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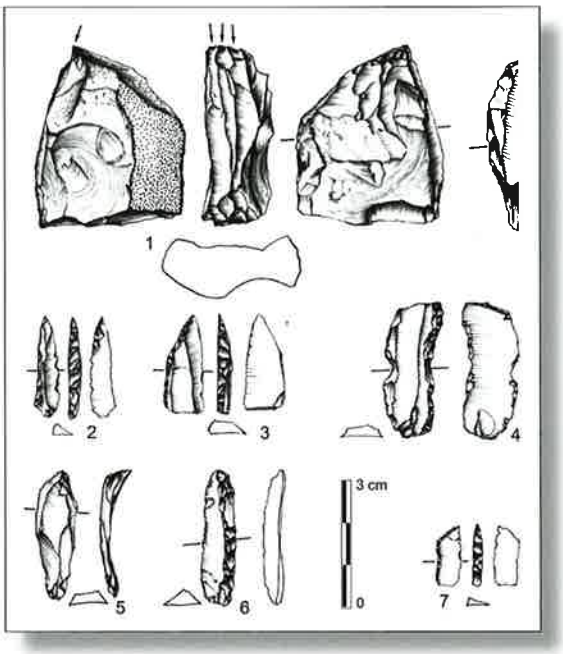

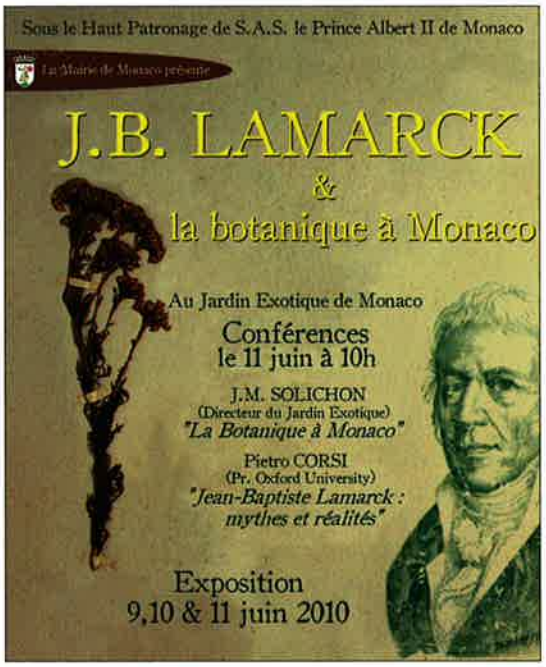

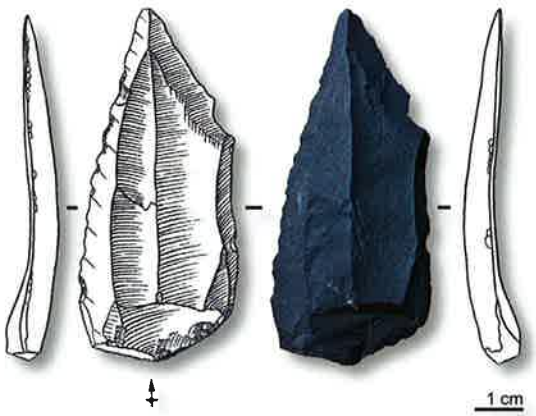

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THE REVOLUTIONS OF EVOLUTION: GEOFFROY AND LAMARCK, 1825-1840

by

Pietro CORSI*

The main purpose of this essay is to critically assess the role of Étienne Geoffroy Saint-Hilaire (fig. 1) in promoting a discussion of Lamarck's views during the late 1820s and the 1830s. Much has been written on Geoffroy's belief in the transmutation of species, and on his alleged fidelity to the teaching of Lamarck. Historians have rightly pointed out that the two authors differed widely on their interpretation of the mechanisms responsible for changes in life forms throughout the history of the Earth or on the issue of spontaneous generation. They have nevertheless insisted on the great debt Geoffroy owed to Lamarck, seen as the first systematic evolutionary thinker of the nineteenth century (I. Geoffroy Saint-Hilaire, 1847; Cahn, 1962; Appel, 1987; Laurent, 1987; Le Guyader, 2004). It will be argued that the relationship between the two naturalists was personal and possibly affectionate, but that Geoffroy showed scant knowledge of, and at times little respect for, his colleague's work. He dropped all positive reference to Lamarck as soon as the change of regime after the 1830 Revolution and growing difficulties within the *Académie des sciences* pushed Geoffroy to look for new allies, in both the right and the left of the political and cultural spectrum. It will therefore be useful to briefly sketch the ways in which political strife was reflected within scientific and broader cultural debates during the decade 1825-1835.

Geoffroy's and Lamarck's views were eclectically combined by authors writing for influential scientific, medical and general periodicals and encyclopaedias of the time. The analysis of their work provides important evidence warning against reducing a complex set of doctrines, of authors and of tools for scientific communication and confrontation, to the single issue of assessing the influence of Lamarck in early nineteenth century France. Rather, Lamarck was seen as one among several authors offering interesting views on life and its transformations. Practitioners of several disciplines reacted in different ways to the debate on life's supposed capability for change, ranging from total denial, to guarded or enthusiastic support, to sheer indifference. It is however this richness of positions, of actors, of publishing enterprises and broad political interests that needs to be reconstructed, if we wish to draw a less anachronistic picture on the early history of modern evolutionary doctrines in France and in Europe.

PRINTING AND THE POLITICS OF SCIENCE

Outside a restricted circle of specialists, it has been widely assumed that Lamarck's ideas cut no ice in either French or European natural history debates of the early nineteenth century. As recently as 2009, the authoritative journal *Nature* carried a short article commemorating the publication, in August 1809, of what to us is Lamarck's most famous book, *Philosophie zoologique*. The three *Nature* authors were happy to conform to the traditional view that by the time of his death in December 1829 Lamarck's ideas were openly derided. Cuvier's eulogy of his deceased colleague, sarcastic and disrespectful as it was, only reflected current opinion (Graur *et al.*, 2009). Clearly, what Cuvier wanted us to believe to be the conceptual, social and political situation within Parisian natural history practices of the early nineteenth century has been taken as an accurate assessment requiring no further investigation. Together with a handful of colleagues, I have myself argued the contrary, and documented the many different ways in which Lamarck was read and discussed in France and elsewhere in Europe (Corsi, 1987, 2001 and http://www.lamarck.cnrs.fr; Laurent, 1987). Only over the last few years has it been possible to push my research further, into sources that the new electronic technologies, and in particular Google Books, the Biodiversity Heritage Library, the Bibliothèque de la Faculté de Médecine, and Gallica at the Bibliothèque nationale de France in Paris have made available and, most importantly, searchable in word format. This has made it feasible to survey hundreds of volumes of dictionaries, encyclopaedias and periodicals published in several European languages over the span of several decades.

As indicated above, and as it will become clear in the following pages, to highlight the role of discussions about Lamarck does not imply reducing early nineteenth century debates on the transformations of life to the single albeit complex case represented by the French naturalist and his

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works. To do so would amount to perpetuating anachronistic assumptions about the actual cultural, social and political articulations of natural history practices and publications in the early decades of the nineteenth century, in France and elsewhere in Europe. Moreover, contemporary periodicals, and in particular the scores of dictionaries and encyclopaedias then published on every possible subject, throw much needed light on a rich population of intellectual and professional actors (naturalists, doctors, geologists and palaeontologists, social and political agitators, reformers of philosophy and of religion) who took active part in scientific and cultural debates at the time. Most of these "men of letters" would have regarded our concentration on a few key figures active in less than a handful of institutions as an attempt to perpetuate elitist manoeuvres aimed at depriving them of their right to spell out their views on matters of common interest. It should also be pointed out that some of the key figures privileged by past and current historiography (Cuvier, Étienne Geoffroy Saint-Hilaire, François Arago or André-Marie Ampère, to drop a few names) openly courted the periodical press and encyclopaedic ventures, well aware of their wide ranging impact on cultural and political matters. Thus, Geoffroy Saint-Hilaire never tired of calling upon public opinion to judge the many contentious issues he was involved in during the 1820s and the 1830s. He even went to the extreme length of asking contributors to medical and natural history publications to address comments on one of his texts, declaring his readiness to modify it according to their suggestions[1]. The early career of Geoffroy's son Isidore, surely a major institutional figure in French science during the middle decades of the century, was characterized by scores of contributions to journals and encyclopaedias, many of which were also collected in *Essais de zoologie*[2]. Even an undisputed star of academic science such as Cuvier, who insisted that scientific matters should be left to the scrutiny of specialists, did not shy away from using the periodical press and main dictionaries to score a few points against his opponents[3]. Indeed, almost all the main institutional figures of French science during the first half of the nineteenth century were involved, directly or indirectly, in editorial enterprises designed to please cultivated public opinion, and the growing segments of the reading public that aspired to be counted among the elites. One could even push the argument and maintain that the big stars themselves were collectively part of a complex process of social mobility and of political empowerment that relied heavily on the printed press[4]. Even when they advocated the exclusive right of the specialist to be its own judge, against the pretence to the contrary expressed by publicists, they had to do so, paradoxically, through the very press they were contesting. Thus, our neglect of the whole range of printed sources and of the individuals who made them possible, which would have been unjustifiable in the eyes of contemporaries, openly contradicts classic, elitist historiographic approaches, since the editorial ventures we will refer to in this essay benefited from the active cooperation of the very members of academic science whom many historians see as the only authorities worthy of our attention.

Before embarking upon the analysis of selected features of the treatment of Lamarck and of the question of life and its transformations in dictionaries, encyclopaedias, and periodicals of the second and third decades of the nineteenth century, it is appropriate to recall that during the 1810s and especially the 1820s Lamarck's doctrines were respectfully discussed by individual authors such as, among others, the well known agronomic expert Charles-Hélion de Barbançois-Villegongis (1760-1822), the medical writer and translator Antoine-Jacques-Louis Jourdan (1788 -1859), the Italian physiologist Luigi Chiaverini (1777-1780?-1834), the mineralogist Cyprien Prosper Brard (1786-1838) or, at the beginning of the 1830s, by authoritative and respected geologists such as the Belgian Jean-Baptiste-Julien d'Omalius d'Halloy (1783-1875) and the Franco-German Ami Boué (1794-1881; fig. 2), both well known in Paris, where they spent many years, as well as in Scottish and English scientific circles (Corsi, 1988; Laurent, 1987).

It was however during the 1820s, and in particular after the turning to the extreme right of the Restoration governments and the enthronement in 1824 of Charles X – himself a staunch absolutist and an ultra-catholic – that references to Lamarck's doctrines or to a variety of other contentious issues in natural history took on a defiant political meaning. Groups of medical writers and naturalists joined the cultural opposition to the regime. Doctors in particular, even those of moderate or mild right-wing persuasions, were incensed at the cleansing of the medical faculty in November 1822; the Faculty remained closed until March 1823. Even a revered figure like Philippe Pinel (1745-1826) was ousted as politically suspect. Opposition took several forms. The most spectacular and the most feared by the police involved crowds of medical students and members of the public taking part *en masse* in the funeral of distinguished medical authorities known for their liberal leanings or their work *outside* official institutions. Interrupting the lectures of medical professors appointed by the Government was a further favourite form of action with students. At a more sophisticated level, medical authors tried to discredit Cuvier the anatomist in order to tarnish the image of an authoritative member of the Council of State (Corsi, 2012).

Though the true extent of Cuvier's conservatism is open to debate, there is no doubt that in many quarters he was considered as a pillar of the ultra right wing Government[5]. According to the testimony of the celebrated writer Stendhal (1783-1842), Sutton Sharpe (1797-1843), a friend of the writer, a frequent visitor to Cuvier's salon, and an intimate of the naturalist's stepdaughter Sophie Duvaucel, whom he hoped to marry, was shocked at his future father in law's political leanings (Corsi, 2005a; Gunnell, 1925; Del Litto, 1999). Among medical writers, some extolled the virtues of Marie François Xavier Bichat (1771-1802), whom they regarded as the true founder of modern anatomy: Cuvier was to them a mere naturalist who had meddled with subjects outside his competence. His work on fossils was undoubtedly interesting, but true anatomists knew better. Others compared Cuvier unfavourably to contemporary German anatomists such as Friedrich Tiedemann (1781-1861) or Johann Friedrich Meckel (1781-1833). Indeed, French anatomy was risking lagging behind, being held hostage to the conservative views of a politically reactionary and power-hungry man such as Cuvier. Some – including Geoffroy – even hinted that Cuvier had given up science altogether, being happy to write prefaces to expensive,

illustrated coffee-table books others were assembling for him (Desmoulins, 1826, p.VIII; Raspail, 1830, pp. 151-159). A long-term German friend, Christian Pfaff (1770-1845), visiting Cuvier for the last time in 1829, reported that the naturalist was only interested in what the newspapers reported on the political front. He could not engage his friend in any scientific discussion (Marchant, 1858, pp. 42-43).

