DISCUSSION OF EVOLUTION BETWEEN NEO-LAMARCKISM AND NEO-DARWINISM IN THE CZECH LANDS, 1900–1915

Abstract: *The study focuses on the impact of the changes in biology of the late 19th and early 20th century in the Czech Lands. Until WWI, there existed several distinct theories of evolution of organisms. In the Czech Lands, this multitude of explanations was complemented by a multi-layered cultural and scientific environment, where Czech and German biology influenced each other and met at various autonomous institutions. There were also differences between Prague and Brno, centres with their own scientific traditions and independent links to Vienna and other European universities. The main subject of this paper are the theoretical biologists who had long-term impact on Czech biological thought or influenced it directly by working here. In about 1900–1915, we witness the first clear and recognised peak in the Czech reception of evolutionism.*

Keywords: *history of biology; Neo-Darwinism; Neo-Lamarckism; theory of evolution; Czech Lands 1900–1915; Charles University*

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Diskuse o evoluci mezi neolamarckismem a neodarwinismem v českých zemích (1900–1915)

Abstrakt: *Studie se zabývá odrazem změn v biologickém myšlení v českých zemích od přelomu 19. a 20. století do první světové války, kdy vedle sebe existovaly různé názory na evoluci. Mnohovrstevnatost teoretickou přitom doplňuje i kulturní a vědecká mnohovrstevnatost českých zemí, kde se mísila německé a české biologie na autonomních institucích. Projevovaly se i rozdíly mezi centry v Praze a Brně s jejich badatelskými tradicemi a nezávislými vazbami na Vídeň a jiné evropské univerzity. Ústředním zájmem jsou teoretičtí biologové, kteří dlouhodobě profilovali české biologické myšlení či na něj měli přímý vliv skrze své zdejší působení. V letech 1900–1915 došlo k prvnímu otevřenému a diskutovanému vrcholu v české recepci evolucionismu.*

Klíčová slova: d*ějiny biologie; neodarwinismus; neolamarckismus; teorie evoluce; české země 1900–1915; Univerzita Karlova*

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The process of reception of Darwinism in the Czech Lands offers, through the medium of a particular historical example, a fascinating insight into a broad range of general questions concerning the theory and sociology of science, brings up various important issues of contemporary intellectual history, namely questions regarding the place of science in modern society and within different political regimes, and finally, it sheds some new light on the relation between science, philosophy, politics, and ideology in general.

Until today, Darwin's teaching provides the most important and influential framework for a scientific explanation of the origin and evolution of organisms. Yet, in the Czech Lands (Bohemia and Moravia), its legacy and discussions surrounding its reception were often influenced by a broad framework of philosophical, ethical, religious, political, and ideological issues. We have described the first hundred years of reception of Darwin's work in the Czech Lands, starting with Darwin's arrival in the scientific community in 1859 and ending with a centenary in 1959, in a volume on *The Reception of Charles Darwin in Europe*.[1] There, we tried to present a broad and comprehensive outline of the influence Darwinism exerted in this region. We took into account the variety of possible applications of the theory of evolution, the many scientific disciplines where it found use, and a number of important people who were connected with Darwinism in some way. In our view, all these aspect, jointly taken, form a remarkable network of scientific, philosophical, ideological, and political issues. Through this prism we can then better understand this one specific region of Central Europe and the events which shaped its history in the 19th and 20th century. The scope of the present study, however, is too limited to go into these particulars.

Given that both of the main totalitarian ideologies of the 20th century, Nazism and Communism, which in fast sequence exerted large influence on the Czech scientific thinking, extensively used and misused Darwinism, it is the beginning of the 20th century that deserves close attention. In the following study we therefore intend to follow in some detail various aspects of the debate and the multitude of positions from which Darwinism was discussed. At the centre of our attention are biologists with theoretical inclinations who either had a large impact on Czech biological thinking or worked here

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[1] Tomáš HERMANN – Michal ŠIMŮNEK, "Between Science and Ideology: The Reception of Darwin and Darwinism in the Czech Lands, 1859–1959." In: ENGELS, E.-M. – GLICK, T. F. (eds.), *The Reception of Charles Darwin in Europe*. Vol. 1. London – New York: Continuum 2008, p. 199–216.

and influenced it directly. And then, there is another aspect which needs proper consideration: A confrontation and comparison between the situation in Prague and in Brno may not only help us understand some of the complexity attendant upon the reception of Darwinism in the Czech Lands but also offer an interesting insight into the complexities of intellectual and scientific networks in Central Europe.

The beginning of the 20th century witnessed an abundance of debates about an "eclipse of Darwinism". For the most part, these discussions focused on a reinterpretation of the foundations of the Darwinian view of evolution, at the centre of which stood the theory of natural selection, issues of origins of variability, preservation of variations, their heritability etc. Theoretical discussions of this period feature a vast number of "isms", often accompanied by the prefix "neo". Various version of "neo-vitalism" emerged and were becoming dominant. They were often defined by contrast to Darwinism of the second half of the 19th century and opposition to a mechanistic explanation of living nature. The need to complete and extend the Darwinian view of evolution led on the one hand to a renaissance of various versions of "neo-Lamarckisms", and to a more extreme formulation of "neo-Darwinism" based on Weismann's original formulations on the other hand. At the centre of these discussions stood the new results of studies in heredity, which after 1900 united the methodology and scientific results of several fields of biology (hybridism, cytology, variation statistics, etc.). The aim of many scientists was to capture the complexity of evolution of living organisms within the fast developing framework of heredity/genetics. In accordance with the prevailing mood of that time, many of these subtle, inherently biological problems were incorporated into philosophical frameworks, and eventually came to play an important role in the development of positions on social issues and social policies.[2]

