

Before Darwin: Transformist Concepts in European Natural History

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Abstract. Lack of consideration of the complex European scientific scene from the late 18th century to the mid-decades of the 19th century has produced partial and often biased reconstructions of priorities, worries, implicit and explicit philosophical and at times political agendas characterizing the early debates on species. It is the purpose of this paper firstly to critically assess some significant attempts at broadening the historiographic horizon concerning the immediate context to Darwin's intellectual enterprise, and to devote the second part to arguing that a multi-faceted European debate on the transformation of life forms had already occurred in Europe around 1800. Of this debate, contrary to long cherished views, Lamarck's was only one voice, amongst many. Naturalists active in different national contexts elaborated solutions and proposed doctrines that shared several viewpoints, yet clearly stemmed from a variety of disciplinary traditions and problematic contexts.

Keywords: adaptation, Darwin, domestication, evolution, history of life, history of the earth, Lamarck, spontaneous generation, transformism

Over the last 30 years or so, considerable progress has been made in deepening our understanding of several facets of Charles Darwin's personal and intellectual life. The publication of a critical edition of his notebooks, the on-going publication of his correspondence, and a new wave of in-depth biographies have greatly improved our appreciation of the Darwinian revolution. Yet, as I shall argue in this paper, much work still needs to be done on pre-Darwinian evolutionary theories, or, to avoid anachronism, on theories offering an explanation for the succession of life forms throughout the history of the earth, and at its surface. By concentrating on Darwin and the *Origin*, scholars (especially British and American scholars) give a misleading impression of what happened in the 19th century. There was certainly a revolution, a revolution that changed people's thinking from a fixed world view with respect to organisms, to a dynamic, evolutionary one. Of this revolution, Darwin was a very important actor, arguably even the most important. But he

was not the only person that played a role. Long before Darwin, people (especially in France, Germany, Italy, etc.) had started to tackle the important issue of the structure and history of life – far more seriously than the Anglo-American accounts suggest. Hence, we do have a revolution, but whether it was a *Darwinian* Revolution may be questioned. Furthermore, the reconstruction of the European dimension of pre-Darwinian debates on species and the limits and extent of changes they are subjected to, is important to better appreciating Darwin's theoretical strategies during the two decades of gestation of his theory, and the difficulties Darwin's solution to the "mystery of mysteries" encountered in England and elsewhere on the Continent and the United States. In other words, and almost trivially, what happened after 1859 had much to do with theoretical concerns and choices elaborated well before the publication of the *Origin of Species*. This is not to deny the importance of existing studies on Lamarck and his influence in pre-Darwinian Europe, nor to ignore significant attempts at drawing a meaningful picture of the background to young Darwin's early and mature speculations. I do however wish to suggest that investigation of broadly "evolutionary" debates during the early decades of the 19th century should be carried on with systematic care.

Lack of consideration of the complex European scientific scene from the late 18th century to the mid decades of the 19th century has produced partial and often biased reconstructions of priorities, worries, implicit and explicit philosophical and at times political agendas characterizing the early debates on species. It is therefore my intention first to critically assess some significant attempts at broadening the historiographic horizon concerning the immediate context to Darwin's intellectual enterprise, and second to argue that a multi-faceted European debate on the transformation of life forms had already occurred in Europe around 1800. Of this debate, contrary to long cherished views, Lamarck's was only one voice among many. Naturalists active in different national contexts elaborated solutions and proposed doctrines that shared several viewpoints, yet clearly stemmed from a variety of disciplinary traditions and problematic contexts.

Widening the Context: The Early 19th Century

Scholars dealing with Darwin's formative years have naturally been drawn to inquire into the doctrines put forward by Lamarck and their impact on British soil. This is a long standing historiographic issue, going back to the aftermath of the publication of the *Origin of Species*, when

contemporary commentators, and French ones in particular, insisted that the French naturalist should be credited with the title of “founder” or main “precursor” of the theory of evolution.¹ More recently, Robert Richards has aroused controversy (as well as admiration) by calling upon the “Romantic” influences at work within the conceptual horizon orienting Darwin’s assumptions and reflections.² Work in progress by colleagues in France, Italy and the United States will certainly produce much valuable information on, and critical assessment of, debates on the origin and development (including metamorphosis) of life within German-speaking countries during the first half of the 19th century. Indeed, from the historical point of view the background to Ernst Haeckel’s wide-ranging evolutionary synthesis deserves as much attention as the background to Darwin’s work: with the crucial consequence that historians of the period and of evolutionary theories will need to enlarge their problematic perspective to include a few more countries outside the United Kingdom as their meaningful perimeter of research.³

