

From Organismic Biology as History and Philosophy to the History and Philosophy of Biology—the Work of Hans-Jörg Rheinberger in the German Context**

Christian Reiß*

Summary: In this paper, I ask about the broader context of the history and philosophy of biology in the German-speaking world as the place in which Hans-Jörg Rheinberger began his work. Three German philosophical traditions—neo-Kantianism, phenomenology, and *Lebensphilosophie*—were interested in the developments and conceptual challenges of the life sciences in the late nineteenth and early twentieth centuries. Their reflections were taken up by life scientists under the terms *theoretische Biologie* (theoretical biology) and *allgemeine Biologie* (general biology), i.e., for theoretical and methodological reflections. They used historical and philosophical perspectives to develop vitalistic, organicist, or holistic approaches to life. In my paper, I argue that the resulting discourse did not come to an end in 1945. Increasingly detached from biological research, it formed an important context for the formation of the field of history and philosophy of biology. In Rheinberger's work, we can see the "Spalten" and "Fugen"—the continuities and discontinuities—that this tradition left there.

Keywords: history of biology, history and philosophy of biology, Lebensphilosophie, phenomenology, neo-Kantianism, organismic biology, Hans-Jörg Rheinberger, biophilosophy, theoretical biology

C. Reiß

History of Science, University of Regensburg

E-mail: christian.reiss@psk.uni-regensburg.de

** I would like to thank Kärin Nickelsen and Lara Keuck for the invitation to contribute to this special issue. This paper benefitted greatly from their feedback, from the feedback of the participants in the authors' workshop and from Elizabeth Hughes' editorial skills. It was a pleasure to return to Abteilung III. The paper is part of a special issue, *On Epistemic Times: Writing History 25 Years after Synthesizing Proteins in the Test Tube*.

© 2022 The Authors. Berichte zur Wissenschaftsgeschichte published by Wiley-VCH GmbH. This is an open access article under the terms of the Creative Commons Attribution Non-Commercial NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. Berichte zur Wissenschaftsgeschichte published by Wiley-VCH GmbH

1. Introduction

When we think about the impact of Hans-Jörg Rheinberger's work on the history and philosophy of the life sciences, we should also consider his own background and the context from which his work arose. The legacy of French history and philosophy of the life sciences in their different variations is apparent. A bit more complicated is his relation to the US-American tradition that began to dominate the field from the 1970s onwards. Interestingly, Rheinberger has approached the history and philosophy of science from a third place, namely, Germany.

In the following, I will examine a German tradition in the history and philosophy of biology and the connection to Rheinberger's work. I will sketch the relationships of three philosophical schools—neo-Kantianism, phenomenology, and *Lebensphilosophie*—to the life sciences. I will argue that they developed a very particular relation to life and the sciences of life. Taken up by life scientists, these approaches played an important role in the development of vitalism, organicism, and holism. Following the protagonists of this German history and philosophy of biology into the second half of the twentieth century, it becomes clear that they supported—or even invented—an organismic biology that positioned itself in stark contrast to the reductionism of molecular biology. This setting would haunt the field almost until the 1980s when the importance and the impact of genetics and molecular biology were slowly acknowledged by German historians and philosophers (of biology).

2. History, Philosophy, and Life since the Nineteenth Century

Life and the life sciences were important references for three closely connected philosophical traditions in the German speaking world: neo-Kantianism, phenomenology, and *Lebensphilosophie*.¹ Instead of looking at these traditions from within philosophy or from the perspective of the history of philosophy, I will focus on their relation to the life sciences. By doing this, I will concentrate on the similarities rather than the differences.

Neo-Kantianism emerged in the middle of the nineteenth century with a strong interest in the sciences.² Here, the scientific study of life was of interest in relation to physics in particular. Following Kant's own exclusion of the study of life from the sciences with regard to the problem of teleology and purpose, neo-Kantians were especially interested in electrophysiology (or organic physics, as it was called by its proponents) and evolutionary theory as the two most prominent approaches to the organic world at this time. Herman von Helmholtz (1821–1894), one of the leading physiologists, was deeply engaged with Kantian philosophy for his own epistemological studies. The challenge was how to align fully mechanistic explanations of organic phenomena with the specificities of the organic realm, like purpose or teleology. The

¹ My account of these traditions and their relation heavily relies on Bianco 2019.