There were also individual authors who took full advantage of the situation. They mounted a concerted campaign aiming at rallying the reading public under the banners of progressive, philosophical views of natural history and medicine, while presenting themselves as the true upholders of disinterested scientific research, free from institutional censorship. The reform of knowledge was as needed as the reform of the political system. France could not aspire to restore the political and cultural glory of the revolutionary and Napoleonic years without courageously embarking upon a programme of intellectual reform, the prelude to major political changes. This was in a nutshell the programme put forward by a man such as Bory de Saint-Vincent (fig. 3) and the group of young authors he gathered around the project of his successful *Dictionnaire classique d'histoire naturelle* (Ferrière, 2001 and 2009). In less explicit terms, this was also the cultural strategy pursued by the former Napoleonic magistrate Eustache-Marie Courtin (1768-1839) in his generalist and equally successful *Encyclopédie moderne* (1st ed., 1824-1832, 24 vols.), to which Bory and Geoffroy Saint-Hilaire contributed important articles during the late 1820s.

Periodicals such as the *Journal complémentaire du Dictionnaire des sciences médicales* (established in 1818, absorbed in 1832 into the *Archives générales de médecine)*, initially conceived as a supplement to the best-selling dictionary of medical sciences; the *Revue encyclopédique* (1819-1835); the *Revue médicale française et étrangère* (1822-1886); and more cautiously the *Annales des sciences naturelles* (1824-1833), or in later years the *Gazette médicale de Paris* (1830-1916), took sides with Geoffroy and Bory and endorsed, albeit not unanimously, philosophical anatomy, German anatomy, the recapitulation theory and spontaneous generation. In 1828, even the *Revue française* (1828-1839), established by the moderate conservative Catholics known as the "doctrinaires" and headed by the authoritative politician Pierre-Paul Royer-Collard (1763-1845), praised philosophical anatomy and recapitulation theories, pushing acceptance of the view that the development of the embryo summed up the history of life on earth. In several encyclopaedia entries and journal articles, it became common to contrast the love of science that had made Lamarck blind and poor, with the opportunistic exploitation of early scientific merit that had made Cuvier rich and politically powerful (Royer-Collard, 1828a and 1828b)[6].

In this cultural and political context, Geoffroy was particularly keen to present himself as the torchbearer of a reformed scientific movement, capable of looking beyond the mass of positive facts being mindlessly collected and of capturing the ultimate philosophical principles science had the duty to investigate. The story of his 1830 confrontation with Cuvier on the principle of the unity of composition shown by all animal structures has been told again and again (Appel, 1987). In fact, this was only one among several highlights in Geoffroy's very busy decade 1825-1835. A kind of guerrilla warfare had indeed erupted between Geoffroy and Cuvier in the early 1820s, and had peaked for the first time in 1825, when Cuvier, worried by the proliferation of publications and doctrines outside the reach of Academic censorship or control, launched a counter-attack in the article "Nature" he inserted in the *Dictionnaire des sciences naturelles* under the editorship of his brother Frédéric[7]. Cuvier bitterly lashed out against Geoffroy, Naturphilosophie, embryological recapitulation, spontaneous generation and the transmutation of species – all put together in a rather unlikely alliance. Geoffroy reacted with vigour, as did his son Isidore, Bory de Saint-Vincent and many writers in natural history and medical periodicals. In those charged months spanning 1825 and 1826, debates raged furiously in the Chamber and in the country on the planned legislation to further restrict the freedom of the press. In particular, Cuvier's hint in the 1825 article that his opponents'tenets betrayed pantheistic – or worse – religious tendencies read as especially threatening at a time when the ultra-Catholics were pressing for the introduction of an anti-blasphemy legislation so extreme that it shocked even the right-wing writer François-René de Chateaubriand (1768-1848). In other words, the charge of atheism, pantheism or of harbouring doubtful religious leanings could have had serious professional and even extreme penal consequences. After all, the regime had just fired several distinguished medical professors for their past political associations and made no mystery of its determination to fight materialism and irreligion, literally to death. In the end, censorship of scientific publications turned out to be very mild: the control of political reporting or of texts for theatrical representations that attracted masses of people, absorbed all the energy of the Ministry of the Interior's office in charge of the press (Granata, 2008)[8].

After 1825, Bory de Saint-Vincent inserted peppery comments against Cuvier in the earliest sections of the *Dictionnaire classique d'histoire naturelle* ready for the press, and Geoffroy wrote a long article, entitled, as Cuvier's was, "Nature", which appeared in the *Encyclopédie moderne*, and was also printed as a separate pamphlet (E. Geoffroy Saint-Hilaire, 1829a and 1829b). Geoffroy openly courted Catholic opinion. He also embarked upon a strategic and rhetoric move centred on the attempt to show that prominent Catholic thinkers agreed with him, or at least were not opposed to his conception of the philosophical implications and ambitions of his science, and of science in general. Already in September 1825 Geoffroy had answered a charge of dangerous religious leanings coming from two colleagues, François Magendie (1783-1855) and Antoine Desmoulins (1796-1828), a riotous former protégé of Geoffroy. The latter called his readers'attention to a modest speech given by a minor prelate, Jean-François-Marie Le Pappe de Trévern (1754-1842), then bishop of Aire. The bishop had praised the study of nature that revealed the foresight of the Great Architect of the universe, and expressed his conviction that scientific and religious truth could always be reconciled[9]. A few years later, in the 1829 article "Nature", Geoffroy paid homage to the liberal views expressed by a prominent representative of the conservative Catholic hierarchy, Denis-Antoine-Luc Frayssinous (1765-1841), the bishop (*in partibus*)

of Hermopolis and Minister of Education from 1824 to 1827. This allowed Geoffroy to make fun of Cuvier, a well known Protestant, by asking ironically whether his colleague had turned theologian, and an authoritative one, at that, since he was now distributing charges of infidelity with generous nonchalance[10]. As far as Geoffroy was concerned, he reiterated his belief in God, in the Revelation, and in the teaching of the Catholic Church. This declaration pleased several members of the Catholic intelligentsia, though it failed to convince all. A handful of authors defended Geoffroy, and publicly praised the increasingly mystical tone the naturalist adopted after 1834. Geoffroy, in turn, increased his references to God and to those members of the Catholic hierarchy and press who were willing to quote him with favour. From 1834 until the very late 1830s, Geoffroy courted the approval of the independently-minded, ultra-catholic turned almost democrat Félicité de Lamennais (1782-1854). One of Lamennais's close friend, the Swiss doctor David Richard (1806-1859), had followed Geoffroy's classes at the Sorbonne since 1830, and acted as intermediary between the naturalist and the theologian. During the 1830s, the latter had become a well-known figure in Parisian intellectual circles and salons. His controversial stand against the Pope and the Catholic hierarchies on several doctrinal, social and political issues was attracting huge attention from the press. In his correspondence, Lamennais bestowed affectionate praise upon Geoffroy, but, to Geoffroy's chagrin, refrained from any public endorsement (de Lamennais 1909, 1977, 1978)[11].

Though under attack, Geoffroy was undoubtedly the main beneficiary of a political conjuncture that made fellow-travellers, including the then close ally Bory de Saint-Vincent – who did not necessarily endorse all of his tenets – overlook differences in a show of unity. Yet, at times even close allies proved tiresome. Geoffroy had to suffer frequent accusations that he had simply imported into France ideas developed in Germany twenty years earlier, if not thirty: by Johann Wolfgang von Goethe (1749-1832) and Carl Friedrich Kielmeyer (1765-1844), in the late 1780s and early 1790s; by Meckel, Tiedemann, Lorenz Oken (1779-1851), and Johann Baptist von Spix (1781-1826), starting with the early 1800s. Thus, though sympathetic critics acknowledged that Geoffroy was undoubtedly several steps ahead of Cuvier, they also pointed out that he had waited for German inputs to move forward. Geoffroy asked friends and pupils to intervene in the press, and restore his title to originality: if only for patriotic reasons (E. Geoffroy Saint-Hilaire, 1827). Finally, Geoffroy's engagement with the anatomical and classificatory puzzles offered by the Ornithorhynchus generated endless argument with the irascible and competent Henri Ducrotay de Blainville (1777-1850), who could count on the support of Richard Owen (1804-1892) and Robert Edmond Grant (1793-1874)[12]. To Geoffroy's dismay and chagrin, all sided with Meckel in criticizing the anatomical and taxonomical conclusions he had reached concerning the strange animal coming from the extreme borders of the British Empire. Geoffroy complained bitterly of the conditions he was working in. He lacked specimens, had to rely on what British travellers and naturalists wrote, and fellow academicians, notably de Blainville, prevented him from accessing new specimens brought from Australia[13]. On rare occasions, he could ask colleagues travelling to London to check anatomical details for him (E. Geoffroy Saint-Hilaire, 1835, p. 6). Due to Meckel's European reputation at the time, and the impressive work produced by Owen, it could be argued that the acrimonious discussions over the Ornithorhynchus weighed more on Geoffroy's mind and reputation within the Academy than the celebrated confrontation with Cuvier. There is a hint in one of the last works published by Geoffroy, that in 1835 he became ill and took almost one year off, due to a deep scientific disappointment[14].

GEOFFROY'S AMBIVALENCE TOWARDS LAMARCK: SCIENCE, RELIGION AND RADICAL POLITICS

A further point of dissension with Cuvier, stretching back to the mid-1820s, concerned the interpretation of living and fossil crocodilians. It was in this context that Geoffroy started challenging his rival by arguing that crocodilian specimens from ancient Egypt were not exactly identical to the animals living today, and that crocodilian-like fossils unearthed in Normandy were the ancestors of present-day forms. In the very early 1830s he announced new, important findings from the Auvergne, confirming and generalizing his conclusions. Faithful to his methodological declarations in favour of overriding principles capable of forcing the eyes of the mind to see beyond bare facts, since the mid-1820s Geoffroy developed a general theory of the relationship between changing environmental conditions and mutations occurring at embryonic level. It is not appropriate to rehearse in the present context the conclusions reached by eminent historians about Geoffroy and palaeontology, or to repeat my own analysis of Geoffroy's doubtful commitment to the transmutation of species. It is indeed open to discussion whether Geoffroy remained prisoner of a purely morphological, almost a-historical concept of variation of a basic common structure, or whether he came to conclude that the history of life on earth showed traces of a progress towards higher levels of organisation, due to the decrease in the oxygen content of the atmosphere over endless ages[15]. For present purposes, I am assuming it to be established that Geoffroy's theories could in no way be equated to the ones put forward by Lamarck. Yet, it is also clear that Geoffroy's positive comments on Lamarck contributed to the high reputation the naturalist enjoyed during the 1820s. Together with his ally Bory de Saint-Vincent, Geoffroy missed no opportunity, when talking of the changes of living structures throughout the ages of the Earth, to invite readers and students to study Lamarck's *Philosophie zoologique*, especially the chapter dealing with the role of newly contracted habits in adapting organisms to changing environmental conditions[16].

I am instead arguing that historians have failed to notice that, judging from his references, Geoffroy had read precious little of Lamarck, for whom he nevertheless felt considerable human and political sympathy. They had got along well since the mid-1790s, when Cuvier's relationship with Lamarck was already far from excellent. Cuvier felt that his senior colleague was making ample albeit little acknowledged use of the deep anatomical and taxonomical reforms he was introducing in

the study of invertebrates. Geoffroy never had this problem, so to speak: his lack of interest for invertebrates remained a constant of his scientific career[17]. The widening gap with Cuvier experienced by both reinforced the cordial relationship between the two, and Geoffroy was a relatively frequent visitor of Lamarck during the latter's last years. His last personal tribute to Lamarck as friend was the speech Geoffroy delivered at the funeral of his colleague, on December 28, 1829, as the official representative of the Museum's staff. Geoffroy aroused the audience's sympathy by recalling Lamarck's last years as an old man, his blindness, and his poverty: summing up, in other words, all the arguments Geoffroy's anti-Cuvier fellow travellers were using in the press to extol Lamarck's role in French science, and diminish by contrast Cuvier's importance. By looking systematically at contemporary press reports, it becomes clear that the myth of Lamarck the poor, old, and blind prophet (as all prophets have had to be since biblical times) started during Lamarck's own life, and was part of the construction of the *positive* myth stressing the uncompromising and uncompromised greatness of the naturalist. Geoffroy's eulogy did in fact close with the hint that Lamarck's last, sad days were warmed by the old man's awareness that he had come to be called "the French Linnaeus": the only living naturalist to be so honoured[18]. Yet, Geoffroy's expression of sympathy, no doubt sincere, was not matched by an equal fidelity in acknowledging Lamarck's contribution to the theory of the transmutation of species.