Yet, the issue of broadly “Lamarckian” views at large in early 19th century Europe still awaits comprehensive and critical assessment, and we shall discuss in the second part of this paper how much early “Lamarckism” really owed to Lamarck. In any case, one way to assess Lamarck’s direct influence, apart from tracking down open or oblique reference to his writings and doctrines in the works of contemporaries, is to establish as far as possible who were the naturalists directly connected to his teaching and who, among them, were active in announcing the good word. The results of an ongoing research on the heterogeneous and multinational population of students attending Lamarck’s lectures at the Muséum national d’histoire naturelle from 1795 through 1820, listed on the www.lamarck.net website, will certainly bring much needed data and light. Out of 973 signatures (186 of which referring to foreign visitors to Paris), 540 have been identified.⁴ Moreover, preliminary research on names checked against library catalogues in several European countries has led to the retrieval of manuscript notes taken in Lamarck’s classroom (and at courses given by other scientists active at the time), which are currently being transcribed and studied.⁵

¹ Corsi, 1984.

² Richards, 2002.

³ Robert Richards, Stéphane Schmitt, Mario Di Gregorio, and Joan Steigerwald are currently completing studies on German theories of life and of evolution.

⁴ Corsi, 1988 and new edition, with the complete list of attendants to Lamarck’s lectures, Corsi, 2001, 1997; Bange, Corsi, and Duris, 2000; Bange, Bange, and Corsi, 2002.

⁵ See Corsi, 2001, pp. 367–383, for excerpts from notes taken at Lamarck’s classes.

As a general point, it is sufficient to state here that Lamarck's ideas were translated into a variety of languages and contexts, often through highly misleading summaries provided by influential dictionaries, such as, to take just one instance, the *Nouveau dictionnaire d'histoire naturelle*, where Julien-Joseph Virey (1775–1847) endorsed a purely psychological interpretation of the mechanism responsible for transforming organs and structures. Whereas for Lamarck “will” was simply the phenomenal expression of a complex process of nervous fluid dynamics, and intervened only in animals endowed with a central nervous system (it had nothing to do with the transformation of plants, or of life forms deprived of nerve “ganglions”, where the fluids present in the environment acted directly on the tissues), Virey repeatedly referred to the unhappy passages where his colleague had spoken of birds “wishing” to avoid getting wet, thereby turning themselves into flamingos. Darwin famously stated he did not understand at all what Lamarck meant by “will,” though unwittingly he came very near Lamarck's real position on the matter when he stated that processes of adaptation were really more akin to chemical reactions than to psychological acts.

Adrian Desmond's pioneering work on radical Lamarckism in early Victorian England has further deepened our appreciation of the uses to which selected features of Lamarck's thought could be adapted, though it would be unwise to claim that every Lamarckian had to be a radical, as Desmond has claimed and William Whewell (1794–1866) also claimed a long time before Desmond, albeit for opposite reasons.⁶ It was precisely the equation between radicalism and evolution – whether of the Lamarckian brand, or in the limited and ambiguous form advocated by Geoffroy Saint-Hilaire – that Whewell implicitly proposed in his reviews of Lyell's first and second volume of the *Principles of Geology*, as well as in his *History of inductive sciences* (1837), that deeply worried the Oxford mathematician and theologian Baden Powell (1796–1860), and spurred his early concern for, and cautious defence of, developments in evolutionary debates. As is well known, in the infamous and controversial *Essays and Reviews* of 1859, Baden Powell became the first theologian to publicly express his support for Darwin. Historians dismissing Powell's impact on the culture of his day, by equating him to irrelevant “radicals,” miss the point. The question of impact is certainly important, but the issue of individual reactions to what many regarded as relevant to their concerns, is equally important. During the 1830s, Powell reacted to the first debate on species launched in England by Lyell's critique of Lamarck, as others did: Whewell,

⁶ Desmond, 1989.

