

Articoli/Articles

“MONSTRE”.
ÉTIENNE GEOFFROY SAINT-HILAIRE AND THE SCIENCE
OF MONSTROSITY

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SUMMARY

“MONSTRE”. ÉTIENNE GEOFFROY SAINT-HILAIRE AND THE SCIENCE
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This article aims at analyzing the entry “Monstre”, written by Étienne Geoffroy Saint-Hilaire in 1827 and included in the Dictionnaire classique d’histoire naturelle. Under Etienne Geoffroy the study of monsters brought new heuristic and theoretical approaches to the research fields of anatomy and embryology, and acquired the status of a scientific discipline having its own theoretical foundations and therefore its own standards for classification, seen as non-random means for revealing a groundbreaking knowledge.

A Norm for Monsters

Monster. The term monster dates back to an age of gross superstition. Originally it was used to define all that is most dreadful and ghastly in nature but later it took on a restricted meaning, identifying extraordinary births and unusual phenomena, as well as any work seen as irregular. Monstrosities were the more frightening the more ignorance tried to find an explanation, in a frenzy of weird speculations and odd assumptions. However, such ludicrous and irrational biases on monsters had no legitimacy: science will help us demonstrate it¹.

Key words: Monstrosity – Geoffroy Saint-Hilaire – Dictionnaire classique d’histoire naturelle

So far as Étienne Geoffroy Saint-Hilaire's² speculation is concerned, the science of monstrosities stemmed from the attempt to explain the variability of animal forms – even extreme ones (i.e. abnormal or monstrous beings) – as the evidence of basic invariants. Nevertheless a set of circumstances is required for a speculation to gain the status of science and the time was ripe at the end of the eighteenth century, when new trends, impulses and gains were stirring the field of natural sciences³.

Physical anomalies have always excited a great interest for their ability of challenging the laws of nature and their regular, consecutive connections. In addition, they bear a strict relation to life – more precisely, they tend to act as a dangerous threat which is lurking in life itself. The monster is a living being with a negative value, a vital counter-value – the memento of a fear that appears the more ominous the more unpredictable its cause⁴.

When the birth of a monster is ascribed to a rational principle within a unitary system, as any other event of metamorphosis or transformation, its anomaly may then be considered as an object of study, free from biases, popular believes, preconceived metaphysical, teleological or either theological notions. As such, Étienne Geoffroy (Fig.1) devised a research program that would ground his new science on the *unity of organic composition*, i.e. the universal law and framework to which both monstrous and regular forms are subject. The *unity of the plan of organization* is an ideal plan, a hypothesis necessary for providing a framework that could encompass all potential transformations in the whole of living beings; the foundation of structural-morphologic rationalism, which is expressed by *transcendental anatomy*⁵.

When referred to a single plan of organization, the plasticity of forms allows for a mechanistic and non-finalistic explanation. The *unity of organic composition* is the basis upon which all living beings – both vertebrates and invertebrates⁶ – are formed. At the same time it is the

condition as well as the limit by which any potential variation finds its root cause. The monster is not defined against the law: it is part of the law itself.

The first topic upon which Étienne focused in his entry *Monstre* is a controversial though fruitful one. Étienne argued that when we see a man “*having monstrous features, we feel we are not relating with something human*”. For further explanation, a specific case may be taken into account: the acephalic. Lacking the entirety of human hallmarks – i.e. brain, head, etc. – which makes a human being a man, the acephalic cannot be conceived as a member of the human species. However, he remains a subject worth examining and liable to evaluation, precisely because he has his own peculiar structure, organization and existence.

Far from simply being a human subject affected by an illness, suffering from a more or less lethal disease, the monster is an individual having a different organization, with recurring features classifiable according to a different criterion than the zoological scale, to which the monster pertains by birth: “*It is an entirely different organic complex, ... an entity sui generis, having its own unique value*”.

And yet Étienne went further: drawing on the results of his embryological investigations he succeeded in demonstrating that the development of an individual follows the same laws as those followed by the entire zoological series. In its different stages of development, the fetus of higher animals transiently acquires the same forms of the lowest animals, in so much that the latter can be considered as permanent embryos of the former⁷. The animal kingdom may then be seen as a single animal, whose development can occasionally come to a halt; it is during this standstill that the distinctive features of a given species are set and emerge. In addition, the theory according to which worms are embryos of vertebrate animals – and similarly that cold-blooded vertebrates are embryos of warm-blooded animals – perfectly matches Étienne’s thesis about the existence of a single

natural paradigm, upon which all species are formed and traced out. As a result, Geoffroy ultimately reduced the “old” scale of beings⁸ – where finalism and the relentless, progressive becoming of nature resided – to a single idea, that of the progressive development of “one” animal. Each step in this “one” animal’s development exactly sums up the constant transitions that the human fetus goes through to its birth. Étienne did not only formulate the theory of a parallelism between the natural scale and the different stages of development in fetuses of higher vertebrates, but he was also able to demonstrate that this parallelism could be applied to teratology and embryology as well.