If anything, the more Geoffroy, with his usual contorted lack of modesty, insisted on his epoch-making new ideas of descent through embryonic modification, the less Lamarck's name featured in his writings and speeches. In the early reference of the mid-1820s, Geoffroy had presented Lamarck as a courageous and daring thinker, who had perhaps pushed his ideas a bit too far beyond available facts. He did nevertheless argue that Lamarck's passages on the influence of environmental circumstances on organisms should be considered with the care they deserved (E. Geoffroy Saint-Hilaire, 1825c). From 1825 to 1830 Geoffroy produced several new versions of his view of environmental, mainly atmospheric, directional change inducing variation in embryos; his critique of Lamarck became more pointed. In the short book of 1831 collecting his memoirs of the years 1830-1831 on fossil crocodiles, several passages commented upon Lamarck's work. As in 1825, readers were again invited to contemplate pages from the *Philosophie zoologique*, and Geoffroy even proposed his own version of Lamarck's alleged two-factors process presiding over the development of life, the so called "power of life" and the action of external circumstances. "*The time has come*", he wrote, "*to take stock of the existence* [...] *of two different types of facts to consider with regard to animal organization: (1) facts pertaining to the essence of the germs; (2) facts resulting from the influence of the external world. Thus, inside developing natural bodies, there are two principles locked in perpetual struggle*". Yet, Geoffroy argued, whereas Lamarck's theoretical instincts had been right, the evidence he had produced was less satisfactory.

Lamarck's mistake, he warned in 1831, was his insistence that "will" induced adaptive habits and therefore change, and his view that animals could change throughout their individual life (E. Geoffroy Saint-Hilaire, 1831b, pp. 69, 79, 80, 86). Actually, both contentions reveal a superficial reading even of the texts Geoffroy was praising. Lamarck denied that large numbers of living beings, in particular those belonging to the extremely crowded lower echelons of invertebrates, possessed a nervous system, or even nervous filaments: they could not "will" anything at all. Their "habits" were no more than repeated physico-chemical reactions to external agents and to the omnipresent subtle fluids (heat, electricity, etc.) that constantly invaded and pervaded simple beings. Plants, needless to say, had no will whatsoever; they were nevertheless subjected to the same slow patterns of physico-chemical reaction to environmental change, leading to functional and morphological adaptation[19]. Finally, contrary to Darwin, Lamarck denied that changes occurring in adult age could be passed on to the next generation. Only very young organisms, in which the brisk circulation of fluids was capable of carving new channels and circulation pathways in their soft tissues, were likely to slowly adapt to equally slow environmental change. True, Lamarck never included embryos or teratological considerations in his thinking, but did insist that the tissues and circulation pathways of adult organisms were too rigid to be modified (Corsi, 2012, pp. 11-14).

More was to come. After the work on fossil ancestors of crocodilians published in 1831, Geoffroy undertook further paleontological work, and probably felt he could now move ahead without putting his work under the symbolic (though not uncritical) tutelage of Lamarck. After 1831, he presented Lamarck's ideas in even more superficial and almost derogatory terms, which called for public rebuttal. On August 12 and 26, 1833, Geoffroy read at the Academy a memoir in two parts, entitled "*Palaeontographie*", on his recent geological trips to Auvergne. He reiterated his conviction that antediluvian animals were the ancestors of the ones living today. He did however warn that his ideas could not be equated with the ones put forward by the infamous eighteenth-century treatise *Telliamed*, as Cuvier had suggested in the 1825 article "Nature". He was aware, he explained, that those old doctrines had been given a new lease of life by the German naturalist Rödig and by Lamarck in his *Hydrogéologie*. Yet, these antiquated speculations had nothing to do with the fact-based, brand new theories he was developing. The source for this surprising historical assessment was of course the sarcastic anti-Lamarck passage in Cuvier's *Discours préliminaire* to the *Recherches sur les ossemens fossiles* (1812). As is well known, the preface was separately printed under the title *Discours sur les révolutions du globe*, and became Cuvier's best known and most read work. In it, Lamarck's scientific credentials were questioned and indeed laughed at. Cuvier insisted that Lamarck was no different from old fashioned, discredited dreamers belonging to the embarrassing past of science (Cuvier, 1825b, p. 48). Like Cuvier, Geoffroy appeared to ignore the fact that it was not the *Hydrogéologie* (Lamarck, 1802a, January) in which Lamarck first put forward his doctrines, but the *Recherches sur l'organisation des corps vivans* (Lamarck, 1802b, July). Moreover, Lamarck's theory of the earth and of life had very little in common with the theses defended in *Telliamed*. Finally,

concerning Johann Christian Rödig (1772-1863), it is doubtful that Geoffroy knew what the German magistrate had been about. Cuvier was probably the only naturalist in France who had read the latter's *Lebende Natur* (1801), which the author had sent him from Pirna, in Saxony, where he lived. In any case, Geoffroy could not read a word of German (Rödig, 1801; Corsi, 2005b). Needless to say, the most astonishing feature of Geoffroy's lukewarm if not negative reading of Lamarck in 1833 and later is that it contradicted what he himself had said in 1825 and in 1831. Then, Cuvier was criticised for his harsh words against Lamarck. Now, Cuvier was quoted with approval and followed almost word by word. All reference to *Philosophie zoologique*, however inaccurate, was dropped altogether.

Geoffroy's partisan reading of Lamarck's work did not escape the attention of contemporaries. In 1830, the *Société géologique de France* had been established. Though largely ignored by historians of French science, the society quickly became a rallying point for a composite membership, ranging from prominent members of the pre-1789 aristocracy to the new aristocracy of the Empire, from civil servants to wealthy provincial amateurs. More importantly, it soon established itself as a welcoming abode for the few professional and the many amateur geologists and palaeontologists from Europe and the United States, including all the main players of British geology. Geoffroy courted the Society, was admitted at the recommendation of Bory de Saint-Vincent (3 November, 1833), and soon afterwards, on 18 November, read a version of his paleontological paper already presented to the Academy. Though the full text was not printed, the reaction to his intervention confirms that the passages on Lamarck were kept, and did not please the audience. Like the Academy, the Geological Society was known for frank talk; unlike the Academy, its structure was democratic. The Geological Society held open door meetings, where, unlike the Academy, all attendants, including visitors, could speak their mind. This is what Gérard Paul Deshayes (1795-1875) did on 3 December. Deshayes was one of the leading conchologists of Europe, much respected and sought after by famous geologists such as Charles Lyell (1797-1875) or Roderick Impey Murchison (1792-1871). He challenged Geoffroy's account of Lamarck's ideas, with the authority of someone who had attended the lectures of the naturalist, and aspired to be considered his heir. In the society's *Bulletin*, Deshayes was reported to have claimed for "*our celebrated M. Lamarck*" the priority in proposing the theory of the transmutation of species:

"*This thesis has been developed by Lamarck, not only in his zoological philosophy, in 1809, but also in his fine introduction to the history of invertebrates, in 1815. M. Deshayes points out that it is not fair to quote, as M. Geoffroy Saint-Hilaire has done, the Hydrogeology of Lamarck, a work that preceded the other two, and in which this idea was presented in the most cursory way. Finally, M. Deshayes ends his intervention by stating in the most positive way – quoting the pages 129 and 130 of the above mentioned preface – that Lamarck had never shared the systematic views of Telliamed, as M. Geoffroy Saint-Hilaire appears to believe, which have since been taken up by Bonnet and Rödig*" (Anon., 1834, pp. 99-110).

On 3 and 24 February, and on 7 April, 1834, Ami Boué (fig. 2) (1794-1881), the President of the Geological Society of France, read a volume-size report surveying developments in geology during the year 1833. It is very interesting to note that Boué (a Franco-German naturalist who had spent several years in Edinburgh, as a pupil of Robert Jameson, 1774-1854) considered that a good number of geologists viewed the hypothesis of transmutation as a viable explanation for the succession of faunas. He himself endorsed it. Boué is indeed a good candidate for the authorship of the famous pro-transformist 1826 article in the *New Edinburgh Philosophical Journal* traditionally attributed to Robert Edmond Grant[20]. The ecumenical tone of the narrative allowed Boué to praise Lamarck and Geoffroy alike, considering the latter as the naturalist who had completed the theoretical framework the former had sketched. In diplomatic terms, Boué introduced a distinction between zoologists and geologists. The latter were exposed to the evidence of change on a massive scale, whereas the former often took their experience, limited to their own lifetime, as the yardstick by which to judge the history of life on earth. No wonder that zoologists tended to believe in the eternity of species.

Boué was not a timid follower. He had his own ideas concerning spontaneous generation (a subject on which Geoffroy maintained a prudent reserve) and argued with Bory de Saint-Vincent, against Lamarck, that at the microscopic level there existed spontaneously generated organisms intermediary between plants and animals[21]. Boué was convinced that the vital properties of matter guaranteed the constant formation of new microscopic chains of molecules, capable of assembling together to give birth to organisms intermediary between the vegetable and the animal kingdoms. At the beginning of things only such beings were capable of surviving in a world very different from ours. The growth of organic complexity, interacting with changing environmental conditions, was responsible for the appearance of the successive extinct faunas geologists were slowly unearthing. Boué did not exclude that in previous ages the vital forces could have spontaneously produced organisms more complex than the microscopic ones, nor that man himself could be further perfected, or indeed that on other planets there lived humans endowed with more perfect senses and intelligence.

Boué was aware that the theory of spontaneous generation had been rejected by prominent naturalists, and that Charles Lyell had forcefully argued against the transmutation of species in volume two of his *Principles of Geology* (1832). Boué was not convinced. The real issue, in his view, was the assessment of imperceptible processes of change acting over limitless ages. In Lyellian terms, he argued that processes of organic change were active in today's world, under our very eyes, and it was important to be able to calculate their cumulative effect on the immense scale of geological time:

"*In fact, if modifications in the environment or in the action of vital properties are capable of changing parts of the organism and to establish varieties within our species, no one can maintain that these same causes do not have the power to split one species into many. Our observations in natural history do not go further than two thousand years; let's concede even*

Fig. 1
Étienne Geoffroy Saint-Hilaire

Fig. 2
Ami Boué

Fig. 3
Jean-Baptiste Bory de Saint-Vincent

Fig. 4
Pierre Leroux

four or five thousands: how do we still dare to limit to such a short lapse of time the creative and modifying power of nature, which has millions of centuries at its disposal?" (Boué, 1834, p. 117; Laurent, 1987 and 1993).

The reaction Geoffroy met with at the Geological Society was not as bad as the constant attacks he suffered on the floor of the Academy. He was nevertheless disappointed. Geoffroy did not communicate any further memoir to the Geological Society. His writings for the years 1830-1836 show that his knowledge of the current geological and paleontological literature was as limited as his actual familiarity with the writings of Lamarck. Though in a paper read at the Academy in August 1834 he corrected his previous statements concerning the intellectual filiation between de Maillet and Lamarck, this only provided further evidence of his superficial reading of the works of his colleague. This time Geoffroy accused Cuvier of having misrepresented the case, but proceeded to accuse Lamarck of having a rather limited view of the time it takes for change to occur. This of course runs against every line of Lamarck's texts (E. Geoffroy Saint-Hilaire, 1834d, p. 557). The technical language of Geoffroy's geological memoirs was at times lamentable when compared to current publications in the field, available in Paris as well as in the provinces. His field activity was limited to a few days, accompanied by local collectors and notables, whom he duly acknowledged. In Auvergne, it was the expert palaeontologist and Christian apologist Abbé Jean-Baptiste Croizet (1787-1859) who assisted him in making sense of scattered bones[22].