[2] On the situation in biology in early 20th century see in contemporary account esp. Emanuel RÁDL, *The History of Biological Theories*. London: Oxford University Press 1930. (German original Emanuel RÁDL, *Geschichte der biologischen Theorien. Teil II, Entwicklungstheorien in der Biologie des XIX. Jahrhunderts*. Leipzig: Engelmann 1909; for more on the author see below.) From newer literature, see esp. Peter J. BOWLER, *Evolution: The History of an Idea*. Berkeley – Los Angeles – London: University of California Press 2003, p. 224–324 (contains further references to various problems and disciplines), also Garland ALLEN, *The Life Sciences in the Twentieth Century*. New York – London: Cambridge University Press 1975. For genetics especially, see Leslie C. DUNN, *A Short History of Genetics*. New York: McGraw-Hill 1965; Hans STUBBE, *History of Genetics: From Prehistoric Times to the Rediscovery of Mendel's Laws*. Cambridge, MA: MIT Press 1972; and Raphael FALK, *Genetic Analysis: A History of*

Just as the impact of Darwin's thoughts varied in different sciences, so too its influence and the ways in which it was asserted differed in life sciences across various countries and their intellectual centres. We can make a very rough division of four "scientific cultures" in Europe of this period, centring them around the Anglo-Saxon, French, German, and Russian linguistic and cultural sphere. Since the mid-19th century, however, other national communities of various sizes began to rise and gain influence. Not surprisingly, one of their main aims was an emancipation of national science. Such enterprises usually included a creation of an independent scientific infrastructure and a formation of new intellectual elites.

The Czech Lands of this period represent not an exception but rather a historically typical example of local traditions, regionalism, and cultural interfaces of modern European science.[3] It was a multi-national region situated in the middle of the European continent, historically integrated in a larger supranational state unit (the Hapsburg monarchy), whose two nascent modern cities, Prague and Brno, were the home of two cohabiting linguistic communities, the Czech and the German one. Nevertheless, an exclusively linguistic/national point of view can be in the case of these regional capitals misleading since some traditional and largely independent ties to the capital of the monarchy, that is, Vienna and its scientific institutions existed at least until 1918.

In the Czech Lands in the period between 1900 and the outbreak of the WWI, we can distinguish in contemporary discussions of Darwin's legacy and evolutionism two different but inherently closely related centres and their viewpoints. One was the bilingual environment of Prague, the only university town and the most important intellectual centre of the Czech Lands, the other was found in Brno with its specific research tradition, in which after 1900 genetics also played a key role. In the context of discussions in early 20th century, the contribution of Moravia's capital, Brno, was no less important than that of Prague. At that time, it still probably had closer ties to Vienna than to Prague. Its position had much to do with the beginnings and development of modern research of heredity. After 1900, the question of a mutual relation between a Mendelian explanation of heredity based on hybridisation experiments and Darwin's approach to evolution surfaced as one

Genetic Thinking. Cambridge: Cambridge University Press 2009. For cytology, see Arthur HUGHES, *A History of Cytology*. London – New York: Abelard-Schuman 1959.

[3] For more on this topic, see Otto URBAN, *Die tschechische Gesellschaft 1848 bis 1918*. Vienna – Cologne –Weimar: Böhlau 1994; and František KAFKA – Josef PETRÁŇ (eds.), *A History of Charles University*. Vol. II. Prague: Karolinum 2001.

of the important topics to be dealt with. Already the first Mendelians, such as William Bateson (1861–1926), speculated about possible consequences of connecting existing results of Mendel's and Darwin's work.[4] This provoked a discussion which remained part of Mendelian biographical research for the entire first half of the 20th century. Another issue that appeared at this time was the question whether Mendel's own attitude to Darwin was one of approval or rejection, and whether his work in any way aimed at filling in the gaps in his theory of evolution of living organisms.[5] At the beginning of the 20th century, we witness not only various attempts to publicise Mendel's own work – these were undertaken mainly by one of the "re-discoverers" of his work, Erich von Tschermak-Seysenegg, who, inspired by his older brother Armin (1870–1952), directly followed in Darwin's footsteps – but also the first attempt to present Mendel's biography, which was the work of the botanist Hugo Iltis (1882–1952). Iltis presented his interpretation of Mendel's attitude to the theory of evolution in a comprehensive biography *Gregor Johann Mendel, Leben, Werk und Wirkung*, which was published first in 1924 in German, and in 1932 also in English.[6] In addition to presenting Mendel's own documents, Hugo Iltis also tried to ascertain which parts of Darwin's work Mendel had at his disposal. He concluded that the library of the convent contained not only Darwin's main works but also all important publications of 1860s and 1870s. The celebration of Mendel in 1910 then provided the opportunity to present also the views of scientists such as Richard Semon (1859–1918) and Paul Kammerer (1880–1926) who tried to unite the principle of "somatic induction", i.e., an alternative view of heredity which relied on so-called "mendeling" (*mendeln*) with evolution.[7]

[4] William BATESON, *Mendel's Principles of Heredity*. Cambridge: Cambridge University Press 1909.