² Beiser 2017.

epistemological debates concerned only a small but prominent number of scientists and were deeply embedded into broader cultural discourses about life and the limits of science. In these debates, critiques of the dominance of *Mechanismus*, i.e., the mechanical interpretation of nature, culture and man, gained momentum toward the end of the nineteenth century. While the field was more diverse and most practitioners rather agnostic to these philosophical considerations, a small group of zoologists and botanists effectively constructed the mechanistic framework as an erroneous and orthodox interpretation of life that needed to be overcome. They tied their critique to new results brought about by methods like the experiment. But they also managed to frame their view in a way that resonated with broader concerns about social and cultural transformations.

The two most prominent proponents of this approach, the zoologists Hans Driesch (1867–1941) and Jakob von Uexküll (1864–1944), came directly from the zoological laboratory. They turned the exclusion of the study of life from the sciences by Kantian philosophy into an asset and a demarcation. In his programmatic text, *Die Biologie als eigenständige Grundwissenschaft*, Driesch famously concluded:

For us, who follow the position of Kantian idealism in this study, in which causality and teleology are subjective forms of judgement, I see no concerns to also include teleological views in science. One may decide in this matter as one wants and, for my part, say that where causality ends, also science ends. But one should not forget that then something else begins that is connected to teleological judgement.³

Instead of defending the study of life as a science in what they portrayed as the orthodox Kantian sense, Driesch and others called for the necessity of an independent science of life, precisely because its object did not meet the requirements of the so-called exact sciences. It was only at the end of the century, that neo-Kantianism—or a philosophy inspired by a new reading of Kantian philosophy—fully embraced the life sciences and vice versa. Driesch would eventually switch from zoology to become a professor of philosophy in Heidelberg and Leipzig, and Uexküll, through an increasingly precarious career, developed his *Umweltlehre*, which would become highly influential both in the life sciences and in philosophy.

The next generation of life scientists and philosophers developed the field further. On the side of neo-Kantian philosophy in the narrower sense, it was Ernst Cassirer (1874–1945), who cultivated a continuing interest in the life sciences. But there were also other scholars who worked on establishing a common ground between philosophy and the life sciences. Building on the epistemology and classification focus that neo-Kantianism had set for philosophy and following the close relation between historical and philosophical approaches to investigate the related problems, these researchers developed the field into a systematic analysis of the heterogeneous landscapes of disciplines, methods, and theories that made up the life sciences at the beginning of the twentieth century.

³ Driesch 1893, on 58. Translation is mine.

This neo-Kantian approach played an important role in the formation of *theoretische Biologie* (theoretical biology) and *allgemeine Biologie* (general biology) as the two fields in which the foundations of a science of life were reflected upon and the basic structure for a unified biology was formulated at the turn of the twentieth century.

Phenomenology as developed by Edmund Husserl can be understood in part as a reaction to neo-Kantianism.⁴ Husserl himself was already very interested in the life sciences. The generations after him intensified this interest. With Max Scheler (1874–1928), Helmuth Plessner (1892–1985), and Arnold Gehlen (1904–1976) as the most prominent examples, the so-called philosophical anthropologists developed a third position between philosophical and often idealistic theories of man and the scientific and, particularly, the biological theories that became especially successful after Darwin.⁵ To this end, the approach built on a philosophical and historical reflection on the epistemological foundations of biology and became part of the same discourse as neo-Kantianism. While the approach was mostly developed by philosophers, there were also a number of life scientists involved in philosophical anthropology, most prominently the Swiss zoologist Adolf Portmann (1897–1982) and the Dutch physiologist Frederic J. J. Buytendijk (1887–1974).

Lebensphilosophie is a bit more difficult to grasp, since it was mostly a label assigned from outside, most prominently from neo-Kantianism and phenomenology. Thus it is most easily understood from the vantage point of the other two movements.⁶ Heinrich Rickert (1863–1936), a neo-Kantian, and Max Scheler were central in shaping the term for this heterogeneous and explicitly anti- or at least extra-academic movement. Both tied it to the names of Friedrich Nietzsche (1844–1900), Henri Bergson (1859–1941), and Wilhelm Dilthey (1833–1911) and used it to demarcate their own position as non-*Lebensphilosophie*. As the term *Lebensphilosophie*—philosophy of life—indicates, there was a lot of resonance with anti-mechanistic concerns and the focus on life as an irreducible phenomenon that also motivated Driesch and Uexküll.

Much more could be said about these philosophical traditions; however, my aim in this text is not to write a history of philosophy and to go into the details of these philosophical movements. I want to show the ways in which these movements were interested in biology and, even more, how life scientists drew on these movements to establish a distinct discourse on the history and philosophy of biology.

All three movements had a particular interest in life. The discourse labeled *Lebensphilosophie* was interested in life in the broadest sense with scientific conceptions of life being just one aspect. It set the frame for the extension of the concept of life beyond what was seen as the narrow mechanical

⁴ Bianco 2019.