Geoffroy appeared to have a rather elementary acquaintance with contemporary debates on stratigraphy and geological chronology. He remained a zoologist at heart, though he pleaded for palaeontology to become an independent science concerned with the chronology of beings. Yet, his public authority was growing, almost in direct contrast to the increasingly hostile reception his ideas met with in academic circles. Doctors, young geologists and palaeontologists, contributors to periodicals and encyclopaedias, but also prominent writers and political theorists were honoured to engage such a personality in public debate, and to acknowledge Geoffroy's original and powerful voice, thereby asserting their own leading role in contemporary intellectual and social affairs. To praise Geoffroy, and to be praised by him, was to many the vindication of their intellectual standing in a very competitive world.

From 1830, Geoffroy kept busy re-writing the copy of his public persona. He boldly reconstituted his own intellectual ancestry. Buffon, whom he had always admired, became one of the inspirers of his unity of composition doctrine. One sentence in Newton's 1704 *Opticks* Laplace kindly provided, and generic passages from Leibniz, were also used to illustrate the genesis of Geoffroy's own contribution to the progress of knowledge. Goethe, who had come unexpectedly to his aid in the summer of 1830, was also granted a place of prominence amongst the benefactors of humanity (E. Geoffroy Saint-Hilaire, 1835, p. 175). On the issue of species change, Pascal was now called upon, together with the Buffon of the *Époques de la nature*. The more Geoffroy moved into the realm of physics – the speculative physics he had started developing in the years of the Egyptian adventure – the more his intellectual genealogy ramified and grew in prestige. Kepler (often spelled Keppler) had the intuition of attraction that Newton formulated in our modern scientific terms. Napoleon, to Geoffroy the great man of Providence, at the age of 15 had sketched a research programme on attractive forces acting at molecular level, a programme Geoffroy was destined by the same Providence to express in the terms of the universal law of "the attraction of the self by the self". He, Geoffroy, was going to achieve for molecular attraction what Newton had done for astronomic attraction[23]. Even these (to us) extreme, almost senile intellectual wanderings attracted favourable attention on both the left and the right of the political spectrum. The rarefied language Geoffroy adopted, which the modern reader finds difficult to appreciate, was for some contemporaries the clear sign of his elevated thoughts, of his poetical intuition bridging the gap between the dead world of science and the phenomenal, existential experience of life[24]. Philosophical insight into the wonders of life elevated the human mind to acknowledge the Divine presence in nature.

All reference to Lamarck and his doctrine of organic change was dropped from Geoffroy's last works[25]. Indeed, after 1835 reference to his own controversial work as anatomist and zoologist waned, emphasis being placed instead on his work in palaeontology, physics, and the study of quadrumana. His *Études progressives d'un naturaliste* of January 1835 was designed to become an influential periodical publication, competing with current official publications: "*On my own, I will provide my own volume of Annales; on my own, without any help from a publisher*" (E. Geoffroy Saint-Hilaire, 1835a, p. VIII). Both the Academy and the Museum were dragging their feet faced with Geoffroy's endless stream of notes and recriminations, and even refused to publish his physical speculations or to invest in expensive illustrations for his paleontological works. So, the *Études* were advertised by Geoffroy as a new periodical redressing a patent injustice[26]. The author, the publisher (one was in the end found), and at least one reviewer, a fervent Catholic, appeared convinced that a single man could indeed take on the whole of contemporary science, and write an entire journal himself. The second volume of the series, Geoffroy's last scientific work, *Notions synthétiques, historiques et physiologiques de philosophie naturelle*, was devoted to physics, and was inscribed to Napoleon:

"An homage of admiration to the other face of Napoleon Bonaparte's genius. To his memorable meditation, The World of Detail, a conception belonging to the adolescence of this philosopher, when thinking of science at the age of fifteen. Geoffroy Saint-Hilaire, one of the soldiers and men of letters taking part in the military and scientific expedition to Egypt, during the last years of the XVIII Century."

The troubles of daily life interfered with the plan of carrying on with the new periodical, and dramatically interrupted even the narrative of volume two. Geoffroy recounted how the new, young Minister of Public Education (a devotee of Cuvier), Narcisse Achille de Salvandy (1795-1856), had stripped him of his directorship of the *Ménagerie* of the Muséum, the zoological garden he had been in charge of since 1793[27]. The job was given to Frédéric Cuvier, who on 24 December (the perfect date for a coup) had been appointed to a chair

especially created for him at the Muséum, which included responsibility over the *Ménagerie*. In exalted terms befitting the theatrical representations of the self many contemporaries adored, Geoffroy announced his withdrawal from the public scene. His new periodical was dead. He had been thinking of exile, embarked upon a tour of Germany, but cut it short, too ill to travel. Friends testified as to the deep depression Geoffroy fell into following what he considered the ultimate official insult[28]. The restitution of the directorship of the *Ménagerie* after the death of Frédéric, a few months later, was no consolation. Blindness struck in 1840, as it had done Lamarck in 1818. He was now free, so to speak, to become a sage. He was increasingly honoured as such, until his funeral apotheosis in 1844, when top French naturalists, writers and philosophers paid homage to the great man (Anon., 1844).

GEOFFROY'S DISAPPOINTMENTS: CRITICS AND ADMIRERS

In spite of his efforts and rhetorical exaggerations, Geoffroy did not manage to convince contemporaries that his theory of organic change had nothing to do with Lamarck's doctrine of transmutation. We have already noted the reaction he met with at the Geological Society, when he repeated the Cuvierian story of a Lamarck following in the footsteps of wild eighteenth-century amateurs. He also failed to restrict public discussion to his own doctrines. Geoffroy's suggestion that Lamarck had nothing to do with his own ideas was ignored even by his most devoted admirers. Not unlike Boué, several contemporaries engaged in the eclectic merging of elements from a variety of authors. Bory de Saint-Vincent, for instance, was frequently commented upon, and favourably so, for his work on microscopic animals. Particularly successful was Bory's proposal to establish a new kingdom, intermediary between animals and plants, which he called *Psychodiaire*. He described in detail how molecules of vital matter released in infusion could regain their pristine autonomy, combine again, and produce new organisms: not exactly the same, but almost the same, since the laws of combination were like the laws of chemistry and physics (Bory de Saint-Vincent *et al.*, 1824). Commentators have paid little attention to the fact that Bory denied that the environment had anything to do with organic change, and declared that species do not change at all when stimulated by external conditions. Geoffroy's faithful disciple and friend, Étienne Serres (who was a staunch anti-transmutationist) and Meckel were also providing authoritative statements in favour of the theory of embryonic recapitulation many saw as the primary evidence of the history of life on Earth[29].

Geoffroy also failed to convince religious commentators that his doctrines were sound and safe. Though at least one Catholic writer praised him for having abandoned earlier materialistic assumptions, others respectfully pointed out that there was not much substantial difference between Lamarck and Geoffroy. The latter too, therefore, was open to the ridicule Cuvier had poured on de Maillet and Rödig. In one of the serialized "Conversations physiques" published in the *Chroniqueur de la jeunesse* he edited, the historian and Catholic apologist Julien-Marie Daniélo (1800-1866) provided a lengthy review of Geoffroy's 1835 *Études progressives*. In his view, Geoffroy's writings and theories represented an important change in élite scientific mentality. The naturalist had finally come to understand the importance of feelings, of the appreciation of the divine in nature, of developing a style at the level of the sublime truths which properly conducted scientific investigation was unveiling:

"*If science wishes to occupy a place in the world and to capture the ear of writers and thinkers; if it does not wish to remain in the shadow and count for nothing, nor live forgotten and despised by men, and deservedly so, science will be compelled to develop its own intelligence and its own soul, and abandon the rotten scraps only insects and dogs are running after.*"

Geoffroy, stated Daniélo, was the man to achieve this goal. To the objection raised by the son of the leading character of the conversation, that the naturalist was accused of materialism, denied vitalism, and in any case still believed that matter was endowed with intrinsic active powers, the father answered that the system was far from being achieved. Geoffroy had announced a new work, *La Genèse des choses*, where his devotion to a creative Supreme Power would become even more evident. Still, his recent work, the *Études*, represented a move in the right direction. It was written with elegance, reaching at times poetical heights. Geoffroy could be reassured, he concluded, that the lay public was going to prove more than willing to listen to him, surely more than the "often deaf and lazy ears" of the members of the Academy of sciences[30].

Daniélo kindly avoided all reference to Geoffroy's doctrine of species change through embryonic modification, even though he quoted extensively from the *Études*. This was not the line adopted by Philippe Joseph Benjamin Buchez (1796-1865) a commentator Geoffroy had exchanged civilities with in 1833, or by Henry Belfield-Lefevre, one of Buchez's most trusted collaborators. Buchez, as well known in his time as he is almost forgotten today, was a major political agitator. A conspirator and one of the founders of the French "Carboneria" (originally an Italian secret society), Buchez was investigated for treason in 1822, and escaped the scaffold thanks to a sympathetic, "philosophical" judge (Castella, 1909; Isambert, 1967; Guccione, 1986). After taking a medical degree in 1824, during the late 1820s Buchez was known as a Saint-Simonian publicist and organiser. In 1830 he converted to Catholicism, and was among the main promoters of Catholic Christian socialism in France. Little is known of Belfield-Lefevre, a medical writer and probably himself a doctor. He worked for Buchez on a variety of editorial enterprises.

The text by Belfield-Lefevre we are briefly considering here, before turning to his master's later and thorough assessment of Geoffroy and Lamarck, appeared in one of the many encyclopaedias that fed scores of medical students and would-be men of letters, the *Dictionnaire de la conversation*[31]. It was in fact a biographical entry on Geoffroy, whom the editors considered famous enough to deserve to be included even if still alive. Readers of the *Dictionnaire* were eager to shine in their walk of life by expressing an opinion of whatever subject salon goers, in short, public opinion, considered worthy of attention. The tone was respectful but firm. No one

doubted Geoffroy's pious life, his Christian beliefs and his reputation as a loyal friend and an uncompromising seeker after truth (Belfield-Lefevre, 1836, p.126). Yet, he had unfortunately fallen into the trap of materialism. He was continuing the work of demolition of the belief in God Buffon in the *Époques de la nature*, de Maillet in *Telliamed*, and Lamarck in his "*Hydro-géologie*" (sic) had started within the natural sciences. According to Belfield-Lefevre, Geoffroy believed:

"that all living species descended from a single primitive antediluvian species by way of generation; only the modifications impressed upon this primitive form by the changes that came about in the environment [milieux ambians] have determined the diversity and the multitude of present day species. He therefore admits that a species can be deduced carnally, materially, from a neighbouring species, and as a consequence he establishes a reciprocal material relationship among all species".

Belfield-Lefevre commented upon the intellectual ancestry Geoffroy had indicated, including the much revered Pascal, who had allegedly argued that at the beginning there only existed ambiguous and inform organic beings later shaped by circumstances; however, he denied that such a prestigious ancestry proved a sufficient antidote against evil[32]. Geoffroy had not distanced himself critically from the authorities he himself had quoted. He had further maintained the eternity of matter; he had expressed the belief that species were created by material forces: there was no need for God in his animated nature. He should have stuck to Cuvier's elevated views on the subject. In spite of his good intentions, Geoffroy was a victim of the merciless logic of modern materialism. He had joined Lamarck and Pierre Henri Leroux (1797-1871, the radical philosopher and mystic socialist discussed below, fig. 4) in their work of demolition of Christianity and ultimately of society.

Geoffroy was deeply hurt by this review. He obtained that the *Dictionnaire*'s next available instalment contained an entry created *ad hoc*, "*Hérésies panthéistiques*", where he defended himself from the charge of pantheism and reiterated his faith in Christianity and Revelation (E. Geoffroy Saint-Hilaire, 1836c). He printed the entry for separate distribution and presented it to the Academy (E. Geoffroy Saint-Hilaire, 1836d). He also asked Leroux's friend and collaborator, Jean Reynaud (1806-1863) to vindicate his reputation by contributing a biographical entry on his career to yet another encyclopaedic venture, the *Biographie des hommes du jour*, which duly appeared in 1836[33]. Writing to Geoffroy's son, Isidore, Reynaud deplored the lack of gratitude Buchez and his pupil had shown to Geoffroy, who had been so kind to the neo-Catholic intellectual (Griffiths, 1965, pp. 157-159). Indeed, one of Buchez's early works, *Introduction à la science de l'histoire* (1833) had been favourably reviewed by Geoffroy in the *Revue encyclopédique*. The brief introduction by one of the editors, probably Pierre Leroux, had even called attention to the extraordinary event represented by a review from the pen of Geoffroy on such a theme. The naturalist had himself proposed to write a report on the book for the Academy of sciences, but the two colleagues who were asked to join him in drafting it had withdrawn. The Academy, the *Revue* editor commented, did not know what to do with a text bridging the natural and the human sciences[34].