[5] See Vítězslav OREL, "Rozdílné výklady postoje G. Mendela k evoluci a darwinismu." [Different Interpretations of G. Mendel's Attitude to Evolution and Darwinism]. *Dějiny věd a techniky*, vol. 2, 1969, no. 1, p. 9–17; and see also Gavin de BEER, "Mendel, Darwin, and Fisher 1865–1965." *Notes and Records of the Royal Society of London*, vol. 19, 1964, no. 2, p. 192–226.

[6] Hugo ILTIS, *Gregor Johann Mendel, Leben, Werk und Wirkung*. Berlin: J. Springer 1924. Hugo ILTIS, *Life of Mendel*. New York: W. W. Norton & Co. 1932.

[7] See Richard SEMON, "Die somatogene Vererbung im Lichte der Bastard- und Variationsforschung." *Verhandlungen des Naturforschenden Vereines in Brünn*, vol. 49, 1910, p. 241–266; Paul KAMMERER, "Mendelsche Regeln und Vererbung erworbener Eigenschaften." *Verhandlungen des Naturforschenden Vereines in Brünn*, vol. 49, 1910, p. 72–111; and see also Sander GLIBOFF, "The Case of Paul Kammerer: Evolution and Experimentation in the Early 20th Century." *Journal of the History of Biology*, vol. 39, 2006, no. 3, p. 525–563.

The dominant academic institution in Prague was the Prague University, which in 1882 split in two largely independent parts, a Czech and a German one.[8] Until the mid-20th century, the German science in Czech Lands was more or less smoothly incorporated in the large body of research produced in German speaking countries, and was generally considered part of the German scientific environment. Let us just mention, for example, the stay in Prague of such important representatives of modern science as Ernst Mach, Albert Einstein, Christian von Ehrenfels, Berthold Hatschek, Carl Rabl, Richard von Wettstein, Alfred Weber, Felix Weltsch, Hans Kohn, Oskar Kraus, Philipp Frank, and later also Rudolf Carnap. Some of these men of science were born in Prague or lived here for a long time, while others left their mark here by their scientific work. It was Max Brod, the Prague-German writer, who introduced the expression "Prague Circle" (*der Prager Kreis*) as a name for the rather unique phenomenon of Prague German literature. It would be hard, though, to speak of a "Prague Circle" in science since any such thing would include scientists from a variety of fields, many of whom worked here only for a brief period of time.[9]

At the beginning of the 20th century, intense discussions about the importance and implications of Darwin's theory went on also among the German-speaking intellectuals. The first widely reported debate took place in Vienna but a number of scholars working in Prague joined it as well. This discussion took the form of a series of articles inspired by lectures of Professor Dr. Max Kassowitz (1842–1913), a paediatrician, in winter 1901. The lectures were presented at the Faculty of Philosophy of the University of Vienna under the title "The Crisis of Darwinism".[10] Alongside biologists such

[8] *Universitas Carolina*, in the 19th century called *Charles-Ferdinand University,* was created by Ferdinand III in a decree on union of February 23, 1624, which united Charles's school with the Jesuit college in Klementinum. After 1918, its Czech part was once again called *Charles University,* while the German part of the university was to be known as *The German University in Prague* (this separation was however instituted only on February 19, 1920, by "Lex Mareš"). Other institutions such as societies for science and various clubs played had their place but their importance was secondary. For more see HERMANN –ŠIMŮNEK, "Between Science and Ideology."

[9] Max BROD, *Streitbares Leben*. Munich: Kindler 1960. Max BROD, *Der Prager Kreis*, Stuttgart: Suhrkamp 1966.

[10] See Max KASSOWITZ, "Die Krisis des Darwinismus." In: *Vorträge und Besprechungen. Wissenschaftliche Beilage zum fünfzehnten Jahresbericht (1902) der Philosophischen Gesellschaft an der Universität zu Wien*. Leipzig: J. A. Barth 1902, p. 7–64 (including the discussion of R. v. Wettstein, B. Hatschek, Ch. v. Ehrenfels and J. Breuera). For more on Ehrenfels see also Fabian REINHARD, "Christian von Ehrenfels: Leben und Werk." In: *Studien zur österreichischen Philosophie*. Vol. 8. Amsterdam: Rodopi 1986.

as Richard von Wettstein and Berthold Hatschek, who worked in 1880s and 1890s in Prague, Christian von Ehrenfels (1859–1932), the founder of Gestalt psychology who in 1896–1929 lectured at the Faculty of Philosophy of the German part of the Prague University, also took part. Von Ehrenfels focused on the principle of selection and its implications for the social sphere and ethics. Later, he even considered this principle to constitute an irrefutable basis of his cosmological hypothesis.[11] Emphasis on social applications led him to contacts with the founders of German hereditary (racial) hygiene. As an enthusiastic Wagnerian, von Ehrenfels had especially good relations with the physician Dr. Wilhelm Schallmayer (1857–1919). He also took long-lasting interest in the issue of a "sexual reform" based on "organic necessities". Von Ehrenfels saw systematic selection based on scientific grounds as one of so-called "generative tasks" (*generative Aufgaben*). In this context, he became known to broader public in 1907 by his work on the "constitutive malignancy" (*konstitutive Verderblichkeit*) of monogamy.[12] At about the same time, Alfred Weber (1868–1958), younger brother of Max Weber, devoted in 1904–1907 much of his lectures in sociology, which he presented at the faculty of law of the German part of the Prague University, also to reflection and discussion of Darwin's theory of evolution. The close connection between local discussions in philosophy (Prague followers of Brentano), theoretical physics, biology, and sociology, as well as interdisciplinary discussions of the theory of evolution is illustrated in the well-known memoirs of Max Brod who regularly attended Weber's seminars.[13]

As in many other countries, the German-speaking biologists of Prague, too, espoused Darwin's legacy. This was marked in February 1909 by a keynote address speech called "Commemorating Charles Darwin" on the relevance of Darwinism was presented at a meeting of the German-speaking "Lotus" Society in Prague.[14] The author was at the then newly appointed

[11] Christian von EHRENFELS, *Kosmogenie*. Jena: Eugen Diderichs Verlag 1916, p. 74–75.