*Monstrosities may turn from the forms of their species only to acquire those of another: what is anomalous in one instance may be considered as the rule in another case*⁹. As to the acephalic, Étienne concluded that “*when considered from the perspective of its organizational level, this being that had been born from a woman cannot even be seen as the counterpart of the least developed mammal – I daresay not even as the counterpart of a reptile, a fish, a mollusk or arthropod. Hence that being that had been born from a woman is indeed something even lower in the classification of organic compositions.*

It was no longer possible to use the event of the origin of a monster – i.e. its birth, the fundamental requirement for identifying its species – as a heuristic principle for the science of monsters. Every monster is nevertheless subject to regularity constraints, which gain evidence when further levels of interpretation come into play. Given that human anomalies do not pertain to humankind, it may be assumed that the classification of monsters lies outside the original species of such individuals¹⁰. The term “monster” therefore acquires a different meaning: from Étienne on it was to be

used only to define a step in the development of a being’s organization that was struck by a form of irregularity and suffered from the alteration

of some organs, either by excess or deficiency". The monster is "a normal individual that multiple disorders in the development of some organs have altered in some of its parts and made imperfect under one or more aspects.

It is not by chance that Étienne Geoffroy quoted Leibniz. In his *New Essays Concerning Human Understanding*, the philosopher claimed that the anomalous individual loses his/her identity when the standard of classification rests upon the comparison between external forms. This is because the external form of the monster, being somewhat modified by the disease, does not correspond to the typical form found in the same species the monster belongs to. A different standard for identifying such species must therefore be found. Rather than taking into account the external form, which is ever-changing by nature, this standard should answer to the question as to whether the "*inner nature ... that is common to the individuals of a given species ... is also present ... in individuals lacking some of the outer signs that ordinarily occurs in that species*"¹¹. Étienne Geoffroy directly quoted Leibniz:

*It ought to be determined whether monsters are really a new distinct species. And yet a monster must necessarily belong to its own species if it doesn't show the inner nature of another species. We do not have to only consider the external appearance of that being, for its nature is specified by inner signs*¹².

The question is therefore whether monstrous individuals belong to a separate, brand new species. Geoffroy's proposals cast a light upon the historical and epistemological shift which divided him from Leibniz' thought. However, the French scientist did not express Leibniz' speculation in clear terms, since he quoted him for his own purpose. By hinting at the existence of an *inner nature*, i.e. an *entel-echy*, Leibniz had the occasion of clearing the hurdle of an analysis taking into account only the *external features*, which would not allow to identify monsters as belonging to any species. In addition, Étienne

aimed at finding a principle of determination; in his case, however, such benchmark would be the *unity of the plan of composition*.

A New Method

“What should be taken into account when analyzing a monster? What should be left out?” Étienne claimed that a scientific analysis cannot be restricted to the distinctive features of a monster, since they are so many that they could not be adopted as determining principle. For example, a simple, slight change of color in an animal’s hair can distinguish it from an identical specimen. On one hand, his philosophy denied the superiority of a single feature above all others¹³; on the other, in order to detect every potentially recurring relation, parallelisms and analogies had to be drawn through a comparison between different monstrous individuals.

Étienne Geoffroy was thereby applying the four tenets of a “new” method – a purposeful adjective. These tenets are as follows: the *theory of analogues*, the principle of *connections*, the *balancement of organs* and the law of *attraction* or of the “*soi pour soi*” (i.e. *the elective affinities of organic elements*). “Analogy” is the cornerstone of his method. The “method of differences”, as Geoffroy called it, is the starting point – albeit not the point of arrival – of a research that should be carried out until the general laws of organic composition are discovered. An inquiry relying on mere observation remains stuck in the field of sensory data and ultimately proves to be ineffective. To achieve a rigorous observation method, it is fundamental to devise a research method stressing upon the relevant analogies between observed phenomena. The *theory of analogues* should only take into account the relative position of the organs, as well as their mutual dependence; in short terms, the *principle of connections*. Such law lies on the assumption that analogous parts are those presenting structural similarities. The law of *balancement of organs* accounts for the changes in volume in virtue of which a normal or

pathological organ never flourishes to an extraordinary degree, without its being the case that another organ of its relations suffers from a decrease in volume equal to the growth of the former¹⁴. The *elective affinities of organic elements* emphasize the force of attraction and repulsion of the organic matter: like attracts like.

As it was already noticed, in analyzing a monster it is fundamental to omit any feature which is shared with normal beings. The naturalists must purposefully circumscribe the field of research to the single observation of those parts which are the hallmarks of monstrosity. Noticing that many anomalies, i.e. monstrosities, were common in a number of different individuals, Étienne Geoffroy postulates the existence of *two parallel orders of composition*: the normal and the anomalous, i.e. the monstrous, having similar frequency and regular patterns.