Babbage, Herschel, Carpenter, and last but not least, Charles Darwin. It was the reading of Lyell's refutation of Lamarck that got a few people thinking about the consequences of a theory of evolution for current natural-theological, philosophical or social beliefs. By 1843, Powell (again, not alone) had come to contemplate the possibility that a form of evolutionary theory would sooner or later be proposed, and one much more "respectable" than Lamarck's. And to say that in the 1840s or the 1850s the Oxford professor joined disreputable London radicals is to miss the point again: radicals of the 1850s were much less "radicals" than is currently assumed and often enjoyed a comfortable social standing and reputation. Erasmus Darwin, Francis Newman or Henriette Martineau, George Eliot, Herbert Spencer or George Henry Lewes – most of who was part of Powell's circle – were certainly radicals, but socially very famous ones. When confronted by the Bishop of London's firm invitation never to preach again in London (February 1855), after the publication of the *Essays on the Spirit of Inductive Philosophy, the Unity of Worlds, and the Philosophy of Creation* (where he declared that a theory of evolution was a "philosophical necessity") Baden Powell was invited by the Royal family to preach the Easter Sermon (15 April) of 1855 at Kensington Palace Chapel, a site of worship well outside the power of censorship of the Bishop.⁷ By 1855, advocacy of evolution was considered quite acceptable in a variety of cultural circles, including the very high.

Adding to the list of "respectable" evolutionists, Jim Secord has recently called attention upon the anti-liberal and Tory country gentleman Richard Vyvyan, who's *Harmony of the Comprehensible World*, endorsed a quasi-Lamarckian transformation of species, together with phrenology and a broadly evolutionary cosmology.⁸ Outside the British Islands, equally respectable and even conservative scientists did not hesitate to speak in favour of Lamarck, as in 1830 did the Belgian leading geologist (and pupil of Lamarck) Jean-Baptiste-Julien d'Omalus d'Halloy (1783–1875), wealthy member of the aristocracy, Senator and prominent political figure. To Whewell's chagrin, he went on to support transformism up to the end of his life. Writing in 1859 in the influential and very conservative *Civiltà Cattolica*, even a learned Jesuit, father Giovanni Battista Pianciani (1784–1862), while denying that

⁷ P. Corsi 1978, 1988, ch. 16, "Species without Darwin," ch. 14, "The French Threat," p. 205. Secord, 2000, ignores the debate on species aroused by Lyell's critique of Lamarck, and has argued for Powell's irrelevance in pre-1859 debates on species, p. 76, 481.

⁸ Secord, 2000, pp. 181–182. At p. 95, Secord appears to believe that Lamarck endorsed the view of a single series of animals.

transformism was an acceptable scientific theory, defended Lamarck from the charge of atheism brought against him, and stated that the hypothesis was in any case worthy of thorough discussion. In other words, the Jesuit Pianciani showed Lamarck a Christian charity Adam Sedgwick or William Whewell were reluctant to accord to the *Vestiges of the Natural History of Creation* or to anyone even remotely in favour of evolution.⁹ In between D'Omalus and Pianciani, a Belgian botanist, Charles H. Morren (1807–1858), wrote in 1835 a refutation of spontaneous generation and of the action of external physical agents (light in particular) on vegetable and animal organisms opened by a moving homage to Lamarck (whom he was to refute), seen as one of the most eminent naturalist philosophers France had ever produced.¹⁰ Not to speak of the still elusive Frédéric Gérard, whose articles on Lamarck and the state of evolutionary theories in the 1830s and early 1840s also attracted Darwin's attention.¹¹

The list of examples could be greatly expanded to include Italian geologists and botanists, German naturalists and anatomists, Russian palaeontologists and zoologists.¹² Yet, the point is not how long the list is, but what did – or did not – connect these examples into a more or less coherent picture we are still trying to grasp. This picture had explicit and programmatic European dimensions, and that forced contemporaries – as it does today's historians – to struggle with foreign languages in search for further light. Writing in February 1866 to the geologist Giuseppe Meneghini (1811–1889), Federico Delpino (1833–1905), Italian botanist and later on correspondent of Darwin, explained how he got interested in the species issue: “Well before Darwin's work was published, I was very much taken by the question [the philosophical investigation of the origin of species]. In order to make up my mind, I managed to get hold of some works, such as Lamarck's articles in Deterville's Dictionary, Godron on species and races, Isidore Geoffroy Saint-Hilaire's *histoire naturelle générale des regnes organiques*, Flourens' *ontologie naturelle* and Nägeli's *Die Individualität der Natur*.”¹³ Delpino could not read English, and got through his copy of the *Origin of Species* in the first French translation by Clémence Royer. He was

⁹ Omalus d'Halloy, 1831, 1846. On Pianciani, see Corsi, 1985.