[12] See Christian von EHRENFELS, "Die sexuale Reform." *Politisch-Anthropologische Revue*, vol. 2, 1903–4, p. 970–94. Christian von EHRENFELS, "Das Mütterheim." *Politisch-Anthropologische Revue*, vol. 5, 1906–7, p. 221–239. Christian von EHRENFELS, "Die konstitutive Verderblichkeit der Monogamie." *Archiv für Rassen- und Gesellschaftsbiologie*, vol. 3, 1907, p. 615–51, 803–30. Christian von EHRENFELS, *Sexualethik*. Wiesbaden: J. F. Bergmann 1907. Christian von EHRENFELS, "Leitziele zur Rassenbewertung." *Archiv für Rassen- und Gesellschaftsbiologie*, vol. 8, 1911, p. 59–71.

[13] BROD, *Streitbares Leben*; see also Josef KEPESZCZUK, *Alfred Weber: Schriften und Aufsätze 1897–1955*. Munich: Piper 1956.

[14] "Verein Lotos"; see Friedrich CZAPEK, "Zum Gedächtnisse von Charles Darwin." *Lotos*, vol. 57, 1909, no. 9, p. 265–280; for more on Darwin Anniversary 1909 see Marsha

head of the German Institute of Plant Physiology, Professor Friedrich Czapek (1868–1921).[15] As he had just moved to Prague from the University in Czernowitz, Galicia, his speech on Darwin may be regarded as a sort of starting point of his work in Prague. Czapek's paper was originally written during his visit of England, where he attended an international botanical conference in Cambridge. The main arguments of his 1909 lecture may be summarised as follows: 1) From a historical perspective, Darwin, alongside Kepler and Copernicus, belongs to the most important scientists ever. 2) The defence, discussions of Darwinism, and attacks on it have been going on for over fifty years, which is mainly a reflection of the fact that Darwinism is an ongoing, still unfinished process. 3) The validity of the principle of selection both in the manifestation of adaptations, and in the process of formation of new animal and plant forms, must be seen as certain: "Without the use of the principle of selection within the teaching of the origin of species we can not get by."[16] There exist processes which directly influence the form of an organism through external stimuli (here, surprisingly, F. Czapek explicitly overemphasised the Lamarckian explanation of inheritance). 4) Darwinian thinking had an enormous impact on the development of the several disciplines in the preceding fifty years (anatomy, physiology) that can not be neglected.

Another figure who played a very important role in contemporary discussions on development, ontogeny, and phylogeny was the anatomist and embryologist Professor Carl Rabl (1853–1917), who held a chair at the German Faculty of Medicine in Prague in 1885–1904. He became well known in the scientific community thanks to his work on the structure and functioning of cells, where he focused on the description and detailed representation of the poles of cell nuclei, and investigation of the number of chromosomes. In his 1880 study "On Cell Division" (*Über Zellteilung*), he formulated, for example, a hypothesis about a continuity of chromosomes through cell division.

L. RICHMOND, "The 1909 Darwin Celebration. Reexamining Evolution in the Light of Mendel, Mutation, and Meiosis." *Isis*, vol. 97, 2006, p. 447–484; and Eduard I. KOLCHINSKY, "Charles Darwin's Anniversaries in Socio-Cultural and Cognitive Contexts." *Studies in the History of Biology*, vol. 1, 2009, no. 1, p. 15–49.

[15] Interestingly, Czapek's career was influenced by Darwin's work from the very beginning. He studied in Vienna with the well-known German botanist Professor Wilhelm Pfeffer (1845–1920). He was interested especially in the physiology of impulses ("Reizphysiologie"). Later on he graduated from botany dealing with the geotropism.

[16] CZAPEK, "Zum Gedächtnisse von Charles Darwin," p. 280.

Unlike the German part of the Prague University, its Czech part was the top central institution of modern Czech science. This was apparent especially in social sciences, and played a practical role also in medicine. Academics working in natural and technical sciences, however, had to deal with an important and at that time often discussed paradox: on the one hand, they played an important role in the system of national education and in the popularisation of science, and on the other hand, they were supposed to find their independent place within international scientific research. Due to the relative parochialism of the Czech scientific environment, the main representatives of biological sciences were connected to a limited number of leading academics. In *botany*, this was Ladislav Čelakovský (1834–1902) and his student Josef Velenovský (1858–1949).[17] Čelakovský's main achievement was a formulation of typological morphology of plants in terms of a theory of evolution. His view of Darwin's thoughts, however, was rather critical. He disagreed with argumentation based on probability, and replaced such arguments by ten laws of evolution, of which only the last included a mechanism of natural selection. In international science, his position was close to Karl von Nägeli. His popularisation of Darwinism as a modern theory was formulated mainly in the second half of the 19th century, and a later edition of his collected Darwinian articles failed to significantly influence the contemporary debate.[18] J. Velenovský, a great systematizer of comparative morphology of plants, contrasted the theory of evolution with other principles, such as the so-called principle of organic harmony. He was a proponent of traditional vitalism, and his interest in spiritualism and occultism inspired his evolution-minded students to adopt various fashionable versions of psycho-Lamarckism.