⁵ Ebke 2012.

⁶ Bianco 2019.

understanding of the nineteenth century.⁷ As a particularly non-academic discourse, it also established an interest for these extensions beyond expert discussions. Neo-Kantianism focused on biology as a science with all of its epistemological and ontological challenges. It provided a philosophically rigorous discussion of the possibilities but also of the limits of a scientific conception of life. It also offered the tools to critically think about other core concepts like evolution, organism etc. and to identify theoretical problems such as purpose, and finality. Phenomenology shared the general interest in the sciences of life. In addition, it developed a very particular interest through its anthropological program. For a synthetic anthropology that would combine perspectives from philosophy and the life sciences, a common ground had to be established.

3. *Theoretische Biologie* and Other Biophilosophies in the Early Twentieth Century

These philosophical offers met a growing demand in the life sciences. From the middle of the nineteenth century onwards, a growing number of life scientists began to voice criticism concerning the theoretical and metaphysical foundations of their disciplines. They portrayed the field as dominated by mechanistic explanations and the orientation towards physics and chemistry.

In exchange, or at least in resonance with philosophical traditions like neo-Kantianism, the discussion about the foundations of the life sciences and the limits of mechanistic explanations gained momentum. Its impact was also fueled by the atmosphere of crisis and decline that was prevalent in Europe at the turn of the century. In the generations following Uexküll and Driesch, scholars worked to establish common ground between the life sciences and philosophy: Julius Schaxel (1887–1943), Emil Ungerer (1888–1976), Adolf Meyer-Abich (1893–1971), and Ludwig von Bertalanffy (1901–1972) from the side of the life sciences, and Emanuel Radl (1873–1942), Helmuth Plessner (1892–1985), Theodor Ziehen (1862–1950), and Richard Kroner (1884–1974) from the side of philosophy.

Many of the actors gathered under the headers of *theoretische Biologie*, *allgemeine Biologie* and *Biophilosophie*.⁸ The protagonists brought together perspectives from second generation neo-Kantianism and phenomenology to critique what they framed as the existing orthodoxy of biological thought and its application in philosophy and beyond—namely neo-Darwinian evolution and mechanistic and reductionist theories of life. From this critique, they set out to construct alternative approaches that developed, roughly speaking, from vitalism to holism and organicism.

⁷ Even though the connection is not stated explicitly, Lynn Nyhart's *Modern Nature* and the discourse on closeness to life in museum exhibits might serve as an example of the relations still to be explored, Nyhart 2009.

⁸ Laubichler 2001; Laubichler 2006.

Far from coherent, this field produced a specific form of history and philosophy of biology. The projects were driven by the search for a theoretical basis for biology as the new science of life that would unify the heterogeneous body of knowledge produced by zoology, botany, and other disciplines and do justice to the uniqueness of life as a phenomenon. Often this was mixed with other sentiments. The rejection of the mechanistic worldview carried anti-modern undertones. The search for wholeness and life was fueled by a critique of the abstraction of modern science and the vanishing of *Anschaulichkeit*.⁹

These biophilosophies were largely assemblages of philosophical and biological elements. Their proponents were less interested in systematicity, consistency, or philosophical rigor but worked at integrating biology and philosophical knowledge. For the most part, the actors worked at supporting what they framed as anti-mechanistic arguments. In this, they used history as a way to show the prevalence of non-mechanistic philosophies of life and they used philosophy to justify purpose and finality in the context of a science.

One prominent platform for these discussions was the book series *Abhandlungen zur theoretischen Biologie* (Essays on Theoretical Biology) edited by the Jena biologist Schaxel.¹⁰ It appeared in 30 volumes until 1931 with more volumes planned. Schaxel himself opened the series with a volume on general biology.¹¹ Other contributors included Driesch, the neo-Kantian philosophers Kroner and Ziehen, the botanist and theoretical biologist Johannes Reinke (1849–1931), as well as the Viennese zoologists and theoreticians Hans Przibram (1874–1944), Paul Weiss (1898–1989), and von Bertalanffy.¹² The volumes covered a wide range of subjects, such as philosophical investigations, experimental plant embryology, and psychology, always with a theoretical interest. Thirty volumes were published between 1919 and 1931. More volumes were planned, but the series was put on hold. Its final end came, when Schaxel had to flee Germany when the National Socialists seized power in 1933 due to his political activism. The void left in scientific publishing by the end of the book series was filled by *BIOS: Abhandlungen zur theoretischen Biologie und ihrer Geschichte, sowie zur Philosophie der organischen Naturwissenschaften* (BIOS: Essays on Theoretical Biology

⁹ Harrington 1996.