Monsters can be classified on the basis of either the seriousness of their damage or the specific area involved. By deploying the principle of analogy, a comparison between different beings showing the same monstrosity but belonging to different species can thus be drawn. And yet, when establishing a taxonomy for monsters, Geoffroy does not extend further his observations, leaving his son Isidore with the task of devising a systemic and comprehensive classification¹⁵.

Is there a classification of monsters? Obviously not. This is not and may not be our conclusion, for by now we have only a few elements that might lead us to a classification in which all cases could be included. We should be careful not to expect too much from these elements. Nevertheless we should keep on describing and defining monstrous beings, writing studies upon studies about our findings: time – and our descendants – will tell. We should be content with setting out this path that has been just laid out.

Étienne Geoffroy outlines a morphologic classification aimed at the unity of the plan. As such it does neither focus on any particular character nor apply a subordination principle, but merely takes into consideration the law of analogous and the connections between or-

gans¹⁶. This is why Dagognet sees Étienne as an “outstanding precursor of modern times”, an innovator who gave impulse to the issue of finding a new basis for classification, employing a notion that could fund the structural morphology on new grounds¹⁷. Such revolution is set forth by a new idea of classification, which is seen as pertaining to a consistent topological framework. Étienne’s purpose is to reassemble the animal kingdom as a whole, through the use of the same components and their inclusion in a scale of changes, comprised within the *unity of the organic composition* and having a minimum and maximum degree. The monster is therefore assigned a brand new gnoseological value and the abnormal individual is for its species what a rudimentary organ is for the regularly and fully developed organ: moreover such rudimentary organ bears the same kind of relations with adjacent organs in all species. As a result, the *unity of the plan*, of which all living beings are but mere alterations, is subordinate to the development of the *unity of composition*. As such, any achievement in the study of monsters is a useful means for improving the knowledge of “normal” beings, and applying teratology to anatomy and physiology ensures many quick and reliable results. It is nature itself that provides anatomists and physiologist respectively with a set of ready-made dissections and a series of experiments that have already been carried out with the least possibility of error.

The Origin of Anomalies

Given that the laws of *analogues, connections, balancement of organs* and *elective affinities of organic elements* apply to the regular composition of animals, contributing synergically to the formation of monsters – whose composition is not to be found in normal animals from the same species –, where do monstrous anomalies originate from? If the laws of nature are to function as expected, i.e. without exceptions, the element that triggers the process of teratogenesis

must necessarily transcend the organic composition itself. It may be for instance an unexpected blow, a sudden fall or contraction of the uterus from the outside, which temporarily diverts the regular formation of the embryo, *arresting the development* of the fetus¹⁸.

In his *Philosophie anatomique*, Étienne Geoffroy was already reducing the origin of monstrosities to a single mechanical event, which would result in an “adherence” of the fetus and the placenta, where supposedly the shock had been most violently felt. In later studies, namely in the *Histoire générale des anomalies* by his son Isidore, the range of monster-producing events widened greatly. It may be that the embryo is not sufficiently fed, that has an incorrect position in the utero, that the quality of the amniotic fluid has been altered, or finally that a possible malformation has been inherited by the son from his father. In his early works Geoffroy put a special emphasis on the occasional, mechanical and external origin of monstrosities; it is no doubt that his effort was mainly due to the purpose of challenging the widespread opinion that saw embryos as preformed beings and consequently considered monstrosities as predetermined *ab origine*¹⁹. An *arrest of development* is by definition the unexpected interruption of a development process which had a regular start. Inasmuch as the organ always develops after being shaped, most of the times the arrest of development entails the absence of such an organ²⁰. If anomalies come from an occasional, sudden and extremely shocking event, the possibility that malformations are caused by a common disease, namely occurring in the early months of development, must be dismissed. An illness affecting a developing individual causes the whole body to suffer. In addition, no disease could force an organ to return to a previous stage of development, lower than the level achieved when the disease was contracted²¹. The anomalous parts of a monster’s body show evidence of an arrested development. Due to this arrest, the affected organ takes the form of an analogous organ belonging to a lower-ranking animal, as described above. Thereby the law of *arrest of*

formation and development allows justifying the origin of monstrosities by confirming the existence of a *parallelism* between the development of a fetus and the development of the scale of beings.

To demonstrate that a sudden shock under particular circumstances might give shape to an anomalous individual, Geoffroy described – in the entry “Monstre” – three cases of *anencephalic monsters*: the *Anencephalic from Bras*, whose mother fell ill from the shock after she suddenly saw a toad; the *Anencephalic from Patate*, whose mother was assaulted by two women in the darkness and never recovered from the shock; the *Anencephalic of the Seine*, whose mother fainted after hearing about the death of his husband in Bercy’s fire, a shocking news disclosed “with carelessness”. In fact all three pregnancies were advancing regularly “when the event producing monstrous alterations occurred”²². After assuming that a violent emotion might upset the regular development in a fetus, Étienne discarded any direct influence of the mother’s imagination on the shaping of the fetus. How an emotion felt by the mother can affect the fetus can be explained in plainly mechanical terms: this emotion causes the uterus to twitch hardly, thus altering the fetus just like a fierce blow to the stomach would do.