Another important figure among the students of Čelakovský and Velenovský was Karel Domin (1882–1953), professor of systematic botany, organiser of Czech academic life, and an internationally respected advocate of phytogeography and ethnobotany as well as taxonomy and morphology. Domin studied and organised in the Kew Gardens (England) extensive material from western and south-western Australia. In his experimental work, he collaborated mainly with Nils Heribert Nilsson of Sweden with whom he

[17] For more on Čelakovský and Velenovský, see "Short Biographies" in Ilse JAHN (ed.), *Geschichte der Biologie. Theorien, Methoden, Institutionen, Kurzbiographien*. Heidelberg – Berlin: Spektrum Akademischer Verlag 2002. Of other Czech biologists, more here as well: J. E. Purkinje, F. Vejdovský, E. Rádl, B. Němec, and F. Mrázek.

[18] Ladislav ČELAKOVSKÝ, *Rozpravy o Darwinově theorii a o vývoji rostlinstva* [Discussions on Darwin's Theory and on the Evolution of Plants]. Prague: F. Bačkovský 1895.

worked on methods of cultivation of agricultural plants. Under the guidance of Hugo de Vries in Amsterdam, he carried out experiments with mutations, and later continued this research in Prague. Domin presented the results of his experimental work in a monograph *Introduction to Newer Theories of Evolution*.[19] In this work, he presented a theory of mutation as well as an outline of his own theory of "purposeful mutations". He adopted a clearly Lamarckian position and presented Lamarck as the creator of the theory of evolution, an interpretation which was at that time actually not uncommon. He also appealed to the work of a number of vitalists (Pauly, Francé, Wettstein, Henslow, and Velenovský). His work, however, also reflected some of the drawbacks of contemporary academic environment: due to limited peer criticism, authors of Czech publications often presented much more radical and self-confident views than authors of parallel publications abroad, and they often took recourse to excessive quotations. In the case of Karel Domin, this led in 1911 to a charge of plagiarism (concerning the work of Johannes Paulus Lotsy).

Among *physiologists* at the Czech medical faculty we find a similar connection between teachers and students, and vitalism and neo-Lamarckism, as in the case of botanists. Here, the leading figure was Professor František Mareš (1857–1942), who studied philosophy and medicine in Prague (with, e.g., Ernst Mach, who taught here medical physics), and continued his studies in Leipzig (with Karl Ludwig), Berlin (with Emil Dubois-Reymond), and Utrecht. In experimental work, he built his reputation with a study of metabolic processes and energy metabolism in organisms, research of nervous systems, and work in physiologic psychology. On a theoretical level, he was an advocate of vitalism and intuitivism as opposed to mechanistic materialism. His main philosophical work, *Idealism and Realism in Natural Science* provoked among Czech philosophers a long discussion about the interpretation of Kant's work.[20] Mareš saw in the Kantian a priori a noetic support against naïve realism but favoured a biological-vitalistic explanation, whereby he anticipated methods of evolutionary epistemology. In key issues of the dispute between vitalism and mechanicism in the area of physiological psychology, however, Mareš saw Darwin's theory of evolution as playing just a role of an ancillary hypothesis understood in Kantian terms as

[19] Karel DOMIN, *Úvod k novějším theoriím vývojovým* [Introduction to Recent Theories of Evolution]. Prague: Dědictví Komenského 1909.
[20] František MAREŠ, *Idealism a realism v přírodní vědě* [Idealism and Realism in Natural Science]. Prague: Fr. Řivnáč 1901.

a *regulative* principle. In the chapter on controversies surrounding Darwin's work, Mareš put emphasis on the failure of mechanistic explanation of adaptation, and elaborated on the problem of "primary vital properties", which Darwinism – as he saw it through the prism of a vitalistic framework – failed to adequately address.

Mareš's most important student, Edward Babák (1873–1926), at first also favoured Lamarckian conclusions. Mareš's and Velenovský's late-Romanticist, spiritualist, and religious tendencies accompanied by systematic scientific work and conservative national stance found wide acceptance among like-minded Czech philosophers and writers.[21] Babák, however, focused on the experimental work of his teacher, and extended it in the direction of research of breathing movements, thermal regulation, ontogenesis, etc. He extensively edited and contributed to Hans Winterstein's famous *Handbuch der vergleichende Physiologie* (e.g. 1910). In connection with the relative position of Prague and Brno, it is worth noting that after 1918, Babák played a key role in the founding of Brno's universities (in particular, he was active in the establishment of the medical school of the newly founded Masaryk University and of the University of Veterinary Sciences), and in the further development of Mendelism. He importantly contributed to the Czech discussion of evolutionism by his monograph *On the Theory of Evolution: A Review of the Thinking About Evolution*.[22] When it appeared, it was the most objective and coherent Czech presentation of the origin and contemporary state of thinking about evolution. In this work, Babák was not just repeating the views of other scientists,[23] he managed to present an original theoretical work. Though a large part of the work still contains a comparative summary of evidence in support of an evolutionary explanation, after introducing of the concept of a theory of evolution and clarifying the relation between it and systematics, Babák in several chapters summarises evidence for a theory of evolution in comparative anatomy, embryology, palaeontology, zoogeography, and general morphology and physiology. He goes on to discuss the current state of research of variability, and devotes two chapters to the origin of mankind and the origin of life. In those chapters, he indicates that these issues go somewhat beyond the scope of evolution theory proper. In his discussion of current theoretical issues, Babák in the end reveals an inclination

[21] In a way, their influence could compared to that of Ernst Haeckel in Germany.