As far as he was concerned, Geoffroy admitted that Buchez was dealing with the "sciences" as if they represented an unified bloc; Buchez pretended to discuss where they were leading to as if they were an uncontroversial body of knowledge. In spite of an excess of *a priori* reasoning, Buchez was however right in considering humanity as the object of a new scientific discourse. As individual beings, societies too were born, grew and died. All the natural sciences, from geology to embryology and comparative anatomy, were asked to contribute to the gigantic undertaking of establishing a science of history and of humanity. Geoffroy felt he had something important to say on the matter, and took the opportunity of presenting again his own views on the history of the Earth and of the transformations life had undergone. He argued that the main factor responsible for the change in organisms had been the decrease in the oxygen level of the atmosphere. Primitive animals were huge, because they were living in a hot climate, and were breathing an atmosphere rich in vital air. Geological change and the decrease of oxygen had forced many animals to adapt: in fact, it was their embryos that were affected by the different nūtritious and gaseous elements the mother was taking in. Many died, but those who survived passed on the new structure, the starting point of a new species[35].

Buchez was not pleased. Geoffroy's known sympathy for his increasingly antagonistic former friends Leroux and Reynaud did not soften his attitude towards the naturalist. Moreover, Buchez's conversion to Catholicism strengthened his reaction against the pantheism of his youth: a new science of progress, natural and social, had to dispense with the deadly sin of unbelief. Progress was the expression of God's will, and to put Him aside would have jeopardized all hope of lasting social and political reform. In 1838 Buchez confided to his friend Belfield-Lefevre the task of publishing the transcription of an introductory course to medical studies he had delivered at a private medical school. His lectures contained very little medicine and a lot of his philosophy and theology. A long section of the book was devoted to denouncing materialism and encyclopaedism from d'Alembert to Auguste Comte. Hints dropped here and there made the reader aware that the *Encyclopédie nouvelle* edited by Leroux and Reynaud was guilty of the same sin. To Buchez, the systematic presentation of the sciences and of their classification had never been a neutral service to the reading public but had always represented dangerous attempts at promoting atheism.

What d'Alembert and Laplace had done for astronomy and cosmology, Lamarck and Geoffroy had been doing for the life sciences. We have no idea whether Geoffroy read Buchez's discussion of his work, though this is likely, since Belfield-Lefevre, the editor of the *Cours*, kept sending his publications as homage to the naturalist. If he did, he must have felt again deeply wounded: Buchez attributed all the merit, or the lack of it, to the Germans and to Lamarck. Geoffroy was given a back seat role.

"*There exists a doctrine, widely diffused in Germany under different forms, and put forward in the great anatomical works of Schelling, Spik* [sic] *Carus, Oken, and even Meckel: a*

doctrine that has been developed and made popular in France, towards the end of the last century, by the illustrious Lamarck. This doctrine can still count among its partisans M. Geoffroy Saint-Hilaire and some of the most learned naturalists of our time. This is the doctrine of Continuous Progress" (Belfield-Lefevre, 1838, p. 142).

As with many intellectuals wishing to establish a science of history, Buchez cared little for historical detail and even the spelling of the names he was quoting. He was nevertheless very pointed in detailing the essence of Lamarck's theories and their bearing on the belief in the existence of God. In fact, Buchez concentrated his critique mainly on Lamarck, considering Geoffroy a mere follower of the author of the *Philosophie zoologique*. From the almost imperceptible grading of forms in our ever richer taxonomies, Lamarck had deduced that species did not exist, and that they were constantly produced by the process of change the environment is constantly undergoing: "*The environment can vary endlessly, thus generating an endless number of varieties which, under the prolonged influence of the same conditions, will become true species*" (Belfield-Lefevre, 1838, p. 149).

After seven pages (Belfield-Lefevre, 1838, pp. 142-149) devoted to Lamarck, Geoffroy was dealt with in less than two. Buchez paid homage to the great anatomist; summed up the theory of the unity of composition; mentioned the change in the gaseous composition of the atmosphere; and insisted on the role that nutrition played for Geoffroy in conditioning the molecular intake of animals, and therefore their structure. All the sophistication Geoffroy had introduced into the debate on life was not sufficient to impinge upon the factual truth that species were rigidly confined within their reproductive barrier. Local varieties did of course occur, and man himself had produced quite a few useful ones in the vegetable and animal kingdoms. But the species barrier could never be overcome, and never had been. As Cuvier had shown, species were entities created by God. It was therefore logical to deduce that changes in faunas following geological catastrophes had been brought about by repeated creative interventions (Belfield-Lefevre, 1838, pp.149-150). All the ingenuity Lamarck and Geoffroy had displayed was mainly directed at developing specious arguments to dispense with the belief in God's creative power and therefore in His existence. Leroux and Reynaud were seeking the scientific, philosophical, and social support of Geoffroy. Buchez tried to show, without mentioning their names, that the doctrine of Continuous Progress they insisted upon in their publications was nothing less than materialism and atheism. Their idea of "Progress" was in fact founded on the discredited biological and geological theories of Lamarck and Geoffroy. In other words, the doctrine of limitless social progress was denying the action of God in society, as the scientific proponents of biological progress were denying the action of God in creation.

It is important to point out that Buchez in 1838, as Boué in 1834 or indeed, in England, William Whewell in his 1832 review of Charles Lyell's *Principles of Geology*, were all convinced that Lamarck and Geoffroy had many followers, even though this view is not shared by many of today's historians[36]. Indeed, during the 1830s two more large circulation encyclopaedias, the *Dictionnaire pittoresque*, and the *Encyclopédie nouvelle*, devoted considerable space to discussing Lamarck and the state of transmutation theories in contemporary culture. Both publications are of interest for different reasons. The *Dictionnaire pittoresque* testifies to the capacity of the book market to absorb yet another encyclopaedia. In the advertising prospectus for potential subscribers, the editor, the entomologist and engraver Félix-Édouard Guérin-Meneville (1799-1874), announced the intention of making all useful information available in just 4 volumes, thus avoiding the expense of current, multi-volume publications. Success and profit made the publishers expand their ambition. Between 1833 and 1839, nine volumes were in the end published, as usual in instalments, which sold around 12.000 copies. A new edition, with the title *Nouveau Dictionnaire classique d'histoire naturelle*, appeared between 1844 and 1846 (47 small volumes). As the title of the new release suggests, Guérin, who had been a collaborator of Bory de Saint-Vincent, tried to capitalize on the success of his friends'dictionary, though the choice of pirating the title of the work Bory had edited was probably taken by the publishers. The list of contributors included several pupils and followers of Bory and of Geoffroy.

The *Encyclopédie nouvelle* (1834-1842, 8 vols.), launched in 1834 by Pierre Leroux and Jean Reynaud under the then fashionable and to us slightly confusing title of *Encyclopédie pittoresque à deux sous*, quickly became the *manifesto* of a new brand of post-Saint-Simonian, quasi-mystical social theorizing[37]. Leroux, like Buchez a former supporter – in succession – of the Carboneria and of Saint-Simon, cut quite a figure in mid-nineteenth century politics, philosophy and literature, and not just in France. A close friend of Georges Sand and Victor Hugo, his writings were admired by Charles Kingsley and British Christian socialists as well as by Heinrich Heine in Germany or Giuseppe Mazzini from his exile in London. Leroux was mentioned by Geoffroy as one of his "oldest and most cherished friends". Geoffroy may have met Leroux when the latter was working for the publisher Charles-Louis Panckoucke (1780-1844), another long-term friend of Geoffroy's[38]. During the late 1830s, the naturalist wrote letters to the authorities in the hope of obtaining a pension for Leroux who, he hoped, could join forces with other friends, such as David Richard, and convince George Sand to write publicly in support of his theories[39]. Geoffroy praised the *Encyclopédie*, to which he contributed a highly interesting biography of Buffon, and often invited the two editors, Leroux and Reynaud, to dinner at his home (E. Geoffroy Saint-Hilaire, 1836b; Griffiths, 1965, p. 153). After Leroux and Reynaud split over the – to them – momentous issue of metempsychosis, Geoffroy and his wife kept in close touch with both. Reynaud was a friend of Isidore, Geoffroy's son, and in 1843 married Léonie Olivier, a former pupil of Chopin and a close friend of Isidore's wife[40]. In 1844, Reynaud wrote a moving obituary of the naturalist for the *Magazine pittoresque* and was personally involved, together with Leroux, in the erection of a monument to Geoffroy in the latter's native town of Étampes (Reynaud, 1845).

Contrary to the neo-Catholics Buchez and Belfield-Lefevre, several writers in the two publications we have

summarily introduced expressed their support for transmutation, even though they did not agree with Geoffroy that Lamarck had been the visionary Cuvier had denounced. They also provide substantial evidence of the eclectic nature of pro-evolutionary statements at the time. In view of the fact that the authors we are going to quote in this section of the present paper are practically unknown, or have been read as docile members of the Lamarckian flock, it is worth reproducing and commenting upon key passages from their writings.

In the article "Animaux" of the *Dictionnaire pittoresque* the agronomist and zoologist Louis-Michel-François Doyère (1811-1863) quoted extensively from Lamarck, and expressed his admiration for the philosophical tone pervading all his works. To avoid the dangers of blind listing of facts, he explained, the study of nature had to follow principles: "*It is from the meditations of the learned Lamarck that we will borrow them. At first sight, they may not seem all equally evident. Yet, studied with care, confronted with facts and phenomena, they will be judged under a completely different light. Made strong by evidence and truth, these principles will soon be perceived by our mind as indicating a deep study of the intimate nature of beings, as the most faithful and the simplest expression of the laws that presided over their creation*". Doyère, as many before and after him, felt free to propose a synthesis of ideas taken from Bory de Saint-Vincent (he expressed belief in the existence and power of aggregation of particles of living matter), Geoffroy and Lamarck[41].

The entry "Animaux fossiles" was contributed by Émile Puillon Boblaye (1792-1843), then, in 1834, one of the two Secretaries of the Geological Society of France. Boblaye had taken part in the 1829 scientific expedition to the Peloponnese headed by Bory de Saint-Vincent, and, together with Pierre Théodore Virlet d'Aoust (1800-1894) had authored the much acclaimed geological section of the voyage's printed report. Writing as a geologist, Boblaye argued that the continuous succession of species throughout the geological strata "*has given rise to the question of whether the changes of faunas were due to successive creations or to slow modifications of primitive types. The latter system has been maintained with the greatest sagacity by Lamarck. He does not grant species a real and permanent existence: he believes species are susceptible of indefinite alterations, so that the most ancient animals, and those that differ most from the ones living today, could have been the ancestors of the later forms*". Boblaye explained that this view had been opposed at first by leading naturalists, Cuvier *in primis*, and by those who wished to argue in favour of repeated creative interventions marking the history of life on earth. Things had nevertheless changed: "*The daring hypothesis formulated by Lamarck, and modified by Geoffroy Saint-Hilaire, has acquired a degree of probability it did not possess at the time Cuvier fought against it. Geoffroy Saint-Hilaire has conceded the fixity of species when the environmental circumstances are stable, as is the case with the short length of our historic times. He has also established that species must and indeed have varied indefinitely due to the changes occurred in the composition of the atmosphere, of the sea, briefly, of the physical state of the globe.*" Boblaye was aware that in England many tried to use biblical arguments to enhance the authority and acceptability of geology, and that even in France Ampère had argued along analogous lines in his lectures at the Collège de France: "*Luckily, we do not need such vehicles*"[42].

Turning now to Pierre Leroux (fig. 4) and his collaborators, it is important to point out that the handful of authors who have commented upon Leroux's relationship to Geoffroy Saint-Hilaire and to the doctrine of the transmutation of species have failed to distinguish between different issues and very different attitudes (Viard, 2004, pp. 54-55; Viard, 2009, pp. 95-104; Conlin, 2011). Conversely, the very original presentation of the state of evolution theories in the early 1830s which Achille Requin (1803-1854) contributed to the *Encyclopédie nouvelle* has been completely ignored (Requin, 1836a and 1836b).