¹⁰ For more on Schaxel's work in theoretical biology, see Reiß 2007. For his political activism that eventually forced him to flee Germany, see also Hopwood 1997. The journal *Biologia generalis*, founded in 1925 by the Austrian physiologist Leopold Löhner (1884–1958), the US-American geneticist Raymond Pearl (1879–1940), and the Czechoslovakian biologist Vladislav Růžička (1870–1934) with Schaxel on the editorial board, offered a more international platform. In the editorial essay in the first issue, the editors referred to Schaxel's book series as important inspirations, see Löhner et al. 1925. In 1935 the journal *Acta biotheoretica* was founded in the Netherlands by the Leiden zoologist Cornelis J. van der Klaauw (1893–1972), the Leiden anatomist Joannes A. J. Barge (1884–1952) and Adolf Meyer-Abich, see Reydon et al. 2005.

¹¹ Schaxel 1919a. In the same year, Schaxel also published a monograph on theoretical biology titled *Grundzüge der Theorienbildung in der Biologie* (Outlines of the Formation of Theories in Biology), Schaxel 1919b.

¹² Driesch 1919; Kroner 1919; Ziehen 1921; Reinke 1922; Przibram 1923; Weiss 1926; Bertalanffy 1928.

and Its History, as well as on the Philosophy of the Organic Sciences). The new editor, Meyer-Abich, wrote the first volume, entitled *Ideen und Ideale der biologischen Erkenntnis: Beiträge zur Theorie und Geschichte der biologischen Ideologie* (Ideas and Ideals of Biological Knowledge: Contributions to the Theory and History of the Biological Ideology) and dedicated the volume to Driesch and Uexküll as “pioneers of theoretical biology.”¹³

The focus on theoretical and general biology lay on a particular set of fields. Experimental embryology and developmental biology were at the center, which promised a new view of the organism and the processes that formed it. There was also a lot of interest in animal psychology, which shared many of the same challenges and promises as developmental biology as well as the nascent field of human psychology.

Together with the similarly new field ecology, they formed the core of what in the second half of the twentieth century would become known as organismic biology. Ernst Mayr (1904–2005) carefully developed this notion as a defense strategy against molecular biology whose successes were perceived as increasingly threatening in the 1960s.¹⁴

4. The Fate of German History and Philosophy of Biology after 1945

At first sight, this field came to an end in 1945. Publication series ended and careers did not materialize. While we could easily dismiss this development as a dead-end, I argue that it played a significant and very much overlooked influence on the ways in which the history and philosophy of the life sciences developed in the second half of the twentieth century. It certainly shaped the topics and approaches in Germany.

Instead of a break, a closer inspection reveals a strong, albeit selective, continuity. Adolf Meyer-Abich was the first person to get a habilitation in history and philosophy of the sciences from the Universität Hamburg in 1926.¹⁵ He received an unpaid professorship in 1930. In 1946 he became a paid associate professor and later a full professor in Hamburg. Meyer-Abich had started his career as a philosopher with biological inclinations. He did his PhD with the *Lebensphilosoph* Rudolf Eucken on a neo-Kantian topic and his habilitation with Husserl on the *Logik der Morphologie* (The Logic of Morphology).¹⁶ In the course of the 1920s and an unsteady career path, he became one of the leading proponents of holism in Germany. He continued to publish on the history and philosophy of biology with a focus on holism until the end of his life.¹⁷

¹³ Meyer 1934, on V.

¹⁴ Milam 2010.

¹⁵ Brocke 1993, on 26. For more on Meyer-Abich, see Amidon 2008 and Dahn 2019.

¹⁶ Meyer 1916; Meyer 1926. He would only later add the name Abich to his last name.

¹⁷ Baedke et al. 2020 and Fábregas-Tejeda et al. 2021.