[22] Edward BABÁK, *O theorii vývojové: Přehled myšlení o vývoji* [On the Evolutionary Theory: An Overview of Thinking About Evolution]. Brno: Příroda a škola 1904.

[23] As did e.g. Eduard OPOLECKÝ, *O vývoji tvorstva dle Darwina* [On the Evolution of Creatures According to Darwin]. Prague: Dělnická akademie 1899.

to Lamarckist solutions but leaves the issue of further research and evidence open. This work constituted a sort of culmination of a discussion which continued on the pages of the main Czech journal for natural sciences, *Živa*, since 1901. It also influenced all subsequent research dedicated to these issues (including the already mentioned work of Karel Domin). All biologists then involved in the discussion argued against the then new and rather radical stance which Albert Fleischmann took against the theory of evolution. It would seem that they thereby manifested a certain independence of Czech natural sciences *vis-à-vis* the conservative attitude of Austrian clericalism, which at that time still exerted large influence and dominated the primary and secondary education.

Sophisticated Catholic Aristotelian-Thomistic views were presented by Eugen Kadeřávek (1840–1922), philosopher and theologian at the faculty of divinity. Kadeřávek, earlier an advocate of dogmatic Austrian Herbartism, belonged to a generation which under the direct influence of Leo XIII's encyclical letter *Aeterni patris* (1879) systematically adopted Thomism. His comprehensive work *On Darwinism*,[24] which, pace Babák, summarised arguments *against* evolution, became – perhaps thanks to its almost official correctness – a standard work among biologists. On the delicate issue of religion, however, most scientists adopted Eric Wasmann's position, which incorporated humans as organisms into the process of evolution, and left issues of mental qualities open and outside the scope of biology proper. This kind of position was also well compatible with various versions of Lamarckism. By the beginning of the 20th century, evolution was among Czech biologists accepted as a matter of course but the mechanism was still seen, cautiously and with some reservations, as awaiting further explanation in the near future, probably in connection with ongoing research in mutations, variability, and heredity. One can trace here a strong tendency to downplay the importance of natural selection. Lamarckism functioned in this context rather as a modern, specialised supplement to classical Darwinism and a correction of neo-Darwinism as presented by August Weismann.

Even though we do not find among Czech biologists any explicit advocates of Weismann's strict line, some *zoologists* came close to his position. In this context, one should mention another leading figure: František Vejdovský (1849–1939), professor of comparative anatomy, embryology and zoology at the Czech university. He was perhaps the most important

[24] Eugen KADEŘÁVEK, *O Darwinismu* [On Darwinism]. Prague: Cyrillo-Methodějská knihtiskárna 1906.

representative of Czech biology after Jan E. Purkyně, and one of the founders of modern biology in international context. He was famous especially for his discoveries in cytology, works on the maturation, fertilisation, and segmentation of the egg, and was the first to discover the centrosome in animal cells. Vejdovský saw Darwin's theories not so much as a "grand theory" but rather as an accepted part of an empirical approach in modern biology. His textbook G*eneral and Systematic Zoology*,[25] which was used by several generations of students, concludes with an presentation called *A Basic Outline of a Theory of Evolution*. In its structure, Vejdovský anticipates Babák's way of presenting the issue (outline of the theory, comparative evidence in individual fields, discussion of Lamarck's and Darwin's approach, current issues) but concludes by expressing a measure of cautious sympathy with neo-Darwinian solutions:

> The importance of neo-Darwinism is in the simplicity of explanation of repetition in heredity, as well as in explaining many adaptations which no other theory (not even Lamarck's) can offer.[26]

Vejdovský's influence was further strengthened by the fact that in his laboratory, he brought up several generations of biologists, many of whom went on to become leading figures in their fields (that is why we speak of "*Vejdovský's school*"). It was he who drew the attention of his students away from local issues to up-to-date experimental problems important in international context. In general, representatives of Vejdovský's school tended to unite *experimental* work with *theoretical* reflection. Of his many students, we shall mention in the context of evolutionism two: Alois Mrázek (1868–1923) and Emanuel Rádl (1873–1942).[27]

Mrázek, professor of zoology at the Czech university, under Vejdovský's guidance studied a variety of problems of general and experimental zoology, and published important articles on cytology with Vejdovský as a co-author. Since 1900, he also lectured on issues of heredity and theories of evolution.

[25] František VEJDOVSKÝ, *Zoologie všeobecná i soustavná* [General and Systematic Zoology]. Prague: J. Otto 1898.
[26] *Ibid*, p. 503.
[27] For more on Vejdovský's school see Jan JANKO, *Vznik experimentální biologie v Čechách, 1882–1918* [The Origins of Experimental Biology in Bohemia]. Studie ČSAV, vol. 8, Prague: Academia 1982 (with English summary); for more on this discussion, see ass well Jan JANKO, "Die allgemeinen theoretischen Konzeptionen in den Wissenschaften vom Leben an der Wende des 19. und 20. Jahrhundert." In: *Acta historiae rerum naturalium necnon technicarum*. Special Issue. Vol. 16. Prague 1981, p. 209–274.