¹⁰ Morren, 1835.

¹¹ Gérard, 1843.

¹² See for instance Todes, 1989, for a testimony as to the early exposure to French transformism by Russian Darwinists. Carl Eduard von Eichwald (1795–1876), Baltic Russian palaeontologist and one of the last pupils of Lamarck, became an early “converted” to Darwin in Russia.

¹³ Federico Delpino to Giuseppe Meneghini, 17 February 1866, Pisa University, Department of Earth Sciences, Meneghini Correspondence.

convinced, but not converted. Reason and divine plan, not chance and natural laws were responsible for the succession of species. Yet, the question is still open: why did Delpino get interested in the species question? Which issues within his own discipline, or within what he called the “philosophical” dimension of natural history, plunged him into his reading programme? The answer is once again simple and complex at the same time: a long tradition of debates on the stability of species, carried on within national and international contexts that still await reconstruction. It is further to be noted that Lamarck was just one element of this context, and in many cases not the most important one.

A fruitful albeit radical working hypothesis for putting to test the European dimension of debates on species before and after Darwin would suggest leaving aside Lamarck and Darwin in order to look, if at all possible, to the question of debates on evolution in terms that would by necessity include the two key figures and their key texts, but would at the same time pay much closer attention to diversified populations of standpoints. If historians appear increasingly aware that 19th century British and Western Darwinism or evolutionism had often little in common with the doctrines expounded in the *Origin of Species*, it still needs to be argued that Lamarckism had few points in common with the doctrines the French naturalist developed from 1800 to 1822. I am not referring to the so-called neo-Lamarckians of the 1870s and 1880s who could boast never to have read the master. I am arguing that in the first half of the 19th-century the expression “Lamarckian” indicated a variety of theoretical or philosophical options often loosely related to the writings of Lamarck, or, in some cases I shall illustrate below, not related at all to Lamarck. On the contrary, it was Lamarck himself who shaped his own theory by reacting to contemporary developments, trends, research interests or broad philosophical pronouncements concerning species mutability or the history of life on earth. Some of the cases I will be dealing with are well known, and only deserve cursory mention. Others require comment, since they have been systematically overlooked.

Species Around 1800: French Viewpoints

The last decade of the 18th century and the first of the 19th witnessed a debate on the history of life on earth that deserves closer attention. Several national trends or even the expression of an individual standpoint so far seen (or ignored) as idiosyncratic or isolated events (the myth of the precursor), take a different meaning when considered at

continental level. Not that everyone was aware of everyone else: languages did constitute a barrier, though the balance was certainly in favour of the French idiom, and penalized German, English and Italian naturalists. Thus, for instance, Charles Bonnet's works elicited attention at the European level, whereas Kant's third critique, and the debate on final causes within German philosophical and naturalistic circles percolated with difficulty through France and England, though less so in Italy. Bonnet's use of the term "evolution" to indicate the unfolding of a providential plan to replenish the earth with life, on the model of the "evolution" of germs and embryos, found eager interpreters in Germany, as Robert Richards has brilliantly shown.¹⁴ In France, the erudite compiler Virey adopted the term and the concept in 1803, in one of the earliest critiques of Lamarck, and of authors who, independently of Lamarck, supported a materialistic history of life on earth: "It is thus plausible that, thanks to such evolution, nature has arisen from the most tenuous mould to the majestic cedar, to the gigantic pine, just as it has advanced from microscopic animals up to man, king and dominator of all beings."¹⁵ Virey also sketched his own version of the recapitulation theory, when he equated the first phase of development of the human embryo to the "living gel" constituting the body of polyps, subsequently passing through the state of worm, mollusc and fish. Surprisingly, according to Virey the newly born child only enjoys "the obscure and slow life of a reptile," before taking up the erect posture of his lordship.¹⁶ Following Buffon, Virey multiplied examples of structures adapted to the way of life of organisms. He even favourably commented upon contemporary attempts to link the successive formation of the earth's crust to the "evolution" of life as sketched above. Yet, he insisted that no materialistic conclusion could be drawn from such theoretical reconstructions, legitimate as they were: nature was at all times and forever under the close scrutiny of Divine Providence.