Excess of Development

The *unity of the plan of organization* seems to give way to exception, when the research takes as its object any monster affected by an “excess of development”. An organ outgrowing its regular size in normal individuals of a given species is said to reach an excessive development. As a consequence, the idea about the existence of rigid boundaries set by nature for every species is at stake. According to this theory, an organ might develop to a size under or above that limit and therefore would show either an arrested or excessive development. Whereas an arrest of development necessarily entails a regression toward lower forms of composition, exceeding that limit underlies the hypothesis of a transformation.

The assumption that nature may bring into being new forms of organization, by transcending to some extent the limits itself has set, is empirically demonstrated and therefore its validity cannot be denied. However it is essential to explain the degree to which variations are allowed by nature. Once more, the limits are those that can be empirically detected through a close and direct observation of the different changes in type and degree by which an organ is affected. This enables to notice that excessive developments affecting the organs in a monster of a given species can be also found in individuals belonging to a higher species. It appears that nature does not “create” anything new, but ceaselessly modifies its forms according to the laws of composition, by which it must always abide.

As such, nature would draw on a restricted set of possibilities encompassing all form variations; the boundaries of a potential *excess* of either formation or development are outlined by the *unity of the plan of organic composition*. Even in the most conspicuous and significant cases of monstrous individuals, the process of transformation never requires the creation of “new” material, but merely involves a modification of the existing materials. Thence, in order to explain an *excess* of development a set of laws is required, ensuring that the organic matter can never be “created” but only modified. Of all these laws the most important is that of the “*eccentric or centripetal*” *development*, according to which all nerves and blood vessels form before the development of both heart and cerebrospinal axis. This theory postulates a reversion in the process of organogenesis – i.e. the formation of organs follows the direction of the venous blood flows – and affirms that the formation of every organ proceeds from the “circumference” to the center. As such, a normally unpaired organ, standing in the middle line of a bilateral symmetry, is originally double: the right and left halves are distinct from each other during the early stages of development, only to conjoin in the latter stages of development. If an accident prevents the two halves from joining

– i.e. *arrest of development* –, this would result in the creation of two separate organs – i.e. *excess of development* –, without necessarily entailing the *formation* of new, superfluous matter²³. Paradoxically, the law of *eccentric or centripetal development* – which is the product of a research applying the “*nouvelle méthode*”, namely the *principle of balance of organs* – allows Geoffroy to explain the *outgrowth* of organic matter with the theory of the *arrest of development*²⁴.

The Law of Attraction and the Nature of Monstrosity

What is the substance of monstrosity then? It is clearly the combination of a set of circumstances; the simultaneous existence of a number of right and left parts which are similar and end with frenula and capillary ramifications; the concurrence of all these elements, acting by virtue of fully matching and reciprocal relations and eventually get in touch with and interpenetrate each other – this is due to the force of attraction that is always displayed by the matter when its elements in contact are completely homogeneous.

In this extract Geoffroy hinted at the law of *attraction*, or *the elective affinities of organic elements*, which accounts for the attractive and repulsive force of the organic matter. This general law of composition was part of the “*nouvelle méthode*” and was discovered through the study of monsters – in particular of double monsters²⁵ – only to be applied from teratology to anatomy, physics and chemistry. Under the universal *law of the elective affinities of organic elements*, bodily fluids, secretions and particles unite by attracting like to like. Geoffroy is thus applying Newton’s cosmological model, based upon the gravitational force of attraction, to organic microcosms, in order to explain the rules governing the intrinsic constituency of the body and the processes of growth, reproduction and the formation of fetuses, both normal and pathological. As a broad example of harmony and regularity, Newton’s *law of universal gravitation* is therefore “the herald of hypotheses which in the eighteenth century France

gave rise to a vast philosophical trend which attempted to give a unifying explanation to the constitution and forms of organized bodies by referring to the attractive forces that are acting between molecules”²⁶. For Geoffroy, the “world of details” – as Bonaparte would call the natural microcosm – is ruled by the law of attraction as much as the macrocosm is ruled by the Newtonian law. The attraction is “*the word of creation, ... sublime revelation of the Word made man, that is Isaac Newton*”²⁷. Only in his later works Geoffroy would bring *the elective affinities of organic elements* to a thorough theorization. However, his stance in addressing his last scientific efforts, which has often been contested and misunderstood, was not only that of a naturalist driven by the will of summing up his speculations in an all-encompassing, synthetic view, but must be seen as the expression of an ideological position he tried to take about science and the mystery of life. The relentless search for a universal law testifies the conviction that *unity* is the building block of reality²⁸.