Another prominent author in these intertwining contexts was the philosopher Emil Ungerer. Ungerer began as a botanist and, through Hans Driesch, changed to philosophy. As a Kant scholar, Ungerer investigated many of the central themes of theoretical biology. He published in Schaxel's *Abhandlungen* and in Meyer-Abich's *BIOS*.¹⁸ He was never able to make a proper career in academia and worked as a secondary school teacher. In parallel, he held an unpaid professorship at the technical university in Karlsruhe. Ungerer authored two major contributions to the history of biology, which exemplify the wider networks and influences in the German history and philosophy of biology. When Ludwig von Bertalanffy organized the massive *Handbuch der Biologie* in 1942, Ungerer contributed the first chapter of the first volume entitled *Erkenntnisgrundlagen* (Epistemological Foundations). He used a detailed history of biology to lay out the theoretical and epistemological particularities of the science of life.¹⁹ He extended this approach in the 1960s, when he and the philosopher Theodor Ballauf (1911–1995) published a two-volume history of biology; Ballauf authored the first part on the history from antiquity to Romanticism and Ungerer wrote about the nineteenth and twentieth centuries.²⁰

The coherent affiliations to one of the philosophical traditions became increasingly loose. But the historical and philosophical investigation of biology had been established with holism and organicism as central perspectives. The topics were set from the philosophical traditions, from within biology as a discipline and by a larger cultural critique of reductionism. Although more and more detached from actual research in the life sciences, the aim of this history and philosophy of biology remained to establish a theoretical framework that would justify biology as its own independent science.

The journal *Philosophia naturalis: Archiv für Naturphilosophie und die philosophischen Grenzgebiete der exakten Wissenschaften und Wissenschaftsgeschichte* (*Philosophia naturalis: Archive for Natural Philosophy and the Philosophical Frontier Areas of the Exact Sciences and the History of Science*) is another example of this trend and adds further detail to this still very preliminary sketch of a German history and philosophy of biology. Founded in 1946 by the zoologist and natural philosopher Eduard May (1905–1956), the journal was an important platform for discussions of topics on the border between natural philosophy and philosophy of the sciences until its end in 2013. May started out as a zoologist and eventually became a natural philosopher under the influence of the Deutsche Physik philosopher Hugo Dingler. During the Nazi period, May worked as an applied entomologist at the Dachau concentration camp and started his philosophical career only after 1945. He taught at the Freie Universität Berlin beginning in 1950 and became full professor there in 1951.²¹

¹⁸ Ungerer 1922; Ungerer 1936.

¹⁹ Ungerer 1942.

²⁰ Ballauf 1954; Ungerer 1966.

²¹ On May's career and particularly his work at the Dachau concentration camp, see Reitzenstein 2014, on 78–104.

Apart from May, the journal's editorial team featured a number of names we have already encountered: Helmuth Plessner, Adolf Portmann, and Johann Jakob von Uexküll's son Thure von Uexküll (1908–2004), who continued the legacy of his father. The philosophy of biology made up a considerable portion of the journal during the 1950s and 1960s. Thematically, the influence of the organismic philosophy of biology from the interwar period is apparent. In continuity to theoretical biology and the biophilosophies of the interwar period, the focus was on the question of life in relation to vitalism, organicism and holism, the limits of evolutionary theory, and the problems of reductionism.

The emphasis on these topics was also mirrored by an almost complete neglect of the more physically and chemically oriented branches of the life sciences that had become more and more important since the 1930s. There is almost no interest in genetics, not even classical genetics. Biophysics and biochemistry were not discussed either. Even after molecular biology became increasingly prominent in the 1950s, the journal had hardly any papers on genetics in general. Until the 1970s, molecular genetics was not once the topic of a publication in *Philosophia naturalis*. This neglect by the German history and philosophy of biology is reflected by the fact that the first comprehensive history of genetics in German was published by the geneticist Hans Stubbe in 1963 in the GDR.²² The history of molecular genetics would only become a topic in Germany later. As an indicator, we might take the German translation of François Jacob's *La Logique du vivant*. This influential history of heredity was published in 1972. It was translated into German not by someone from the history and philosophy of biology, rather the Swiss molecular biologist Klaus Scherrer (born 1931), who was at that time the founding director of the molecular biology department at the Swiss Institute for Experimental Cancer Research (ISREC) in Lausanne, and his German wife, Jutta Scherrer (born 1942), who was a historian of Eastern Europe and Russia.²³

On both sides, this situation was understood as a conflict until the 1970s, as the following statement by the geneticist Georg Melchers (1906–1997) shows. In an edited volume on the future of biology from 1970, Melchers portrayed the ultimate victory of reductionism in light of the new molecular biology, pointing out that “nowhere in this context idealistic morphology in the sense of Goethe, Wilhelm Troll and Adolf Portmann is needed, and thomistic ontology does not play a role either.”²⁴

In many ways, the 1970s marked a watershed in this history. This was the decade in which molecular biology ultimately became the dominant reference frame for the life sciences. And it was the decade during which many of the

²² Stubbe 1963.

²³ Jacob 1972. In 1973, Klaus Scherrer became a researcher at the Institute of Molecular Biology (IMB), which was renamed Institut Jacques Monod in 1982. Jutta Scherrer became professor for Russian history at the École des Hautes Études en Sciences Sociales in Paris in 1980.