I have discussed elsewhere the authors Virey had in mind when he commented upon the history of life on earth, and I have drawn attention to the fact that Lamarck was not the first naturalist to engage in this kind of speculation. If anything, his endorsement of a materialistic version of the succession of life forms throughout the history of the earth came *after* the publication of books and memoirs by Philippe Bertrand (1730c–1811), Jean-Claude De la Métherie (or, as he called himself after 1793, Delamétherie, 1743–1817), and Jean André Deluc (1727–1817) whose works, and not Lamarck's, were considered as

¹⁴ Richards, 1992, 2002.

¹⁵ Virey, 1803, 1816, p. 30.

¹⁶ Virey, 1804, p. 380.

authoritative reference by authors such as Alberto Fortis (1741–1803) or Eugène-Louis-Melchior Patrin (1742–1815), who published their own version of the history of life in 1802. Bertrand, Delamétherie, Fortis and Patrin were commenting on the European debate on mountain formation, and did not hesitate to call upon Benoît de Maillet's (1658–1738) *Telliamed* to support their viewpoint, in spite of Deluc's strong opposition to the theory of spontaneous generation de Maillet had advocated. This (to us) surprising survival of, and debates on, de Maillet's crude materialistic theories in discussions on the history of life that took place during the last decade of the 18th century and the early years of the 19th, deserve serious consideration, as does the frequent reference by the authors we are considering (Deluc excluded) to the marine origin of man's different races and species.¹⁷ Fortis even dared to propose human experiments on a few dozen abandoned children (who were in any case condemned to the inhumane conditions of begging and to almost certain death) in order to adapt human beings to live again under the water, thus opening up new sources of food and wealth.¹⁸

The common problematic horizon shared by the participants in this first debate on the history of life comprised a belief in the aqueous origin of the terrestrial globe, the decrease of the sea level, the emergence of land and the adaptation of marine life to surface and atmospheric condition. The mechanism they called upon to explain adaptation was essentially derived from the then omnipresent theory of climates and their influence on all living forms, in health and illness. Bernard Germain Etienne de la Ville, comte de Lacépède (1756–1825), the official heir to Buffon, and a key political figure during the Directorate and the Empire, added a fruitful comparison between domestication and the conditions in which animals and plants find themselves in nature. The results men achieved, he argued, were due to the modification skilfully introduced in the living conditions (essentially food and temperature) of the organisms they wanted to alter for their own benefit. Yet, man only controlled a fraction of the endless components of a "climate." Climatic change was constant over the surface of the earth and even more so throughout its history: nature acted with a power and a discrimination

¹⁷ For a fascinating discussion of the marine origin of the various races of man, see M. Duchet, *Anthropologie et histoire au siècle des lumières*, new ed., Paris, Albin Michel, 1995.

¹⁸ B. de Maillet, *Telliamed, ou entretiens d'un Philosophe Indien avec un Missionnaire François sur la diminution de la mer, la formation de la terre, l'origine de l'homme*, Amsterdam, 2 vols.; English language ed., ed. by A. Carozzi, Urbana, University of Illinois Press, 1968. See www.lamarck.net for excerpts from Bertrand, Delamétherie, Fortis, Patrin, E. Darwin. Ciancio, 1995.

men could only imitate, albeit very poorly indeed. Thus, domestication provided a good model to understanding the strength and extent of effects produced on living organisms by constantly changing environments. Whereas Buffon had stopped short from endorsing a development of life throughout the history of the earth, naturalist inspired by his many examples of adaptive structures deployed them on a huge time scale, thus proposing a scheme – generic and sketchy as it was – for the history of life on earth.¹⁹