The Production of Monsters

Étienne Geoffroy concluded his entry with a recollection of the experiments he had carried out to induce specific anomalies in chicks, with the purpose of demonstrating that it was possible to *create* new species. However, these efforts turned out to be fruitless. Geoffroy succeeded in creating only a few number of artificial monsters, which were not able to neither reproduce nor perpetuate in time. He placed a particular importance on the exact identification of the most suitable procedures for his experiments; for this reason he tried out ingenious methods for modifying life conditions in hen-eggs, thus diverting the common course of fetus development. Between 1822 and 1826 these experiments were enhanced and in 1831 they were to be carried on by Isidore Geoffroy; the experiments consisted in puncturing or violently shaking the eggs after a certain period of incubation, or either forcing them to stay in a vertical position or mak-

ing their outer shell more or less airproof. Had this procedure created monstrous animals rather than mere abortions or rickety chicks, Geoffroy would have easily come to the conclusion that embryos are liable of *ab extra* modifications, thus validating the supposed influence of environmental factors and finally invalidating the theory of preformism. On the other hand, his scarce and often controversial results persuaded him to dismiss the idea of publishing his experiments. This is confirmed by some recently found manuscripts, containing a hint to the experiments while omitting the results achieved. It is obvious that Geoffroy considered them as partially failed²⁹.

The science of monstrosities is a fruitful field of research and experiment, where theory and empirical research are harmonically balanced. Through monsters, nature challenges itself and its own laws with a view to reasserting the necessity of their application. The anatomical study of monsters provides plenty of persuasive examples suggesting a fundamental consistency of the laws of nature, for which no infringement is allowed. The study of monsters ultimately brings new *theoretical* and *euristic* standards in Geoffroy's anatomical program. This program thereby acquires the status of a scientific discipline, with its own dignity and thus its specific criteria of classification as non-random means for discovering new knowledge.

"Those that we call monsters are not so to God, who sees in the immensity of His work the infinite forms that He has comprehended therein"³⁰. Geoffroy was quoting the famous sentence by Montaigne in order to justify what had been the ultimate goal of his speculation: the search for a rule governing the formation of monsters, i.e. a "necessary order in the production of unusual forms and organs". Finding a regular order underlying an overt chaos also meant to identify "what place monstrous beings are entitled to hold among the living beings of the entire universe". Challenging Châteaubriand³¹, who saw monstrosities as the mere realization of the *laws of chance*, Geoffroy would not accept the idea that "the hand of God, which can

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be noticed in the production of perfectly regular beings, refused to create those having monstrous features”. On the contrary, monsters are to Geoffroy the living proof that nature remains consistent with itself and always fulfills its general laws.