²⁴ Melchers 1970, on 43–44. The reference to thomistic ontology hints at the intricacies of the field. It might be a reference to the well-known German philosopher Nicolai Hartmann (1882–1950), the obscure German botanist Hans André (1893–1966), or to the French Jesuit and paleontologist Teilhard de Chardin (1881–1955).

protagonists passed away: Meyer-Abich in 1971, Ungerer and Bertalanffy in 1976. The history and philosophy of biology from the interwar period came to an end and left a void that was only slowly filled again.

5. The 1970s: *Spalt oder Fuge?*

In many ways, Rheinberger's approach to the history and philosophy of biology seems to be evidence for this rupture—or a *Spalt*. As we see in his 1997 book *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube* and the publications that followed, it is not just the history and philosophy of a very different kind of biology—namely molecular genetics—but also a very different form of history and philosophy.²⁵ It is the microhistory of concepts and practices—most importantly of the experiment in the laboratory related to epistemic things and technical objects—and not one of theories. And it is a philosophy, which asks about the epistemological consequences of the history of these concepts and practices.

Still, I would like to close this text by suggesting that there are also interesting continuities—or *Fugen*. Even though the interwar tradition of German history and philosophy of biology eventually became forgotten in the following years, it nevertheless set the stage and the questions for the future of the field. We can find this as traces on different levels in Rheinberger's work. Most obvious are references to phenomenology in the title of his latest book and to the works of the neo-Kantian Cassirer and the phenomenologist Husserl in his writings since *Toward a History of Epistemic Things*. Then there are the traces of organismic history and philosophy of biology. In a recent interview that Rheinberger gave together with Peter McLaughlin, it becomes clear that the two entered the field of history and philosophy of biology via the organismic route. This was in the 1970s, during the hiatus of the field. Consequently, the two remember the history and philosophy of biology as non-existent or marginal at best. They mention professorships affiliated with history of medicine institutes, informal groups like the *Arbeitskreis Biologiegeschichte* (Working Group on the History of Biology), but also Wolfgang Gutmann's group at the Senckenberg Museum in Frankfurt am Main that was working on an “anti-Darwinian, organismic theory of evolution.”²⁶

Then there are connections that suggest that the organismic history and philosophy of biology has a history beyond Germany. Through ways that still have to be explored, the tradition sketched in this paper also played a role in the development of the Anglo-American history and philosophy of biology. Ernst Mayr, for example, eagerly distanced his idea of a philosophy of biology from many of the interwar developments but still used the concept of an

²⁵ Rheinberger 1997.

²⁶ For the interview, see Grote et al. 2021. The early papers are published in Rheinberger and McLaughlin 2021. This is very close to the narrative given by the Deutsche Gesellschaft für Geschichte und Theorie der Biologie on her website, <https://www.geschichte-der-biologie.de/informationen/vorgeschichte> (accessed 2 June 2022).

organismic biology to counter the rise of molecular biology.²⁷ The ways in which Mayr sophisticatedly navigated between organicism and reductionism and the unique idea of a history and philosophy of biology he derived from it was also noticed by Rheinberger in an early review of the German translation of Mayr's *The Growth of Biological Thought*.²⁸ Another link is Marjorie Grene (1910–2009), who knew this German tradition very well through the time she spent in Germany in the 1930s. From there, she imported parts of it, namely the ideas of Plessner and Portmann, into the Anglo-American discourse. Grene and Mayr famously shaped the history and philosophy of biology. They were also important references in the work of Rheinberger. The complex, indirect and certainly often negative relations to the history of German history and philosophy of biology still have to be explored. As his most recent book, *Spalt und Fuge*, shows, we can see traces of this history in Rheinberger's work, but also something entirely different.²⁹

Acknowledgements

Open Access funding enabled and organized by Projekt DEAL.