The literature we have alluded to, the great part of which is now available on the www.Lamarck.net website, makes no mention of Erasmus Darwin's *Zoonomia*, where a theory of the succession of life forms through successive adaptations was briefly outlined. The elder Darwin also expanded upon the role of sexual competition to explain key morphological features of several classes of animals, a point Virey touched upon in great detail in a variety of dictionary articles and works. One of Lamarck's most faithful students, the Neapolitan Giosué Sangiovanni (1775–1849), read *Zoonomia*, and for several weeks walked around Paris with a copy in his pocket.²⁰ Yet, this happened later on, in the early 1800s. No mention is made in the Parisian literature of the German debate on the history of life, or, better said, on the morphological and perhaps historical relationship linking animal and vegetable organisms Robert Richards has convincingly reconstructed.²¹ In the late 1790s, Goethe and his friends, Schelling in particular, read E. Darwin with great interest, though it is highly doubtful that they embraced a materialistic and thoroughly “naturalistic” vision of the history of life on earth such as Fortis, Bertrand or Lamarck were advancing. Yet, Giuseppe Gautieri (1769–1833), a pupil of Schelling, well known to Goethe and to the circle of professional mineralogists and geologists he was supervising in his official capacity of Councillor for mines, did enter the debate on the history of life, and came to conclusions worthy of our critical attention.²²

Transformism without Lamarck: Germany and Italy

With youthful complacency, Giuseppe Gautieri paraded his extensive reading in French, English, Italian and German geological, anatomical,

¹⁹ Sloan, 1979; Hoquet, 2002.

²⁰ Sangiovanni is the author of the longest review of Lamarck's *Philosophie zoologique* so far known, published in two parts in the *Giornale Enciclopedico di Napoli*, 2, 1809, pp. 232–244 and 3, pp. 189–210.

²¹ Richards, 2002, pp. 301–302, 481–482, and the relevant bibliography.

²² Agazzi, 1999. Professor Agazzi quotes two letters by Goethe referring with sympathy to Gautieri. Gohau, 1991; Vaccari, 2003.

botanical, zoological, and medical literature, without letting his readers forget his equally astonishing (albeit half-digested) classical culture. His *Flight on the Genealogy of the Earth and on the Dynamic Constitution of Organisation*, published in Jena in 1805, was inscribed to “The founder of the philosophy of nature, the immortal Schelling.” The opening is almost pathetically classical: at his country home, during a holiday, the author engaged in conversation with a select group of friends. They discussed the hypothesis of the existence on plant-men, absurd to the vulgar, but fascinating to the philosopher, who is able to spot a good intuition where others only see the wildest flight of imagination. To amuse the erudite company, Gautieri “attempted a genealogical tree of various species of animals.”²³ The conversation got very deep indeed, and “Ovid, and perhaps Du Maillet, La-Mètherie, Darwin and you yourself” would have found elements of interest in it, Gautieri mused with false modesty in the preface dedicated to Shelling.²⁴

It is important to point out that Gautieri clearly implied that his German mentor was perfectly familiar with the French and English authorities called upon to provide guidance for the daring theoretical exercise (Darwin, he well knew, was read and commented upon by his friends). After a series of considerations on the unity of nature (seen as “a connected organism”), Gautieri rapidly sketched a series of steps linking the inorganic to the organic, minerals to crystals, zoophytes to plants and animals, and finally to man.²⁵ It is impossible to provide a meaningful short summary of all the themes Gautieri touched upon, in a style strongly reminiscent of Virey. Like his French colleague, Gautieri is writing to impress, and is convinced that anything he has read, however pertinent or impertinent, has to find a place in his narrative. To trace the reference to all the authors explicitly quoted by Gautieri has taken several days and several specialised libraries: to track down all the implicit references to authors such as Bonnet, Haller, Spallanzani, or Goethe and Schelling, would demand a considerable teamwork. Yet, it is precisely the chaotic albeit extremely rich texture of Gautieri’s, or Virey’s, writings that provides such a genuine, idiosyncratic and at times emotional survey of issues the two authors (far from original) thought crucial to current debates on life and its history.

From the consideration of the unity of nature and of organization (“all animals show mutual affinities”), Gautieri moved on to consider

²³ Gautieri, 1805, p. v.

²⁴ Gautieri, 1805, p. vi.