He presented the results of this lectures in a contribution to the current discussion in his *On the Theory of Evolution, Theory of Descent*.[28] There, his aim was not just a presentation of evidence in support of evolution – he took evolution to be a proven fact. Instead, he focused on rectifying various contemporary opinions which spoke of a crisis and decline of Darwinism. Mrázek saw this "crisis" rather as an important and fruitful move away from attempts to reconstruct the historical development of organisms (construction of family lines), which dominated Darwinism in the 19th century. He saw this development as a process precipitated by pressures of new experimental research in variability and heredity. Mrázek objectively discussed the origins of theories of evolution and presented contemporary theoretical conceptions, methods, and experiments (orthogenesis, theory of mutation, variation statistics, etc.). He viewed Lamarck as a historical and rather antiquated figure, and contrasted his work with Darwin's theory, which actuated a seminal change in biology as a historical science. The basic elements of this change persisted despite the fact that current experimental work corrected some historical bias. Mrázek was in this connection the first scientist to inform his academic colleagues of the recent "re-discovery" of Mendel's work. He also had the perspicacity to realise that further development and interpretation of Mendel's results will have a decisive impact on the future form of the theory of evolution. Even though he summarised and understood the partial objections of evolution theorists of Lamarckian leanings, he clearly favoured – perhaps under Vejdovský's influence – neo-Darwinian solutions.

Regarding Emanuel Rádl, we can view his history of biological theories not only as a culmination of the entire discussion about evolution in the Czech Lands at the beginning of the 20th century but also as an attempt to place the issues of evolution theory in the context of *history of biology,* which at that time started to form. In Vejdovský's laboratory, Rádl started with experimental and anatomical research of sensory organs, especially sight, in lower organisms. A series of articles published in leading scientific journals (*Biologisches Zentralblatt*, *Anatomischer Anzeiger*, etc.), was followed by work in the then progressive area of research of sensory reactions (taxis and tropisms).[29] Here, Rádl proved that light plays in the orientation of organisms as important a role as gravitation (*phototropism* and *geotropism*). Yet, from early on, he was attracted to issues of philosophy and history of science.

[28] Alois MRÁZEK, *O nauce vývojové* [On the Theory of Evolution]. Prague: J. Otto 1907.
[29] Presented in Emanuel RÁDL, *Untersuchungen über den Phototropismus der Tiere*. Leipzig: Engelmann 1903.

In 1905, this led to the first outline of his foundational work, *Geschichte der biologischen Theorien*.[30] In the context of the then still developing concept of "general biology", Rádl turned his attention directly to a historical investigation of biological issues, which he saw not as a preliminary summary of "ancestors" of modern biology but rather as an autonomous field of study. He thereby became one of the founders of the history of investigation of life (prior to this point, there existed only isolated fields of history of zoology, history of botany or history of medicine). The first volume of this work focused on the conflict of mechanistic and vitalistic, and physiology- or morphology-based approaches, which he followed from the time of neo-Aristotelians in Renaissance until the beginning of the 19th century. The second volume caused an even bigger sensation. It deals with theories of evolution in biology of the 19th century, and was published both in German and in Czech (in 1909; unlike the classical German edition, the Czech one was somewhat simplified).[31] Here, Rádl analyses classical Darwinism and its far-reaching cultural and scientific impact on European rationality of the second half of the 19th century. In many ways, this was the first systematic overview of Darwin's work from this point of view. Two elements of this multi-layered work are especially worth noting in this context: Firstly, Rádl – uniquely at this time – fully deconstructed the importance of Lamarck as the creator of the theory of evolution, which put him is direct opposition to all fashionable forms of neo-Lamarckism and its ahistoric projections. On the other hand, he rehabilitated the often neglected work of Cuvier whose diachronic and synchronic structural approaches had far greater importance in preparing the ground for evolutionary thinking at various times. Secondly, he put the crucial importance of Darwin's work in perspective when he concluded that Darwinism is facing crisis and decline. On this issue, he concurred with Hans Driesch. In this context, he recalled both the still influential results of older morphological tradition of the pre-Darwinian era, and the current experimental work in biology, which went beyond pure phylogenetic reconstruction, and used evolution as but one of many supporting hypotheses (in this respect, his views resembled Mrázek's). Not only the mechanics of development but also Weismann's neo-Darwinism, theory of mutation, rediscovery of Mendel's legacy, and many other current theories and events

[30] Emanuel RÁDL, *Geschichte der biologischen Theorien. Teil I, Seit dem Ende des 17. Jahrhundersts*. Leipzig: Engelmann 1905.

[31] Emanuel RÁDL, *Geschichte der biologischen Theorien. Teil II*. Emanuel RÁDL, *Dějiny vývojových theorií v biologii XIX. Století* [The History of Evolutionary Theories in Biology of the 19th Century]. Prague: J. Laichter 1909.

were grouped together by Rádl and presented as affected by this "decline" of Darwinism. He saw these developments as a new rationalisation of the original historical and evolutionary scenario which, in his view, constituted an attack on European rationality.