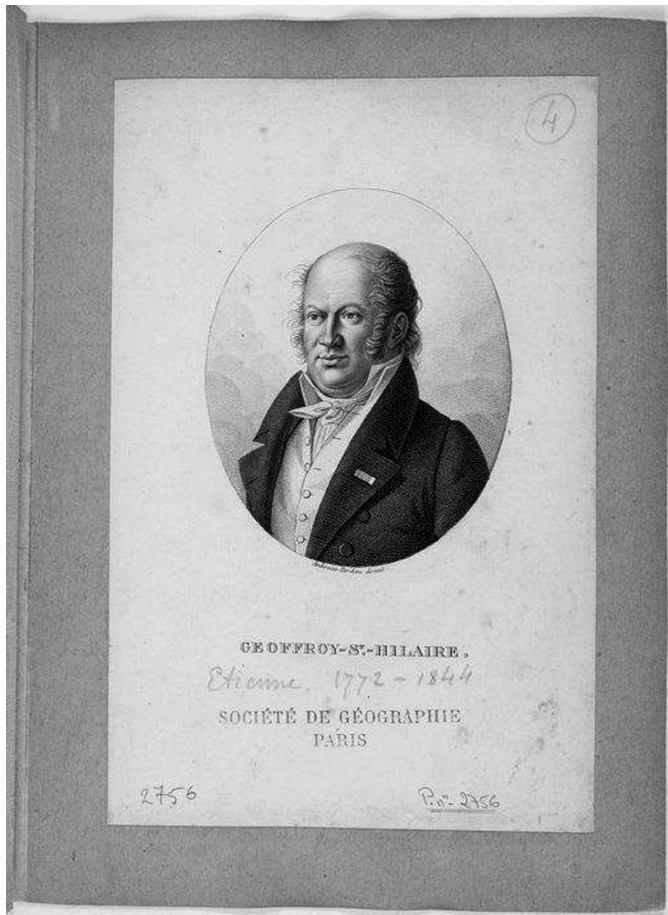


Fig. 1: Boilly, Julien-Léopold, Le Chevalier Geoffroy St Hilaire (Étienne), 1821

BIBLIOGRAPHY AND NOTES

1. This article focuses on the entry “Monstre” by Étienne Geoffroy Saint-Hilaire, included in the *Dictionnaire classique d'histoire naturelle*. Paris, Rey et Gravier, 1827, t. XI (Mo-nso). All excerpts in Italics are taken from this edition and all translations from the French are the author's own.
2. Étienne Geoffroy Saint-Hilaire (1772-1844) was widely renowned for his studies in the fields of comparative anatomy, embryology and paleontology, as well as for granting an independent status to teratology, the science of monsters (which owns its name to Geoffroy's son, Isidore). In 1793 he appointed professor of zoology at the Muséum d'Histoire Naturelle (see in particular GEOFFROY SAINT-HILAIRE I., *Vie, travaux et doctrine scientifique d'Étienne Geoffroy Saint-Hilaire*. Paris, P. Bertrand, 1847; and CAHN T., *Vie et œuvres d'Étienne Geoffroy Saint-Hilaire*. Paris, PUF, 1962). On these subjects and on the rise of teratology, see MAZZOCUT-MIS M., *Mostro. L'anomalia e il deforme nella natura e nell'arte*. Milano, Guerini, 1992, new edition 2012; EAD, *The “Unity of Organic Composition” and the Birth of Teratology*. Riv. Stor. Sci. [S. 2] 1993; 1 [2]; EAD, *La contingenza della forma*. Milano, Cuem, 1994; EAD. (ed.), *Anatomia del mostro. Antologia di scritti di Étienne e Isidore Geoffroy Saint-Hilaire*. Firenze, La Nuova Italia, 1995 (this volume includes the most significant extracts from both Isidore and Étienne Geoffroy Saint-Hilaire's works); EAD., *Esthétique, épistémologie et la vision de la forme*. In: LOI M. (ed), *Mathématique et art*. Paris, Hermann, 1995; EAD., *Gli enigmi della forma. Un'indagine morfologia tra biologia ed estetica*. Milano, Edizioni dell'Arco, 1995 – further editions: Milano, Mimesis, 2012; ANCET P., *Teratologia ovvero scienza dei mostri. Il lavoro di Geoffroy Saint-Hilaire*. In: FADINI U., NEGRI A., WOLFE C.T. (a cura di), *Desiderio del mostro. Dal circo al laboratorio alla politica*. Roma, Manifestolibri, 2001, pp. 83-108; MORIN A., *La Tératologie de Geoffroy Saint-Hilaire à nos jours*. Bull. Assoc. Anat. 1996, 80 [248]: 17-31. See also LE GUYADER H., *Étienne Geoffroy Saint-Hilaire, 1772-1844: Un naturaliste visionnaire*. Paris, Belin, 1998.
3. The science of monstrosity actually owns its name, i.e. teratology, to Étienne's son, Isidore Geoffroy Saint-Hilaire (1805-1861). See GEOFFROY SAINT-HILAIRE I., *Histoire générale et particulière des anomalies de l'organisation chez l'homme et les animaux des monstruosités des variétés et vices de conformation, ou traité de tératologie*. Paris, J.B. Baillière, 1832-1837, t. 3 and Atlas. On these subjects, see also ANCET P., *Le statut*

du monstre dans la tératologie d'Étienne et Isidore Geoffroy Saint-Hilaire. In: CAIOZZO A., DEMARTINI A.-E. (eds.), *Monstre et imaginaire social. Approches historiques*. Paris, Creaphis, 2008; on this particular topic, see TORT P., *L'ordre et les monstres*. Paris, Le Sycomore, 1980 and ID., *Sixième étude. La logique du déviant*. In: *La raison classificatoire*. Aubier, "Résonances", 1989, pp. 143-171.

4. See CANGUILHEM G., *La conoscenza della vita*. Italian Transl. by F. Bassani, Bologna, il Mulino, 1976, Ch. V, VI, VII. See TORT P., ref. 3.
5. The *transcendental* method claims that all living forms derive from one another on account of topological explanations and on the basis of a prototype which is common to all species. "It is the eighteenth century's conjecture of "metamorphoses", which Maupertuis theoretically set forth and the German naturalists from the University of Göttingen (i.e. Blumenbach, Humboldt, Treviranus), as well as the *Naturphilosophie* inspired by Goethe or the French school of transcendental anatomy (i.e. Geoffroy and Serres), subsequently developed on empirical grounds." (GAYON J., *L'espèce sans la forme*. In: GAYON J., WUNENBURGER J.-J., *Les figures de la forme*. Paris, Editions l'Harmattan, 1992, p. 55; see also CUNNINGHAM A., JARDINE N. (eds.), *Romanticism and the Sciences*. Cambridge, CUP, 1990, particularly the essay by REHBOCK P.F., *Transcendental Anatomy*. pp. 144-160).
6. A memoir entitled *Quelques observations sur les mollusques* was submitted to the attention of the Academy of Sciences by Pierre Stanislas Meyranx (1790-1832) and Laurencet (all of whose writings have been lost). In their paper they maintained that the species of cephalopodes bore a striking resemblance with very different embranchements (*embranchements animaux*). The cephalopods (i.e. mollusks) were seen as vertebrate animals wrapped up in themselves; this would prove that the *principle of unity of organic composition* could be applied to both vertebrate and invertebrate animals, having therefore universal validity. This thesis, cunningly reworked by Geoffroy, provoked Cuvier's reaction, who launched many violent and disparaging attacks against Geoffroy. The first attack took place on 22 February 1830.
7. Also called *Meckel-Serres law*. During the first decade of the nineteenth century the law of *récapitulation* – also known as *embryological parallelism* – was very popular; it established a comparison between the stages of development in embryos and the structural composition of adult animals (see RUSSELL E.S., *Form and Function*. London, 1916, pp. 79-101; MEYER A.W., *Some Historical Aspects of the Recapitulation Idea*. *Quart. Rev. Biol.* 1935; 10: 379-396). Antoine Étienne Reynaud Augustin Serres (1786-1868),