Contemporary and later commentators have traditionally presented Leroux as being indebted to Geoffroy for key components of his own evolutionary views, in the strict sense of his doctrine of the unfolding of a providential plan in nature. Yet, it needs to be pointed out that Leroux was not interested in the niceties and at times even in the substance of the scientific theories he claimed to be inspired by. In 1834 he paid public homage to Geoffroy's "progressive" role in the contemporary scientific and philosophical scene, which he contrasted with Victor Cousin's "retrogressive" stand. Geoffroy was, needless to say, elated (Leroux, 1834, pp. XIX-XX; Griffiths, 1965, p. 139). In his own contributions to *Encyclopédie nouvelle*, Geoffroy's son, Isidore, took upon himself the task of placing his father's philosophical anatomy within the wider picture of the history of human knowledge (Geoffroy Saint-Hilaire, 1843a and 1843b).

As far as he was concerned, Leroux did not distinguish between his friend Geoffroy's doctrine of descent through embryonic change and the views put forward in the *Encyclopédie* and elsewhere by another good friend of Geoffroy, Étienne Serres, who was opposed to the idea that organisms could change when interacting with a changing environment. If pushed, Leroux would have preferred Serres' wholly morphological, anti-materialist and almost a-historical view of organic change. To Leroux, the only history worth talking about was the majestic ascent from simple forms towards the revelation of humanity's mission in creation. To his colleague Reynaud, the mission of humanity extended to the entire universe, in an endless process of reincarnation in more perfect worlds. To both, this, whether terrestrial or celestial, was a wholly spiritual rather than a material process. Whether species could really change when interacting with the environment, as Lamarck and Geoffroy claimed, Leroux abstained from pronouncing: "*We do not need to believe, as some great modern naturalists do, that species and genera have generated each other in succession. This may be; this is even very probable, since the type of animal life appears to be the same throughout the series*" (Leroux, 1837, p. 809). It was in any case a detail that should not distract from higher orders of contemplation and investigation. It is perhaps interesting that the key entry "embryo" which Achille Requin announced as forthcoming in the *Encyclopédie* was in the end written by Serres: a dense 60-pages-long treatise entitled "Organogénie" that also appeared as an independent volume[43]. Requin had perhaps been too zealous in attempting

a new synthesis of contemporary views of organic change, and too enthusiastic in extolling the virtues of a materialist account of life and its transformations.

THE NEW SYNTHESIS OF ACHILLE REQUIN

The son of a general of the Napoleonic army who died too soon to be able to provide for his family, Requin lived in relative poverty and opted for a medical career. He gained much needed financial support by writing for periodicals, including the *Revue encyclopédique* of the early 1830s, where he favourably reviewed Geoffroy's *Palaeontographie*. Almost completely forgotten today, Requin succeeded in gaining a chair of Hygiene in a major Parisian hospital in 1851, but died soon afterwards. His best pupil, the promising Jean-Martin Charcot (1825-1893) undertook to complete the publication of the collected works of his beloved teacher. Charcot edited chapters in volume four, but then gave up, thus depriving Requin of the ancillary distinction to be remembered as the teacher of a famous man[44]. Requin's works show competence and originality, as well as considerable independence. His article did not shy away from openly criticizing Lamarck for his definition of life, which introduced too sharp a division between animals and plants: "*Following M. Bory de Saint-Vincent we think that a kingdom intermediary between the vegetable and the animal ones should be established, the kingdom of psychodiaires or plant animals*" (Requin, 1836b, p. 557).

After expanding upon the main features of animal life and sensation, which (again contrary to Lamarck) he believed to be a property common to all animals, Requin tackled the issue he considered the most controversial in contemporary natural sciences: "*whether the different species owe their first origin to a direct generation, and perpetuate themselves with invariable constancy through the successive birth of individuals always similar to their parents; or whether, through the passing of ages, after the direct generation of the most simple individuals, the first sketches of animal organisation have given rise to all known species, thanks to various improvements, originally acquired under the double influence of the internal force of growth, and the action of local circumstances, then perpetuated forever by this kind of hereditary transmission, which is the key feature of life. In short, have we to concede the absolute primacy of species, or their successive filiation?*" (Requin, 1836b, p. 562).

Requin discussed two major mechanisms responsible for the succession of beings throughout the surface of the Earth and its history: the classic Lamarckian model, and accidental variations transmitted through heredity. Requin reminded readers that the observation of nature showed to what an extent vegetables and animals could alter under the influence of varying environmental circumstances. Furthermore, the study of habits had proved that organs were fortified by use, and weakened by the lack of it, to the point of annihilation. There was however another law in action, he continued, following which "*variations accidentally acquired by individuals of one species are transmitted through heredity, if these individuals mate among themselves. To this law we owe the multitude of domesticated races we have produced thanks to the diversity of climate, nourishment, education, etc.: the swift English horses or our heavy cart horses, mastiffs, hounds, basset hounds, spaniels and water spaniels that resemble each other less than the ass resembles the horse*" (Requin, 1836b, p. 563). In other words, environmental conditions produced accidental variation in animals and vegetables alike. If the organisms affected were made to interbreed, then new species could be generated. This process had been carried on by man for several thousands of years, to the point that, especially as far as domesticated plants were concerned, many species common in our fields "*do not grow anywhere else in nature. These are distinct species, in the most rigorous acceptation of the term, produced by man, that have departed from their original type at the end of a great number of generations*". If man had achieved this result in the space of a relatively short time, which Requin estimated as approximately 30.000 years, there was no difficulty in understanding how throughout the ages of the Earth nature had produced the countless species we observe today.

Requin summed up his views in terms to which Lamarck would have subscribed, and indeed the sentence is almost a paraphrase of classic Lamarckian texts:

"*Here are the ideas we consider the more probable concerning zoogeny: 1. Nature has started, as it does still today under favourable locations and conditions, by directly creating the most simple animals; 2. Due to its faculties of growth and reproduction, which are intrinsic to the first periods of all life forms, Nature has progressively, and not directly, created more and more perfect animals, thanks to the gradual complication of organisation occurring within appropriate circumstance, and through the hereditary transmission of all acquired progress. In the long run of centuries and thanks to the infinite diversity of external conditions, Nature has produced a numberless multitude of species, the series of which, shrewdly graduated, reveals even today, in spite of irregularities and gaps, an evident communality of origin.*" (Requin, 1836b, p. 563).

In the entry "Anatomie" Requin did not fail to mention the importance of embryological recapitulation for the understanding of life's progress. Implicitly quoting from Étienne Serres, he stated that "*the embryo of higher animals successively acquires its own organs according to the laws presiding over the gradual complication of organisation in the zoological chain; in truth, embryogenesis is a transitory comparative anatomy, and comparative anatomy is a permanent embryogenesis*" (Requin, 1836a, p. 512).

It is however interesting to note that in the key and rather lengthy entry "Animal", Geoffroy was alluded to only in passing. True, his work had been already commented upon with praise in the entries "Anatomie" and "Anomalie", together with the teratological researches of Isidore. In the entry "Animal" Requin fully adopted the intellectual genealogy Geoffroy had reconstructed, but included the authors his senior colleague had excluded, while failing to mention Geoffroy by name. The progressive transformation of life, Requin explained, was "*the conclusion reached by free and deep thinkers such as Pascal, Demaillet, Goethe and Lamarck; after them, the probability has become almost a certainty, thanks to the progress of anatomical philosophy*" (Requin, 1836b, p. 564). Readers

familiar with contemporary scientific debates could easily have understood the hint, but Geoffroy's name was not there for the general lay public to appreciate. Geoffroy was keeping a keen and almost paranoid eye on whatever was said of his work, especially during the disappointing years 1834-1835. It is fair to speculate that he may not have been pleased with the distinguished albeit almost secondary role he was accorded in the key entry "Animal". Moreover, Requin only alluded in passing to the issues dear to Geoffroy's heart, the very ones the old naturalist believed were going to grant him perpetual glory: the change of the composition of the atmosphere was mentioned only as one among many possible environmental factors of variation; speciation through embryonic variation was obliquely alluded to, and never properly discussed; the entry lacked what Geoffroy would have seen as appropriate reference to his (to him) seminal works. It is significant that Geoffroy never mentioned Requin's contribution to the *Encyclopédie nouvelle*, whereas he praised Boblaye's contemporary contribution to the *Dictionnaire pittoresque*, where his name was clearly and repeatedly mentioned.

We do not know, as yet, why Requin did not contribute more extensively to the *Encyclopédie nouvelle*. The later entry "Paléontologie", for instance, was contributed by Reynaud himself; as we mentioned above, the entry "embryology" Requin announced as forthcoming from his own pen, was in fact written by Serres, under the title "Organogenesis". During the 1830s, Reynaud became a close friend of Serres, who probably acquired an influence on the scientific contents of the encyclopaedia: we have already noted that Serres was no friend of transmutation theories. Thanks to his friendship with George Sand, Leroux was more and more absorbed by fashionable salon life, until he withdrew from Paris and lived the financially more affordable life of the rustic philosopher in Boussac, in central France, where George Sand had properties. The task of doing much of the work for the encyclopaedia fell upon Reynaud. To keep subscribers happy, the instalments for sale at irregular intervals were covering several volumes at the same time, so that it is often difficult to establish when an entry was commissioned, written and delivered. Thus, we can only speculate on the reasons why Requin abandoned the project, and when. As hinted above, Reynaud, increasingly the true and only editor of the encyclopaedia, become a close friend of Geoffroy and interacted almost on a daily basis with his family circle. As he wrote in the final tribute to his deceased friend, he, like Geoffroy, believed that the naturalist had been treading in the footsteps of Pascal and Goethe, not of Lamarck or de Maillet. At all events, Lamarck was never mentioned by Reynaud in connection with Geoffroy Saint-Hilaire's theories.

The internal tensions we have hinted at did not detract from the social and intellectual success of the encyclopaedia. Equally, the critical assessment we have sketched of Leroux's doubtful commitment to transmutation did not prevent contemporaries from attributing to the radical philosopher a role in the debates over the modification of species and the history of life on earth. We have already quoted Belfield-Lefevre claiming that Leroux was following on the footsteps of Lamarck and Geoffroy; in the 1850s a prominent contributor to the mammoth Catholic encyclopaedia edited by the Abbé Jacques Paul Migne (1800-1874) listed Leroux among the materialists endorsing the view that nature alone was responsible for the creation and transformation of life (Jehan, 1853). Charles Kingsley, an admirer of Leroux's mystical socialism, was also interested in the providential scheme of spiritual evolution his French colleague had indicated as the true mechanism responsible for the gradual ascent from matter to humanity. It was through Leroux's eyes, not Geoffroy's and even less Lamarck's, that Kingsley read *On the Origin of Species*.

The debates concerning Lamarck during the 1820s and the 1830s were as complex as later debates on evolution have been. Some historians of science, especially French ones, have too easily adopted the view that an almost straight line led western science from Lamarck to Darwin and to contemporary evolutionary theories, though most would (wrongly) concede that Lamarck's works aroused little debate and even less interest. Non-French commentators continue to assume that Lamarck was an obscure thinker who was in any case wrong and isolated, so why bother. It has been the aim here to show that we would miss the point again if, after the evidence presented above, together with other sources which could not be presented for lack of space, we would limit our conclusions to pointing out that Lamarck was indeed read, discussed, admired and at times loathed[45]. This is of course true, but it does not help our understanding of the several parallel lines of thought and of research developed at times in relative or indeed complete independence, in France as well as elsewhere in Europe. Needless to say, for many the dialogue with Lamarck was then inevitable, even though it was often a straw man they engaged with, not the actual theses defended by the naturalist. For others, as the case of Geoffroy Saint-Hilaire well shows, the intellectual relationship to Lamarck was problematic: one of competition and disagreement, rather than of scientific or philosophical dialogue. Others still, and they were the majority, considered Lamarck one among many interesting naturalists of the early nineteenth century. Even naturalists who were sympathetic to Lamarck as a person, or as a political icon, such as Bory de Saint-Vincent, did not consider Lamarck's views of life as fully satisfactory. Bory denied that species adapted and changed. This was probably true in some limited instances, but life developed and still develops only due to chemico-physical laws pushing organic matter from microscopic organisms up the inexorable ladder of increasingly complex combinations determined by the laws of nature.

A further limitation of classic studies on the history of evolutionary theories and debates is the obsession with handing out patents of "true" evolutionary faith. To some historians, de Maillet, Erasmus Darwin, Bory de Saint-Vincent or Geoffroy were not really evolutionist, and had nothing to do with the "true" history of evolution. Indeed, none of the above-mentioned authors – and the list could include a few of the authors quoted in this paper – were "evolutionists" as Lamarck and Darwin had been. Which does not absolve the historian from placing them within their own times and the web of social, political, and epistemological implications others saw as flowing from their work. Rather than insisting on what they did not say, one should first analyse what they did say and how they were read and by whom.