References

- Amidon, Kevin S., "Adolf Meyer-Abich, Holism, and the Negotiation of Theoretical Biology," *Biological Theory* 3, no. 4 (2008): 357–370.
- Ballauff, Theodor, *Eine Geschichte der Biologie vom Altertum bis zur Romantik*, Die Wissenschaft vom Leben, vol. 1 (Freiburg: Alber, 1954).
- Baedke, Jan, Alejandro Fábregas-Tejeda, and Abigail Nieves Delgado, "The Holobiont Concept before Margulis," *Journal of Experimental Zoology Part B: Molecular and Developmental Evolution* 334, no. 3 (2020): 149–155.
- Beiser, Frederick C., *The Genesis of Neo-Kantianism, 1796–1880* (Oxford: Oxford University Press, 2017).
- Bertalanffy, Ludwig von, *Kritische Theorie der Formbildung*, Abhandlungen zur theoretischen Biologie, vol. 27 (Berlin: Borntraeger, 1928).
- Bianco, Giuseppe, "Philosophies of Life," in *The Twentieth Century*, The Cambridge History of Modern European Thought, vol. 2, ed. Peter E. Gordon and Warren Breckman (Cambridge: Cambridge University Press, 2019), 153–175.
- Brocke, Bernhard von, "Das Elend der Wissenschaftsgeschichte in Deutschland: Zur Entwicklung der Wissenschaftsgeschichte seit Ranke, insbesondere im 20. Jahrhundert," *Mitteilungen der Österreichischen Gesellschaft für Wissenschaftsgeschichte* 13 (1993): 3–81.
- Dahn, Ryan, "Big Science, Nazified? Pascual Jordan, Adolf Meyer-Abich, and the Abortive Scientific Journal *Physis*," *Isis* 110, no. 1 (2019): 68–90.
- Driesch, Hans, *Die Biologie als selbständige Grundwissenschaft und das System der Biologie: Ein Beitrag zur Logik der Naturwissenschaften* (Leipzig: W. Engelmann, 1893).
- Driesch, Hans, *Der Begriff der organischen Form*, Abhandlungen zur theoretischen Biologie, vol. 3 (Berlin: Borntraeger, 1919).

²⁷ Milam 2010.

²⁸ Rheinberger 1986.

²⁹ Rheinberger 2021.

- Ebke, Thomas, *Lebendiges Wissen des Lebens: Zur Verschränkung von Plessners Philosophischer Anthropologie und Canguilhems Historischer Epistemologie* (Berlin: Akademie Verlag, 2012).
- Fábregas-Tejada, Alejandro, Abigail Nieves Delgado, and Jan Baedke, "Revisiting Hans Böker's 'Species Transformation through Reconstruction: Reconstruction through Active Reaction of Organisms' (1935)," *Biological Theory* 16, no. 2 (1 June 2021): 63–75, online: <https://doi.org/10.1007/s13752-020-00370-7>.
- Grote, Mathias, Anke te Heesen, Peter McLaughlin, and Hans-Jörg Rheinberger, "Ordnung und Organisation. Interview zur Historiographie der Biologie mit Hans-Jörg Rheinberger und Peter McLaughlin," *Berichte zur Wissenschaftsgeschichte* 44, no. 3 (2021): 267–280.
- Harrington, Anne, *Reenchanting Science: Holism in German Culture from Wilhelm II to Hitler* (Princeton: Princeton University Press, 1996).
- Hopwood, Nick, "Biology between University and Proletariat: The Making of a Red Professor," *History of Science* 35 (1997): 367–424.
- Jacob, François, *Die Logik des Lebenden: Von der Urzeugung zum genetischen Code*, trans. Jutta Scherrer and Klaus Scherrer (Frankfurt am Main: Fischer, 1972).
- Kroner, Richard, *Das Problem der historischen Biologie*, Abhandlungen zur theoretischen Biologie, vol. 2 (Berlin: Borntraeger, 1919).
- Laubichler, Manfred D., "Mit oder ohne Darwin? Die Bedeutung der darwinschen Selektionstheorie in der Konzeption der Theoretischen Biologie in Deutschland von 1900 bis zum Zweiten Weltkrieg," in *Darwinismus und als Ideologie*, ed. Uwe Hoßfeld and Rainer Brömer (Berlin: VWB – Verlag für Wissenschaft und Bildung, 2001), 229–262.
- Laubichler, Manfred D., "Allgemeine Biologie als selbständige Grundwissenschaft und die allgemeinen Grundlagen des Lebens," in *Der Hochsitz des Wissens: Das Allgemeine als wissenschaftlicher Wert*, ed. Michael Hagner and Manfred Dietrich Laubichler (Zürich and Berlin: Diaphanes, 2006), 185–205.
- Löhner, Leopold, Raymond Pearl, and Vladislav Růžička, "Introduction," *Biologia generalis* 1, no. 1 (1925): I–II.
- Meyer, Adolf, *Über Liebmanns Erkenntnislehre und ihr Verhältnis zur Kantischen Philosophie: Ein Beitrag zur Kritik des modernen Intellektualismus* (Borna-Leipzig: Noske, 1916).
- Meyer, Adolf, *Logik der Morphologie im Rahmen einer Logik der gesamten Biologie* (Berlin and Heidelberg: Springer-Verlag, 1926).
- Milam, Erika Lorraine, "The Equally Wonderful Field: Ernst Mayr and Organismic Biology," *Historical Studies in the Natural Sciences* 40, no. 3 (2010): 279–317.
- Nyhart, Lynn K., *Modern Nature: The Rise of the Biological Perspective in Germany* (Chicago: University of Chicago Press, 2009).
- Przibram, Hans, *Aufbau mathematischer Biologie*, Abhandlungen zur theoretischen Biologie, vol. 18 (Berlin: Borntraeger, 1923).
- Reinke, Johannes, *Grundlagen einer Biodynamik*, Abhandlungen zur theoretischen Biologie, vol. 16 (Berlin: Borntraeger, 1922).
- Reiß, Christian, "No Evolution, No Heredity, Just Development—Julius Schaxel and the End of the Evo–Devo Agenda in Jena, 1906–1933: A Case Study," *Theory in Biosciences* 126, no. 4 (2007): 155–164.
- Reitzenstein, Julien, *Himmels Forscher: Webrwissenschaft und Medizinverbrechen im "Abnenerbe" der SS* (Paderborn: Schöningh, 2014).
- Reydon, Thomas A. C., Piet Dullemeijer, and Lia Hemerik, "The History of *Acta Biotheoretica* and the Nature of Theoretical Biology," in *Current Themes in Theoretical Biology: A Dutch Perspective*, ed. Thomas A. C. Reydon and Lia Hemerik (Dordrecht: Springer, 2005), 1–8, online: <https://doi.org/10.1007/1-4020-2904-7>.
- Rheinberger, Hans-Jörg, "Ernst Mayr, *Die Entwicklung der biologischen Gedankenwelt*" (Book Review), *Medizinhistorisches Journal* 21, no. 1–2 (1986): 172–185.
- Rheinberger, Hans-Jörg, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube* (Stanford: Stanford University Press, 1997).