one of Geoffroy's disciples, was the first scholar who attempted a formal theorization. A comprehensive definition was to be given by the naturalist Johann Friedrich Meckel (1781-1833). (See MECKEL J.F., *System der vergleichenden Anatomie*. 7 vols, Halle, Renger, 1821-1833, vol. I, p. 345). See FISCHER J.L., *Le concept de "récapitulation" chez Étienne Geoffroy Saint-Hilaire*. In: MENGAL P. (ed.), *Histoire du concept de récapitulation*. Paris, Masson, 1993, pp. 55-68.

8. The issue of monstrosity relates with the notions of *chain of beings*, *unity of the plan of organic composition*, transformism, taxonomic method, theories of preformism and epigenesis. Whether included in a finalistic framework or legitimized by a transcendental system, the issue of monsters emerges repeatedly in the philosophical enquiry of naturalists. Between the eighteenth and the mid-nineteenth century, they engaged in the study of the phenomena concerning the organization of living beings. The theory previously laid out by Leibniz and upon which living beings are organized along a chain – a notion that is always linked with the *principle of plenitude* – is pushed to its extreme consequences by Charles Bonnet, inasmuch as Étienne Geoffroy was later to declare that the “universal chain of being ... is nothing but an illusion” (GEOFFROY SAINT-HILAIRE I., ref. 2., p. 131). On the assumption that the chain of being endlessly advanced toward a progressive perfection, Bonnet justified the consequent theory of evolution with a pre-established teleological system and therefore he was led to the hypothesis that catastrophes, *metamorphosis*, and namely monstrous forms found in nature are part of a preconceived design. Being a preformist, Bonnet sees monstrosities as *intermediate* – preformed – forms, ensuring that a species moves and transforms in a higher one without abrupt leaps but by gradual metamorphosis, which are seen in hybrids. See MAZZOCUT-MIS M., ref. 2.
9. GEOFFROY SAINT-HILAIRE E., *Philosophie anatomique des monstruosités humaines*. Paris, De Rignoux, 1822, p. 403.
10. If this were not the case, that is if Étienne Geoffroy had not devised a method for analysing anomalies apart from the zoologic world, the simultaneous existence of different anomalies in one subject would prevent their identification, unless the same mix of anomalies, reciprocally related through necessary links, becomes the standard for a specific genus.
11. LEIBNIZ G.W., *New Essays on Human Understanding*. Eng.Trans. by Peter Remnant and Jonathan Bennett, Cambridge, Cambridge University Press, 1981, p. 152.