The a priori and anachronistic definition of the core of authors worth investigating, and of the sources the historian of science is entitled to deal with, constitutes a final, major obstacle to asking interesting questions concerning the way in which innovative views of living nature were formulated during the first half of the nineteenth-century. Authors such as Requin, or Frédéric Gérard (1806-1857), whom we could not discuss in this paper, provide fascinating testimony of what contemporaries saw as relevant to the assessment of life's history and capacity for change. Gérard has been honoured by a handful of references by Darwin in the latter's correspondence, though Requin too would have interested the British naturalist as he does interest the historian[46]. Few of the authors we have looked at, among those who favoured an explanation for organic change in natural terms, doubted that varieties were incipient species; that geographic distribution, domestication, and the study of fossils pointed in the direction of change through inheritable modifications; that living and fossil organisms bore the marks of common descent.

The fact that Requin was writing for a radical encyclopaedia or Gérard – himself a radical socialist – for a popular natural history dictionary should not be seen as a reason for overlooking their work. The history of evolutionary debates in the broad sense has always been characterized by a plurality of voices; in these debates, the voice of the professional naturalist, yesterday as today, has always been in the minority. As Darwin was attentive to the theological, social, and political dimension of his work, and read avidly on many subjects which were not directly relevant to his research, so did his colleagues. As this essay has shown, Geoffroy Saint-Hilaire was doing precisely this (carefully evaluating the best way to get attention) when he chose to ally himself with young men such as Reynaud and Leroux, after having failed to enlist the support of colleagues in the Academy, or of representatives Catholic or mainstream official intellectuals. It is worth mentioning that even the often quoted, rather "neutral" biographical detail that in 1820, 1822 and 1825 Geoffroy conducted teratological experiments on chicken eggs in an artificial incubation farm in Auteuil, near Paris, is probably hiding a more complex story. The owner of the property, Pierre-Joseph Briot (1771-1827) was indeed a wealthy man, but also a former Jacobin, the founder of the Carboneria in France, living under strict police surveillance (Dayet, 1979; Mastroberti, 1998; Geoffroy Saint-Hilaire, 1826). We cannot establish whether this is a mere fortuitous coincidence, or whether this anecdote is telling us that we know little of Geoffroy's 'real'life, or of the way in which contemporaries judged social and political propriety. Yet, the anecdote fits well with Geoffroy's reviewing a notorious "carbonaro" (a member of the secret society "Carboneria") such as Buchez, or publicly praising a former "carbonaro", Reynaud, who spent a month in prison in the summer of 1834, for contempt of Court in a case involving leading republican politicians, accused of insurrection. Again, Geoffroy pleaded with the authorities on behalf of Leroux, another young man of rather unsafe frequentations, at least during the late 1820s and the early 1830s. At the same time, it should not be forgotten that the same Geoffroy courted conservative catholic theologians and dialogued with whoever was ready to respect and admire his work: doctors, publishers, Saint-Simonians, Christian and mystic socialists, politically conservative writers such as Balzac, a controversial one such as George Sand, a leading catholic theologian such as Lamennais, or a prominent liberal intellectual such as Edgar Quinet.

In the 1820s and the 1830s, as during the 1860s, or the 1950s, or today, the debates over evolution were never limited to the abstract carving out of epistemological categories, nor to the complex physical and mental act of leaning over objects in collections. Epistemology and material history were indeed part of the story, as was politics and publishing, philosophy and individual survival in often dramatic times, or the need to find one's place in science and in society. Deprived of all the above elements, our history reads more like an obsessive autobiography rather than as an attempt to understand how forms of knowledge were produced, used, feared or turned into universal natural truths no one has ever agreed upon.

NOTES

1. E. Geoffroy Saint-Hilaire, 1834. In 1836 Geoffroy declared his faith in the "*solidity of popular judgment, of the masses, which enjoy an instinctive perception [of truth]*", E. Geoffroy Saint-Hilaire, 1836a, p. 585.

2. I. Geoffroy Saint-Hilaire, 1841. The copy on line available on Internet Archive belonged to Charles Darwin. Three blank pages before the back cover, filled with handwritten comments, bear witness to the attention with which the English naturalist read Isidore's account of his father's transmutationist ideas.

3. On Cuvier's involvement with the *Dictionnaire des sciences naturelles*, nominally edited by his brother Frédéric, see P. Corsi, 1987 and 2012.

4. For two masterful analyses of intellectual and social criticism in the French press, from the *ancien régime* to the early nineteenth-century, see A. Lilty, 2005 and J.-L. Chappey, 2010. See also, of the many articles the latter author has devoted to the relationship between science, the press and political power in early nineteenth century France, J.-L. Chappey, 2006.

5. For Cuvier's political views see the classic study by D. Outram, 1984, arguing for his proximity to the group of the moderate "*doctrinaires*".

6. Hyppolite Royer-Collard (1802-1850) was the son of Antoine (1768-1825), Pierre's brother. Antoine had been a controversial alienist. Hyppolite was a friend of Stendhal, of Prosper Mérimée and Sutton Sharpe. In 1830 he was appointed director of the science and literature office at the Ministry of the Interior thanks to his uncle Pierre's intervention.

7. In P. Corsi, 1987, I have pointed out that the 1830 debate between Cuvier and Geoffroy followed a series of provocations in print by Geoffroy and his allies during the 1820s, characterized by an impressive *crescendo* during the years 1825-1830, Cuvier, 1825a.

8. In P. Corsi, 2012, I have discussed the seeming lack of censorship for scientific publications during the harsh years 1822-1829.

9. A. Desmoulins, 1825a. In vol. 2, p. 533, Desmoulins and Magendie claimed that the idea of the unity of composition had been established by Buffon, who knew nothing of anatomy, and that the doctrine "*put in question the creative power.*" E. Geoffroy Saint-Hilaire, 1825a; A. Desmoulins, 1825b; E. Geoffroy Saint-Hilaire, 1825b, pp. 95-96. F.-M. Le Pappe de Trévern, 1825.

10. E. Geoffroy Saint-Hilaire, 1829, pp. 25-26. At p. 26, Geoffroy also quoted with delight the review of Cuvier's entry "Nature" by the then famous sinologist and Professor at the Collège de France Jean-Pierre Abel-Rémusat (1788-1832) published in the *Journal des savants*, (1827), pp. 451-457. Abel-Rémusat was pleased that Cuvier opposed all doctrines advocating the modification of organisms through time. Yet, he denied that such tenets were endangering religion: "*This is a point naturalists have to debate among themselves: the notion of providence will not be obscured, whatever the result of their discussions*", p. 453.

11. See for instance Geoffroy Saint-Hilaire to F. de Lamennais, 4 February 1835, "*Si j'ai mis en cela le doigt sur une vérité à conséquences aussi grandes, si l'attraction de soi pour soi forme le fait en continuelle marche et application, si j'ai apporté l'effort sur l'essentialité des choses, quelle mine de philosophie. C'est la propre substance de Dieu sous l'action méditative – Oh ! Monsieur l'abbé, PROSTERNONS-NOUS !*", *in* Lamennais 1977, pp. 839-841, p. 840. David Richard was a frequent visitor of Geoffroy, enjoying Sunday conversations with the naturalist. He was also a good friend of Geoffroy's son Isidore, and of Hyppolite Royer-Collard. Richard's close links to George Sand, mentioned below, were seen as potentially very useful by Geoffroy.

12. E. Geoffroy Saint-Hilaire, 1833a, p. 79, relates a conversation with R. E. Grant, during which the Scottish naturalist declared that he trusted Meckel above Geoffroy. H. D. De Blainville, 1833.

13. The *Gazette médicale de Paris* helped Geoffroy in this dispute and printed his 1834 *Mémoires sur la structure et les usages des glandes monotrémiques*, a collection of the naturalist's interventions on the floor of the Academy.

14. E. Geoffroy Saint-Hilaire, 1834c: during the discussion, Serres complained that Geoffroy had been ridiculed in the press for his work on the Ornithorhynchus. On October 13, 1834 it was announced that a memoir by Owen, refuting Geoffroy, had just arrived from England and was going to be read to the Academy. Geoffroy's recollection of the event betrays the high pressure he was under: "*here it is, this sword of Damocles. [...] For a moment it sounded threatening, but on the 3d of the following month, the day of the public reading of Mr. Owen's vindication of his own work, I judged it calm and harmless*", E. Geoffroy Saint-Hilaire, 1835, p. 32. Owen's letter was immediately published in the *Gazette médicale*, Owen, 1834; E. Geoffroy Saint-Hilaire, 1835b. Geoffroy referred to his fatigue and illness during summer of 1835, when he "was coming out of a scientific crisis" he wished to forget, in *Notions synthétiques*, 1838, p. 18. See also the perceptive comments by T. Appel, *The Cuvier-Geoffroy Debate*, 1987 and A. Moyal, *Platypus: The Extraordinary Story of How a Curious Creature Baffled the World*, Washington (DC), Smithsonian Institution Press, 2002.

15. G. Laurent, 1987, pp. 467-489, discusses various interpretations of Geoffroy's belief in transmutation, but insists that Geoffroy was a follower of Lamarck.

16. See for instance E. Geoffroy Saint-Hilaire, 1829c. In a long footnote, stretching over pp. 41-43, Geoffroy refereed to *Philosophie zoologique*, t. 1, p. 218 and ff. He compared the views of Lamarck with those expressed by Cuvier in his *Discours sur les révolutions du globe* discussed below, and sided with Lamarck: with the reservation that both contenders had failed to produced a fully satisfactory solution to the problem of the succession of forms throughout the history of the Earth.

17. Needless to say, in view of his increasingly expanding theory of the unity of composition, Geoffroy did not like the expression "invertebrate" Lamarck had introduced into taxonomy, see E. Geoffroy Saint-Hilaire, 1829, Lecture II, pp.19-24, where the naturalist vindicated his discovery in 1820 of osseous elements in crustaceans and insects.

18. E. Geoffroy Saint-Hilaire, 1830b. In a lecture of 1824, Geoffroy spoke of "*notre vénérable Lamarck, homérique par ses grands travaux et sa cécité* ", in Y. Laissus, 1972, p. 377.

19. Several sympathetic commentators quoted below found it difficult to accept that animals without nervous system or nervous cells were incapable of sensation and feelings, however obscure.

20. A. Boué, 1834, pp. 112-119; J. Secord, 1991, proposed Robert Jameson as the true author. For the anonymous article, see Anon., 1826.

21. In spite of their friendship and collaboration, Geoffroy did not endorse Bory's campaign in favour of spontaneous generation. On one occasion only, a polemical article against vitalism, Geoffroy came near accepting the doctrine, see E. Geoffroy Saint-Hilaire, 1831a, by insisting that all inorganic and organic matter was subjected to the same laws of physics and chemistry and that all inorganic elements were capable of becoming organic and vice versa. On 28 December, 1829, Geoffroy had criticized Isidore Bourdon for the latter strong denial of spontaneous generation, but insisted that he himself could not propose a 'scientific'alternative, since the phenomenon of generation was still very little understood, see E. Geoffroy Saint-Hilaire, 1830a, p. 7.

22. J.-B. Croizet and A. C. G. Jobert, 1828. In the preface to the work, Croizet was respectfully but severely critical of Bory de Saint-Vincent. See G. Laurent, 1987, pp. 271 and 381.

23. Pupils and followers of Geoffroy gave publicity to the intellectual genealogy Geoffroy insisted upon. See for instance G. Grimaux de Caux and G.-J. Martin Saint-Ange, 1837c: "*Si jamais les naturalistes comprennent bien la portée des principes posés par l'auteur de la Philosophie anatomique, dès ce moment la France aura un Geoffroy Saint-Hilaire comme l'Allemagne a eu son Keppler, comme l'Angleterre son Newton*", dedicatory page to Geoffroy. The sentence was quoted from G. Grimaux de Caux, 1837a, p. 399. See note below.