²⁵ Gautier repeatedly referred to the speculative chemistry of Jacob Joseph Winterl (1739–1809) and to works by Henrik Steffens (1773–1845), with whom he was in friendly contact.

the similarities between men and animals by relying upon the physiognomic tradition, from Giovanni Battista Dalla Porta (1535–1615) through Peter Camper (1722–1789) and Johann Kaspar Lavater (1741–1801) (authors who loomed large in Goethe’s early interests), to finally consider the mechanism responsible for the series of gradual changes the animal series displayed.²⁶ This opened the way to a phenomenal list of examples of adaptive structures, closely linking the way of life, and the basic nutritional and reproductive needs of animals, to their environment. The trunk of the elephant, which Erasmus Darwin attributed to the difficulty the animal experiences in bending his knees to get food, is attributed by Gautieri to the “desire” to smell, and rendered difficult by the distance of the head from the soil.²⁷ This said, the explanation offered for the membrane joining the toes of birds living near rivers or the sea, for the fingers of the bat prolonged to the point of becoming wings in order to appease his fear of falling down trees, for the formation of the several stomachs of herbivores, victims of their greed, is rather straightforward. And it is not that surprising, upon reflection, to find Gautier adding a world famous example of adaptive structure: “The need to feed on leaves high on trees has stretched out the neck of the giraffe, and shortened his posterior legs.”²⁸ The wealth of examples he proposed, the wish to impress his readers, and the logic of the argument makes it clear that Gautieri did not need Lamarck to make good use of the giraffe, and perhaps not even Darwin. Indeed, Lamarck’s (1800–1802) early evolutionary works – the *Hydrogéologie* and the *Recherches sur l’organisation des corps vivants*) do not appear to have reached Gautieri: privately printed, they did not enjoy a wide circulation, and are rarely to be found in French and foreign libraries. At all events, Lamarck is never mentioned in the *Flight*, whereas Lamarck’s rival Delamétherie, well known to Humboldt and to the Goethian circle as editor of the then quite respected *Journal de Physique*, is often referred to.

Gautieri ended his discussion of the relationship between ways of life, “desires” and structures by commenting on Pierre-Jean-Georges Cabanis’s (1757–1808) warning that animal behaviour is determined by organic structures. This is certainly so in a stable state of things, he approvingly noted: yet, it is equally true that change in the environmental conditions must have induced new needs, new desires, and have in time produced new organs. Buffon, Darwin, and Cabanis himself,

²⁶ Gautieri, 1805, p. 5; see Giacomoni, for a discussion of Goethe’s interest in physiognomy.

²⁷ Gautieri, 1805, p. 9.

²⁸ Gautieri, 1805, p. 11.

Gautieri added, have after all repeatedly remarked that the animals we see today are very different from what they were at the remote time of their first appearance.²⁹ The adaptive mechanisms his authorities had described have to be considered as acting over the immense lapse of time nature has at its disposal, from the period when the earth was covered with waters, through the formation of primitive mountains, the emergence of the first dry land, and its slow occupation by formerly marine plants and animals. It is interesting to note that Gautieri, though active in the mines administration of the Napoleonic Kingdom of Italy, does not appear to be aware of the debate on mountain formation and chronology, as well as on volcanoes, that animated the naturalistic circles of the North of Italy during the last decades of the 18th century: his authorities are essentially German (Franz von Beroldingen (1740–1798) – actually a German Swiss, August Ferdinand von Veltheim (1741–1801), Johann Georg Lenz (1748–1832), with particular reference to the circle of mineralogists surrounding Goethe and the writings of Johann Karl Wilhelm Voigt (1752–1821).³⁰

One final feature of Gautieri's odd and fascinating tract will retain our attention: the second part of the *Flight* is devoted to a thorough discussion of the role of intestinal worms in the debate over the origin and the transformations of life. Once again, the similarity with lesser known doctrines taught by Lamarck is striking, though Gautieri ignored the work of his French colleague, and he could not have done otherwise: Lamarck had published little on intestinal worms at the time of the composition of the *Flight*, and his Museum lectures, as we shall see below, had not yet touched upon the issue. Heavily relying on Johann August Ephraim Goeze (1731–1793), Philibert Chabert (1737–1814), Karl Asmund Rudolphi (1771–1832), Johann Georg Heinrich Zeder, Nathanael Gottfried Leske (1751–1786) and Heinrich August Wrisberg (1739–1808), Gautieri entered the debate on parasitic worms that was so central to medical concerns since the mid-1600s. He was ready to concede that many of the known worms could be generated through eggs or reproductive “germs.” Yet, he insisted that this occurred after several generations had been spontaneously produced within the host animals. All animals originally sprang out of matter, different ones from different material assemblages. With time, many species “learned” to reproduce themselves, with more or less success, including spontaneously generated parasitic organisms. Some even

