers.[97]

This consideration, which completed the description of new teaching methods, highlighted both a knowledge of nature and its exploitation, demonstrating the ideological evolution of a scientist who had to comply with the policy of transmitting the effect of the miraculous environment on the cultivation of wheat and potatoes, a symbol of the power of the new regime on genetics.

With the beginning of the Second World War, the natural sciences programme was modified. The first to be affected were the contents of the 1943 biology and physics textbooks, which moderated previously heated tones against anti-religious education, limiting themselves, in the case of botany, for example, to instil 'the Marxist (materialistic) conception of the world and religious and idealistic interpretations of natural phenomena'. The natural sciences curriculum included botany courses for the V–VI classes, zoology for VI–VII, the basics of Darwinism for IX, anatomy and physiology for IX, and physics for the VIII–X classes.[98]

The concept of Lysenkoism nevertheless continued to find ideological support. As David Joravsky argues:

> In 1948 the 'August Session' of the All-Union Agricultural Academy was supposed to put an end to such pretense, and it did in biology for geneticists. Lysenko announced that he had the official support of the Central Committee and of Comrade Stalin personally for his

[95]Medvedev, *Vzlet i padenie Lysenko*, 76–7, 110–12.
[96]In 1937, the Director of the Russian Institute of Fertilisation, founded in 1936 and annexed to the Agrosoil Station under V. R. Vil'ams and V. P. Bushin's direction, along with 12 agronomists, was arrested in Zaporozh'e, while the group directed by D. N. Priannikov was attacked when it was decided to try crop rotations (*senooboroty*); see Medvedev, *Vzlet i padenie Lysenko*, 141–5.
[97]B. V. Vsesviatskii, *Metodika prepodavaniia botaniki* (Moscow: Gos. Uchebno-ped. Izdatel'stvo, 1941), 20.
[98]J. Dunstan, *Soviet Schooling in the Second World War* (London: Palgrave Macmillan, 1997), 131–2.

Michurinist doctrine. The detonation demolished the laboratories and classrooms of geneticists, who took shelter in odd spots like pharmaceutical institutes of forestry stations until such time as they might emerge and start their science again. Almost none converted to Lysenkoism in their actual work, though a few mouthed pledges of intent.[99]

Conclusion

Science education underwent remarkable changes in the Soviet Union from the 1920s to the 1930s, revealing continuity until the mid-1960s. The first steps of the de-Stalinisation of the natural sciences occurred at the end of 1954, with a progressive abandonment of Lysenkoism. A textbook published in 1954, *The School Garden of Fruit and Berries*, had a cover representing children under an apple tree with baskets full of fruit, indicating that the cultivation of the school garden could have recreational aims in addition to strictly vocational ones.[100] A report of 6 December on the revision of school textbooks described a return to Darwinism, albeit in its Michurinian interpretation.[101]

The abandonment of Lysenkoism and the drafting of new textbooks were decreed during 1965 and definitively in 1966.[102] In a publication edited by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1968, specialists discussed different methods of teaching natural sciences – traditional or active.[103] Concerning the training of students in biology (zoology and botany), there was no more mention of this doctrine because 'besides the subjects mentioned above students study such biological sciences as genetics, the physiology of plants, the principle of the theory of evolution, and must be through with them by close of the third year of study'.[104]

Although it may be assumed that a country such as the Soviet Union has devoted a great deal of space to the natural sciences and generally to the sciences in the name of a general advance of mankind and nature, in this long period there was a manipulation of genetics and of its laws in the name of a sort of palingenesis of nature and of human beings. While at the theoretical level there was an ideological change in the interpretation of genetics, which marked the transition from Darwinism to Lysenkoism, on a practical level in school teaching there was a process that sacrificed the complexity of the natural sciences in favour of botany, which in urban areas also offered the possibility of developing useful activities to solve the problem of school disorder. The experience of country teachers was considered useful for those in the city, as the latter were more accustomed to an abstract lesson without the observations of nature and its laws, such as starting a school garden. It is probable that faith in Lysenkoism gave teachers hope in motivating pupils, even if in the direction of agricultural work, and helped them shelter from the purges.

[99]D. Joravsky, *Russian Psychology: A Critical History* (Oxford: Basil Blackwell, 1989), 403.
[100]A. G. Reznichenko, *Shkol'nyi plodovo-iagodnyj sad* (Moscow: Uchpedgiz), 1954.
[101]GARF, A-2306 (Fund of the People's Commissariat of Enlightenment), 72, 3700, 324–7.
[102]Medvedev, *Vzlet i padenie Lysenko*, 331–3.
[103]M. Oria, 'Sur les méthodes actives dans l'enseignement des sciences naturelles', in *New Trends in Biology Teaching/ Nouvelles tendances de l'enseignement de la biologie*, vol. 1, ed. R. Heller (Paris: UNESCO, 1968), 37–47; R. Baja, 'La méthode historique. Classes terminales et classes préparatoires', in *New Trends in Biology Teaching*, 48–66; and M. Oria and R. Baja, 'The Active and the Historical Method in the Teaching of Science', in *New Trends in Biology Teaching*, 67–77.
[104]E. V. Burlakova and U. A. Kriger, 'Training Biophysicists at the Biology and Pedology Department of Moscow University', in *New Trends in Biology Teaching*, 225–9.

The school thus became an instrument of the hegemonic vision of science, because it became the sounding board of an ideological conception that teachers had to disseminate slavishly. Science education did not reach the goal of mediating to pupils the laws of nature and biological experimentations, but, starting from the 1950s, about 10 years before the definitive abandonment of Lysenkoism, it gradually began to return to these aims.

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