24. There is no space to discuss the great impression Geoffroy's ideas made on one of the most important writers of the time, Honoré de Balzac (1799-1850). Commentators from Cahn 1965 to Appel 1987 and Le Guyader 2004 have documented the borrowings and the differences. See also, for a critical assessment of the historiography on the relationship between the writer and the naturalist, R. Somerset, 2002. For a long discussion dealing with Lamarck and Geoffroy, extolling Geoffroy's role as a French Kepler, see also G. Grimaud de Caux, 1837b, where the admiration Balzac had expressed for Geoffroy was also given due prominence. George Sand has provided an interesting testimony concerning the impact of Geoffroy's style. While she acknowledged the awkwardness of Geoffroy's prose, Sand interpreted it as the hallmark of genius: "*Un style dur, étrange, heurté, obscur, des pensées vastes comme le monde, formulées avec un profond mépris de la forme et, au milieu du vague de l'expression, de cette ignorance ou de ce dédain pour la phrase et pour les mots, des élans de pensée*

biblique, des cris de l'âme mystérieux et grandioses, comme on n'en trouve qu'à l'aurore des religions : voilà ce que j'ai trouvé, comme poète, dans cette brève formule d'un système universel", G. Sand, 1960, p. 548.

25. The rare, late mentions of Lamarck noted by Toby Appel in her important study of Geoffroy are in fact very critical of his deceased colleague, and mainly concerned the classification of the platypus. In particular, Geoffroy accused Lamarck of having announced in 1809 that the Ornithorhynchus should form a new class, thanks to the private communication he, Geoffroy, had provided, see E. Geoffroy Saint-Hilaire 1835a, pp. 30-31 and p. 40.

26. See for instance Geoffroy's complaint that the Academy was refusing to print a report he had written on a work by one of his sympathizers, Claude Jourdan (1803-1869), the director of the natural history museum in Lyon, E. Geoffroy Saint-Hilaire, 1834, p. 442 ; in E. Geoffroy Saint-Hilaire, 1838, p. 137, he referred to one instance in which the special fund designed to pay for illustrations was denied when Geoffroy wanted to add to his work on crocodiles with a new memoir.

27. E. Geoffroy Saint-Hilaire, 1838, pp. 117-118. For a friendly contemporary comment, see J. Reynaud, 1838; F. Thomas, 1904, p. 318; R. Burkhardt, 2002.

28. See for instance J. Reynaud, 1845, p. 149: "*he never recovered*" from this "*hideous outrage*".

29. See H. Ferrière, 2001, and P. Corsi, 1987, for the relevant bibliography and detailed discussion.

30. J.-F. Daniélo, 1835, in particular pp. 115, 118-119, 129. Daniélo also reproduced the passage Geoffroy wrote on de Maillet and Lamarck, and Geoffroy's vindication of his superiority with respect to Meckel, pp. 129 and 125.

31. H. Belfield-Lefevre, 1836; Geoffroy retorted in his E. Geoffroy Saint-Hilaire, 1837, pp. 81-82. Geoffroy was particularly sensitive to the religious overtones of the attack, though he firmly pointed out that a God engaged in continuous acts of creation was a mere "*God of Greek tragedies*".

32. Isidore Geoffroy Saint-Hilaire, who knew how to conduct historical research, confessed in 1859 that he could not find the passage from Pascal his father, and many commentators kept referring to, which most probably did not exist, I. Geoffroy Saint-Hilaire, 1859, p . 384: "*Les êtres animés n'étoient-ils, dans le principe, que des individus informes et ambigus, dont les circonstances permanentes au milieu desquelles ils vivaient, ont décidé originairement la constitution?*"

33. J. Reynaud, 1836; the entry contained expressions such as "*M. Cuvier's glory is on the wane, M. Geoffroy's is rising*". It is interesting that Reynaud, speaking from the point of view of a former pupil of the École Polytechnique turned politician, believed that Geoffroy's works were little known, and that only recently the natural sciences were attracting public interest.

34. E. Geoffroy Saint-Hilaire, 1833b, p. 210. Geoffroy's report was read on October 7. The editor's comment occupied a paragraph at the beginning of the article.

35. For an earlier, more 'academic'presentation of Geoffroy's views on atmospheric change, see E. Geoffroy Saint-Hilaire, 1833c, pp. 55-61 in particular.

36. W. Whewell, 1832, p. 116: "*many of the geologists of France entertain no doubt of the theory of transmutation being that by which the different forms of animal life, at different periods of the earth's past history, are rightly explained.*"

37. P. Leroux and J. Reynaud, 1834-1843. It started as *Encyclopédie pittoresque à deux sous*, Paris, Le Bureau de Vente, 28 rue du Colombier, v.1, Imprimerie de Bourgogne et Martinet; the entreprise had a new start, as *Encyclopédie nouvelle*, vol. 1, Paris, Librairie de Charles Gosselin, 1839. Vol. 1 of the 1834 ed. reproduces a prospect for subscribers, signed by the two editors, and dated May 16, 1834. Not all instalments were in fact published, so that several volumes lack sizeable sections. For a recent renewal of interest in Buchez and Leroux and a perceptive analysis of their social and economic theories, see L. Frobert, 2011.

38. Panckoucke, the son of the famous eighteenth-century publisher Charles-Joseph (1736-1798), became rich with the *Dictionnaire des sciences médicales* and subsequent spin-offs, including the *Journal complémentaire*. Very successful were also works he published on the antiquities of Egypt and the military events of the revolutionary and Napoleonic era.

39. On George Sand and Geoffroy, see J.-P. Lacassagne, 1973, p. 223 ; F. Bourdier, 1973; T. Appel, 1987, pp. 188-190. Sand corresponded with Geoffroy, and finally drafted a few paragraphs on the "loi du soi pour soi" for a new edition of her novel *Leila*, which she did however fail to publish, see G. Sand, 1960. The writer visited the naturalist several times, pleading with him for a friend to be hired at the Muséum, or for David Richard to be given a job when in 1838 the Prefect for whom he was working, François Jean de Preissac (1778-1852), resigned. For an extraordinary portrait of Geoffroy by the novelist, see G. Sand 1967, p. 622, relating a visit to the Ménagerie. Like other fashionable ladies, on December 29, 1836, Sand went to see the severely ill male orang-outang under Geoffroy's care: "*Le vieux Geoffroy pour sa part est une bête assez curieuse, aussi laide que l'orang-outang, aussi babillarde qu'une pie, mais pleine de génie au milieu de tout cela*", she wrote. Sand, Richard and Lamennais often discussed Geoffroy's ideas, as well as Leroux's. In spite of his friendship, Richard passed a severe judgment on the "loi du soi pour soi": "*J'ai eu dimanche une conversation avec lui sur la loi du soi pour soi. Il semble vouloir arriver jusqu'à une matière élémentaire et unique qui se modifiant diversement selon les lieux et les circonstances produirait toutes les variétés de l'Univers. Il me semble que supposer l'existence de circonstances, c'est établir en fait ce qui est en question, c'est admettre une création pour expliquer la création, des lois pour expliquer la loi primitive. D'ailleurs comment la variété pourrait-elle naître d'une force ou propriété unique. Comme vous les dites, la loi du soi pour soi paraît n'être qu'une loi secondaire*", D. Richard à F. Lamennais, February 5, 1835, *in* F. Lamennais 1977, p. 844.

40. Reynaud believed in the transmigration of the soul towards other planets, Leroux in reincarnation on earth. Speculations concerning other, more perfect worlds or the fate of the soul after death (not necessarily religious) were rather common in contemporary publications and debates.

41. L-M.-F. Doyère, 1834. Doyère translated W. Buckland's 1837 Bridgewater Treatise into French, W. Buckland, 1838. He collaborated with H. Milne Edwards (1800-1885) to the "Application de la camera lucida au dessin des objets étudiés à la loupe", 1836.

42. Typically, Geoffroy quoted with approval Boblaye's summing up of the debate on organic change in E. Geoffroy Saint-Hilaire, 1835, p. 122.

43. E.-A.-R. Serres, 1842 and 1843. The instalment containing Serres' long entry, and the separate volume, were published one year

before the bound volume 7, bearing the date 1843, which was never completed.

44. A. P. Requin, 1843-1863. See Vol. IV, "«Notice sur le docteur Requin", pp. VII-XIII.

45. More authors could have been discussed, ranging from the comparative anatomist and zoologist Antoine-Louis Dugès (1797-1838), a frequent discussant of Geoffroy's thesis and an admirer of Lamarck, Marcel de Serres (1780-1862), who engaged Geoffroy on the issue of species change throughout the ages of the Earth, or the original naturalist, geologist and prolific writer Pierre Boitard (1789-1859) who in 1836 put forward an eclectic history of life on earth addressed to the general public, see P. Boitard, 1836. Among medical people, N.-P. Adelon (1782-1862), one of the editors of the *Dictionnaire des sciences médicales*, would also have deserved critical assessment.

46. New important biographical detail on the elusive Gérard has been provided by M. Huiban, 2007. G. Laurent, 1987, pp. 383-395; R. Bange and C. Bange, 1995; C. Bange, 1997.

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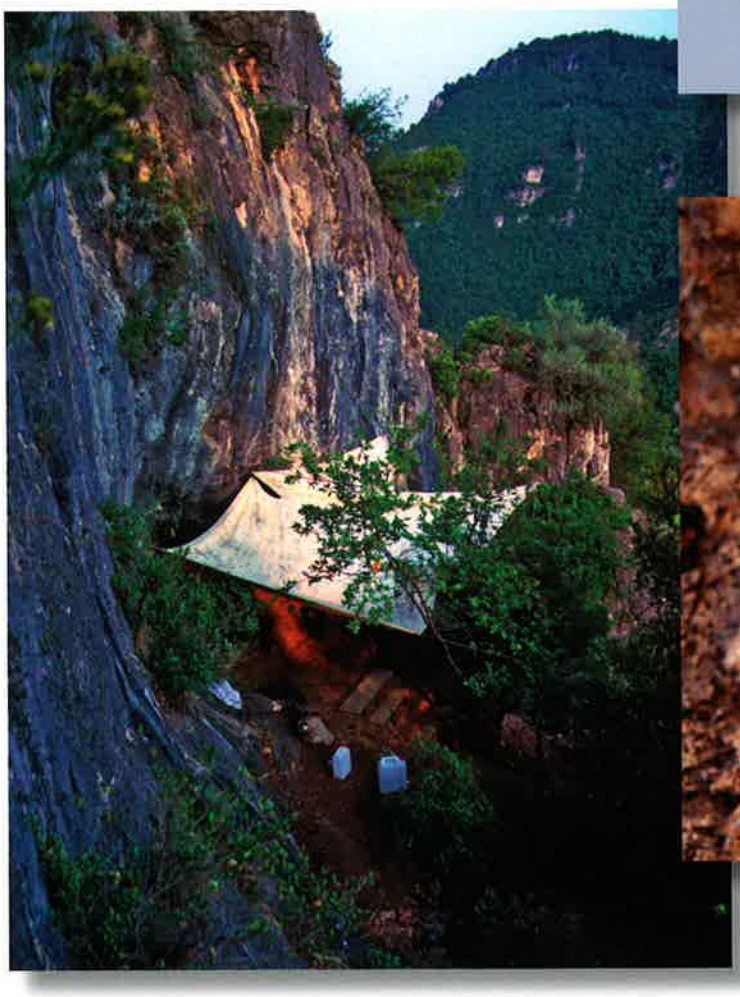

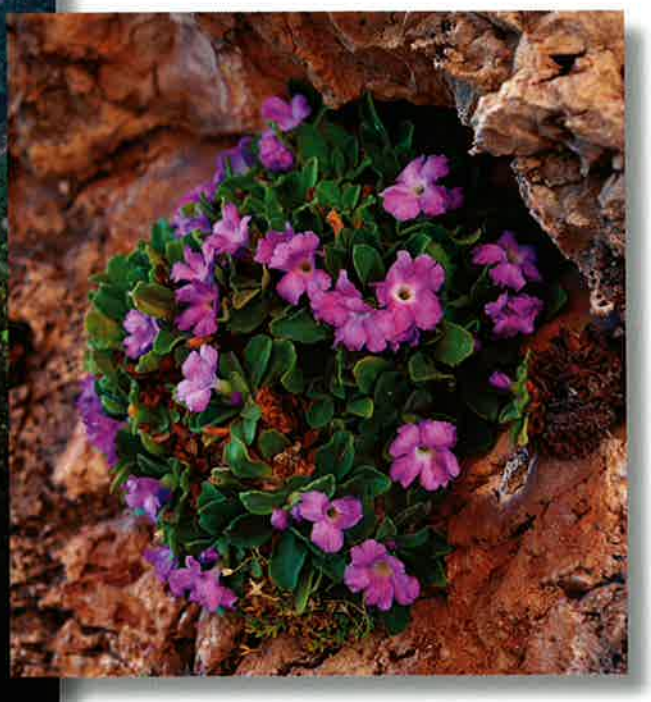

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