²⁹ Gautieri, 1805, pp. 12–15. Gautieri collected a series of examples relating to the change of instincts shown by dogs taken to different parts of the globe, and reverted to the savage state.

³⁰ Vaccari, 1993, 1999.

abandoned the host organism, and became part of the animal series on their own, so to speak. Gautieri further argued that naturalists should be aware that the peculiar conditions of production of parasitic organisms made them highly adapted to the host. If it was true, as Buffon had shown, that climatic conditions and the action of man during the process of domestication do alter animal and vegetable structures, it must be equally true that the same type of parasitic spontaneous generation is bound to be affected by different host animals: “the worms living inside animals are submitted to more active powers and shocks, and must therefore suffer far greater alterations, and degenerate to a much greater extent.”³¹ It was thus wise to avoid multiplying species and genera of worms, and inquire instead on the specific action exercised by specific animal species on their parasitic guests.

Guatieri’s lengthy and at times verbose discussion of intestinal worms and their relationship to the wider issue of species adaptation and transformation, as well as to the issue of spontaneous generation, provides much needed background and suggestion for further research into Lamarck’s teaching medical students interested in intestinal worms. Lamarck come to argue that vertebrates, and men themselves, are probably the descendants of intestinal worms spontaneously generated in an environment forcing them to take up a longitudinal symmetry, instead of the radial one common to spontaneous generations freely produced in warm waters.³² In the notes taken at Lamarck’s lectures in 1807 and 1809, Giosuè Sangiovanni and Franco Andrea Bonelli (1784–1830), a Piedemontese pupil of Lamarck and a convinced pre-Lamarckian transformist, reproduced the discussions held in the classroom, on whether intestinal worms were all spontaneously generated, or only in part; of whether they were introduced from the outside, through food or contagion, or whether worms at large in nature were in fact the descendant of parasitic organisms that escaped their birthplace and gained independence and reproductive capability. Gautieri, in other words, helps us highlighting the main trends of European debates on intestinal worms that were relevant to the development of Lamarck’s doctrines.

³¹ Gautieri, 1805, pp. 78–79.

³² The late S. J. Gould devoted a fascinating article to the subject of the worm ancestry of man in Lamarck, “A Tree Grows in Paris: Lamarck’s division of Worms and Revision of Nature,” in *The Laying Stones of Marrakech: Penultimate Reflections in natural History*, New York, Harmony Books, 2000, pp. 115–143; the point had already been emphasized by J. Farley, *The Spontaneous Generation Controversy from Descartes to Oparin*, Baltimore, The Johns Hopkins University Press, 1977.

It is fair to conclude that the debate on the history of life and on the stability of species had acquired momentum in Europe already around 1800. As it was the case in later decades, and around Charles Lyell or Charles Darwin in England, a variety of agendas, of disciplinary concerns, and of intellectual and social actors (and of political contexts) played a role in that debate. Books and people, ideas and specimens travelled throughout Europe to a far greater extent than we have cared to investigate. The issue of the circulation of works by Erasmus Darwin, Felix Vicq d'Azyr or Charles Bonnet throughout naturalistic and philosophical circles and networks should equally be assessed at continental level. Charles Lyell's critique of Lamarck we referred to, a book like the *Vestiges of the Natural History of Creation*, or the fanciful spontaneous generation experiments triumphally announced by Andrew Crosse to the 1836 BAAS meeting in Bristol, show the extent to which considerable fragments of the protean debates we have sketched above lived on in Britain: as elsewhere, one should add. Much remains to be done in order to gain a less anachronistic, less Darwin or Lamarck oriented picture of evolutionary debates in 19th century Europe, and one which will allow situating Lamarck, Darwin or Haeckel in their context, and not *vice versa*, as it has been the case so far – perhaps inevitably so.

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