Christian Reiß

- Rheinberger, Hans-Jörg, *Spalt und Fuge: Eine Phänomenologie des Experiments* (Berlin: Suhrkamp, 2021).
- Rheinberger, Hans-Jörg, and Peter McLaughlin, *Ordnung und Organisation: Begriffsgeschichtliche Studien zu den Wissenschaften vom Leben im 18. und 19. Jahrhundert* (Rangsdorf: Basiliken-Presse, 2021).
- Schaxel, Julius, *Über die Darstellung allgemeiner Biologie*, Abhandlungen zur theoretischen Biologie, vol. 1 (Berlin: Borntraeger, 1919a).
- Schaxel, Julius, *Grundzüge der Theorienbildung in der Biologie* (Jena: Gustav Fischer, 1919b).
- Stubbe, Hans, *Kurze Geschichte der Genetik bis zur Wiederentdeckung der Vererbungsregeln Gregor Mendels* (Jena: VEB Gustav Fischer Verlag, 1963).
- Ungerer, Emil, *Die Teleologie Kants und ihre Bedeutung für die Logik der Biologie*, Abhandlungen zur theoretischen Biologie, vol. 14 (Berlin: Borntraeger, 1922).
- Ungerer, Emil, *Zeit-Ordnungsformen des organischen Lebens*, Bios: Abhandlungen zur theoretischen Biologie und ihrer Geschichte, sowie zur Philosophie der organischen Naturwissenschaften, vol. 5 (Leipzig: Barth, 1936).
- Ungerer, Emil, "Die Erkenntnisgrundlagen der Biologie, ihre Geschichte und ihr gegenwärtiger Stand," in *Handbuch der Biologie: Begründet von Ludwig von Bertalanffy. Band I/1. Allgemeine Biologie. Erster Teil. Erkenntnisgrundlagen I*, ed. Ludwig von Bertalanffy (Konstanz: Akademische Verlagsgesellschaft Athenaion, 1942), 1–94.
- Emil Ungerer, *Der Wandel der Problemlage der Biologie in den letzten Jahrzehnten*, Die Wissenschaft vom Leben, vol. 2 (Freiburg: Alber, 1966).
- Weiss, Paul, *Morphodynamik: Ein Einblick in die Gesetze der organischen Gestaltung an Hand von experimentellen Ergebnissen*, Abhandlungen zur theoretischen Biologie, vol. 23 (Berlin: Borntraeger, 1926).
- Ziehen, Theodor, *Die Beziehungen der Lebenserscheinungen zum Bewußtsein*, Abhandlungen zur theoretischen Biologie, vol. 13 (Berlin: Borntraeger, 1921).