An analysis of the reception of and reflection on Rádl's work, or a discussion thereof, would go beyond the scope of this contribution. Let us therefore just note that he influenced many philosophers and historians of biology (such as Ernst Cassirer, Max Scheler, Georges Canguilhem, and many others). A later, abridged English edition (starting only with Darwin's work) was published thanks to Julian Huxley's initiative in 1930, and a full Spanish translation in 1931 inspired the foundation of history of biology in Spanish-speaking countries.[32] Rádl still had time to edit and extend the first volume (1913) which started with Renaissance, and put even more emphasis on the subjective elements in the history of science. Rádl's last comprehensive presentation of the concept of history of Darwinian biology is found in the introductory chapter of *Allgemeine Biologie*, which was published by Carl Chun and Wilhelm Johannsen as part of the encyclopaedic series *Die Kultur der Gegenwart*.[33] The outbreak of the World War then redirected Rádl's attention to activist philosophy in the Czech society.[34]

As we already noted, Rádl's work constitutes one of the internationally famous achievements of Czech thinking in biology prior to WWI, one closely connected with issues of Darwinism and theory of evolution. The varied cultural environments and multitude of intellectual influences that met in Prague may help explain why it was here that such an original work of history of cultural positions on biological issues was written. After all, in the Czech environment Rádl's work was often seen as a destructive influence on positive research, and its publication affected his position among academic biologists rather negatively. It prompted his sharp conflict with Karel Domin who published in the same year (1909) the above-mentioned work on theories of evolution and whom Rádl accused of unacceptable plagiarism.

[32] Emanuel RÁDL, *The History of Biological Theories*. Emanuel RÁDL, *Historia de las teorías biológicas*. 2 vols. [The History of Biological Theories]. Madrid: Revista de Occidente 1931.
[33] Emanuel RÁDL, "Zur Geschichte der Biologie von Linné bis Darwin." In: HINNEBERG, P. (ed.), *Die Kultur der Gegenwart*. Vol. 1. Leipzig – Berlin: B. G. Teubner, 1915, p. 1–29.
[34] More on Rádl and his *History of Biological Theories* see Tomáš HERMANN – Anton MARKOŠ (eds.), *Emanuel Rádl – vědec a filosof / Emanuel Rádl – Scientist and Philosopher*. Prague: Oikoymenh 2005 (contributions of U. Hossfeld, O. Breidbach, T. Hermann, N. Bizzo, J. Beaty, and others); as well as Thomas JUNKER, "The Eclipse and Renaissance of Darwinism in German Biology (1900–1950)." In: ENGELS, E.-M. – GLICK, T. F. (eds.), *The Reception of Charles Darwin in Europe*. Vol. 2. London – New York: Continuum 2008, p. 480–501.

There were other important biologists who contributed to discussions of Darwinism and evolutionism both in journals and in books. Let us just mention Bohumil Němec (1873–1966), also Vejdovský's student and later an important experimental botanist and cytologist, or another botanist, Ludvík Tereba, who in his *Neo-Darwinism or Neo-Lamarckism* presented perhaps the most objective overview of contemporary positions.[35] In the broader context of sociology, philosophy and medicine, Czech translations of the works of Charles Darwin, Thomas Huxley, Herbert Spencer, John B. Haycraft, George J. Romanes, and others exerted an increasing influence especially after 1900. Scientists working in medicine, genetics or anthropology (A. Brožek, V. Růžička, J. Matiegka, etc.) at this time gradually advocated a Czech version of the eugenic movement.[36]

In any case, one can conclude that approximately between 1900 and 1915, the Czech reception of evolutionism witnessed a clear and open culmination. The conflict between mechanicism and vitalism gradually shifted in the direction of a discussion between neo-Lamarckism and neo-Darwinism, and clear-cut positions and "grand theories" were by degrees transformed by a detailed discussions abroad, inspiration from experimental work, and cautious expectations based on results of new studies of variability and heredity. Generally speaking, at the beginning of the 20th century, Darwinism and Lamarckism were not perceived as contradictory. Most Czech biologists, especially zoologists from the Prague circle around Vejdovský, preferred Darwinism, where natural selection played a key role as the main mover of evolution (Vejdovský, Mrázek, but also Němec). Among botanists (Velenovský, Domin) and physiologists (Mareš, Babák) prevailed sympathies to neo-Lamarckism, which they understood not as an opposite of Darwinism but rather a development of those Darwinian concepts, which opposed and relativised some radical claims of neo-Darwinism as represented by Weisman. In this sense, they understood their position as authentically Darwinian since except for the issue of heredity, which is left open, neo-Darwinian views often come close to vitalistic positions. The fast development of genetics, discussions surrounding the role of natural selection in evolution, the question of heredity of acquired properties coupled with a Lamarckist tradition clearly defined the character of many works on evolution from the

[35] Ludvík TEREBA, *Neodarwinismus či neolamarckismus* [Neo-Darwinism or Neo-Lamarckism]. Prague: Otokar Šrámek 1912.

[36] For more, see Michal ŠIMŮNEK, "Between 'Eugenics', 'Social Genetics' and 'Racial Hygiene'." In: WEINDLING, P. – TURDA, M. (eds.), *Blood and Homeland*. Budapest: CEU Press, 2006, p. 168–191.

viewpoint of biologists and philosophers. This signified a sharp departure form previous positions, and meant that the beginning of the 20th century left far behind the somewhat stagnant views which prevailed since 1860s, thus laying foundations of modern biology in the Czech Lands.