12. Geoffroy's quote is slightly inaccurate. The first part ("*It ought to be... distinct species*") is to be attributed to Philaetes – who explained Locke's thought in his *New Essays* –, the second ("*And yet a monster... specified by inner signs*") to Theophiles in defense to Leibniz' position (see LEIBNIZ G.W., ref. 11, p. 152). Theophiles namely says: "*In trying to settle whether a monster belongs to a given species, one is often thrown back on guesswork. And that reliance on guesses shows that one is not restricting oneself to outer features; for what we are trying to guess is whether the inner nature that is common to the individuals of a given species (for example reason, in man) is also present—as suggested by the facts of birth—in individuals lacking some of the outer signs that ordinarily occur in that species*".
13. Isidore Geoffroy would reintroduce this tenet in his classification.
14. See GEOFFROY SAINT-HILAIRE E., ref. 9, p. XXXII.
15. The son would then "betray" his father's will by including Cuvier's system of the subordination of characters in his classification. See GEOFFROY SAINT-HILAIRE I., ref. 3.
16. See GIL F., *Sistematica e classificazione*. In: *Enciclopedia Einaudi*. Torino, Einaudi, 1977-1984, vol. XII, pp. 1037-1038.
17. DAGOGNET F., *Le catalogue de la vie*. Paris, PUF, 1970, p. 97.
18. See GEOFFROY SAINT-HILAIRE E., ref. 9, pp. 105-106.
19. As far as *preformism* and *epigenesis* are concerned, Étienne Geoffroy recalled the "dispute" (1733-1742) between Winslow and L  merie; the former endorsed the theory of preformism, whilst the latter was a fierce opponent of the thesis about the existence of originally abnormal *germs*. Winslow therefore challenged the notion that anomalies may be caused by an accidental event. When the monstrous features are preformed in embryos, the search for the causes of anomalies must be directed from the empirical level of observation to the level of ethics and of metaphysics. Hence it is God, in his all-loving mercy, who caused the anomalies. On this subject L  merie replied: "*In his infinite freedom God may not do what its wiseness would not approve of*" (quoted in GEOFFROY SAINT-HILAIRE I., ref. 3, vol. III, p. 490). In particular,   tienne Geoffroy claimed that trying to find the cause of monstrosities in a past that eludes knowledge is like trying to overcome a difficulty by denying its existence. The term *preexistence* derives from a notion of "metaphysical causality" applied to an event that cannot be observed. The same phrase "preexistence of germs" is a *contradictio in terminis*: "*preexistence applies to what exists prior to its existence, thus being a clear inconsistency*" (GEOFFROY SAINT-HILAIRE E., ref. 9, p. 480).

20. See also GEOFFROY SAINT-HILAIRE I., ref. 3, vol. III, p. 406.
21. See GEOFFROY SAINT-HILAIRE E., ref. 9, p. 501.
22. See *Ibid.*, p. 518.
23. Étienne Geoffroy did not devise a complete formulation for the *law of eccentric or centripetal development*, which will be subsequently taken on by his son Isidore and outlined in the *Histoire générale et particulière des anomalies* (where some assumptions by Étienne Serres (1786-1868), already quoted by Étienne, were referred to).
24. In such case, the search for further proofs for the *law of eccentric or centripetal development* led Isidore Geoffroy to find out another embryogenic law, which he did not examine in depth for lack of time: that of the *renewal of organs*, according to which “*a function is subsequently performed by at least two organs – the former provisional and rudimentary, the latter permanent and fully developed – which are reverted and somehow opposing in their development*”. Such law, maintained Isidore Geoffroy, “*was not as much proved as hinted at by the outcomes of my enquiries in teratology*” (GEOFFROY SAINT-HILAIRE I., ref. 3, vol. III, p. 597).
25. The examination of double or triple monstrosities – i.e. monsters born from the union of two or more twins – leads to dismiss the hypothesis that new material had formed: the excess of formation is explained as the arrested development in one of two subjects, which is seen as parasitic forms of its more developed twin. The areas where the twins were joined are always identical, confirming the importance of the law of attraction of like to like: trunk and trunk, head and head, stomach and stomach and so on.
26. TORT P., ref. 3. p. 267.
27. GEOFFROY SAINT-HILAIRE E., *Notions synthétiques, historiques et physiologiques de philosophie naturelle*. Paris, Dénain, 1838, p. 87.
28. See GEOFFROY SAINT-HILAIRE E., ref. 26, and in particular GIL F., *E. Geoffroy Saint-Hilaire's Doctrine of Attraction*. In: ROSSI S. (ed.), *Science and Imagination in Eighteenth-Century British Culture*. Milano, Unicopli, 1987.
29. Dareste (1822-1899) would resume these investigations. Aided by Albert Geoffroy Saint-Hilaire, a descendant of Étienne, he succeeds in recovering almost all of his manuscripts about the experiments and in reproducing most simple monsters; using eggs from a single species, he avoided committing one of Geoffroy's mistakes. Dareste's experiences demonstrate Geoffroy's early theory, in particular the assumption that all monstrosities were due to an arrest of development. Besides he comes to the conclusion that a necessary

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requisite for the production of new races is the potential creation, by altering the development of a fecundated germ, of both monstrosities and simple variations that are compliant with the operation of a generating function and therefore capable of reproduction. In this way Dareste hoped he gave a demonstration for the variability of species and the transmission of hereditary characteristics (DARESTE C., *Recherches sur la production artificielle des monstruosités ou essais de tératogénie expérimentale*. Paris, C. Reinwald, 1877; on this subject, see FISCHER J.L., *Le concept expérimental dans l'œuvre tératologique d'Étienne Geoffroy Saint-Hilaire*. *Revue d'Histoire des Sciences*, 1972; XXV: 347-364; ID., *Monstres. Histoire du corps et de ses défauts*. Paris, Syros-Alternatives, 1991, esp. pp. 102 and f.).

30. MONTAIGNE M. DE, *Essays*. London, Reeves and Turner, 1877, vol. II, cap. XXX.
31. See DE CHATEAUBRIAND F.-R., *Génie du Christianisme* (1802). Paris, Flammarion, 1966, book 5, chapter 3.

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