

Monsters of an Awakened Reason. The influence of the Biblical account in the development of the scientific theories on the origin of man and its variations

Mario César Sánchez Villa

Independent post-doctoral researcher. C/ Málaga 42 2D. C.P. 28945. Fuenlabrada. Madrid

e-mail: mcsv1981@gmail.com

ORCID id: <http://orcid.org/0000-0002-4157-1059>

Submitted: 24 January 2017. Accepted: 15 February 2017

ABSTRACT: The triumph of the reason as the only way of natural knowledge was the most remarkable result of the paradigm shift occurred during the so-called Scientific Revolution, which reaches from the Renaissance to the Enlightenment, and in which dogmatic reasoning lost progressively its role as the principal form of knowledge. Nevertheless, during the following centuries, a large part of the men of science were willing to favour the conversion of dogma into an agent of rational thought. This paper, tries to offer a point of reflection on the influence that the biblical account maintained in the construction of the modern scientific theories that, somehow, tried to explain relevant issues such as the origin of physical and moral differences between humans. The broader objective is to demonstrate that, as a form of cultural expression, the dogmatic-religious thought continued to play a transcendental role in the legitimization of a part of the modern rational scientific discourse, committed to defending the civilizing role and the physical and moral superiority of Western states, far beyond what the simple use of reason permitted.

KEYWORDS: Science; Religion; Monogenism; Racism; Human Variation; Biological Heritage; Degeneration.

Citation / Cómo citar este artículo: Sánchez Villa, Mario César (2017) "The Influence of the Biblical Account in the Development of the Scientific Theories on the Origin of Man and its Variations". *Culture & History Digital Journal*, 6 (1): e008. doi: <http://dx.doi.org/10.3989/chdj.2017.008>.

RESUMEN: *Monstruos de una razón despierta. La influencia del relato bíblico en el desarrollo de las teorías científicas sobre el origen del hombre y sus variaciones.* - El triunfo de la razón como única forma de conocimiento natural fue sin duda el resultado más notable del cambio de paradigma que se produjo a lo largo de la llamada Revolución Científica que, desde el Renacimiento hasta la Ilustración, fue favoreciendo una progresiva pérdida del papel protagonista del razonamiento dogmático como forma privilegiada de construcción del conocimiento. No obstante, durante los siglos siguientes, una gran parte de los hombres de ciencia estuvo dispuesta a favorecer la conversión del dogma en un agente del pensamiento racional. En este artículo queremos ofrecer un punto de reflexión sobre la influencia que mantuvo el relato bíblico en la construcción de las teorías científicas modernas que, de algún modo, pretendieron poner luz sobre una cuestión trascendental como fue el origen de las diferencias físicas y morales entre los seres humanos. Nuestro objetivo más amplio es demostrar que cómo forma de expresión cultural, el pensamiento dogmático-religioso siguió jugando un papel de legitimación trascendental para el discurso científico racional moderno, permitiendo defender el papel civilizador y la superioridad física y moral de los Estados de occidente mucho más allá de lo que el simple uso de la razón permitía.

PALABRAS CLAVE: Ciencia; Religión; Monogenismo; Racismo; Variación; Herencia Biológica; Degeneración.

Copyright: © 2017 CSIC. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY) Spain 3.0.

MYTHS OF ORIGIN

There are few ideas so extended and rooted in different cultures such as those surrounding the Myths of Origin, which talk about a powerful, intangible and unknowable force, that is somehow responsible for the creation of the world in which we live, and by extension of the existence of the man. This form of cosmogony persisted in our culture far beyond the realm of religion (Scully, 2015). It is well known that much like poets or writers, the first scientists resorted to them in order to explain their world (Osborne, 2003: 33-40; Ellis, 2015). However, as the weight of natural facts became more evident, the use of cosmogony became more and more unsatisfactory.

The preference of the physical or natural theories regarding the generation of man was a feature of the classical tradition that permeates through the foundations of any modern theory on the origin of men, but it was not always chosen. Since the end of the second century the Christian tradition began to exercise a cultural power based on the connivance between liturgy and dogmatic reason, reinforced by the continuous increase of its political power (Harnack, 1886-1897, vol.I: 332-334). Regardless of the level of orthodoxy or type of liturgy, the Christian tradition imposed a cosmogony of the origin of man gathered in the accounts of the Creation and the Flood (Genesis (1-10)), and gave them the category of Dogma.

Well known, the book of Genesis states that God created Adam as the first man, completing the creation of the world and the species that inhabit it. From man —always according to the text— God created woman, Eve. After their expulsion from Paradise, they are forced to populate the earth for around 1646 years. It is at this time when God, disappointed with his work, brought down on earth the Deluge of “40 Days and 40 Nights” instructing Noah, a direct descendant of Adam, that he must create an Ark in which to safeguard most of the animal species, his three sons, Japheth, Cham and Shem and their wives. The dogma states that only those who were gathered in the ark survived the Flood, and therefore that Noah and his family were the closest of all humanities common ancestors. Those first *new* men spread across the world and therefore gradually shaped the different cultures and peoples who populate it.

This word of God was composed for centuries as an inescapable structural framework in the construction of the different scientific interpretations about the *monogenetic* origin of men and its varieties. It is easy to see that the coexistence between rational scientific thought and Christian dogmatism must not have been easy, but it was certainly possible. As Steven Shapin points out with respect to the seventeenth century, “there was *no such thing* as a necessary (...) conflict between science and religion, but there were a number of quite specific problems for the relations between the views of some natural philosophers and the interest of some religious institutions” (Shapin, 1998: 136).

In practice, note other authors, “the invention and the validity of a Christian idea of *«the natural law»*” made

possible “the modernization of rational science of the cosmos (...) introducing in cosmology three basic concepts: the «orderly power» of God, as a counterpoint of the divine essence of an «absolute power»; the second cause; and the «conditioned need» or *necessitas ex suppositione* of certain realities and certain movements of the visible world” (Lain Entralgo, 1978: 212). What in the words of German cosmographer Heinrich Martin (ca.1550-1632), would sound like:

“Catholic philosophers concede that naturally of nothing, could nothing be done, but they have (as true), and we all have and believe that Divine omnipotence can do all things from nothing, without any matter, and we do not admire us that Plato and Aristotle were looking at the creation of the world within the limits of nature, because they know not God or His infinite power: but we (...) are instructed in the sacred faith, we firmly believe what faith teaches us (...) whoever wants to see rejected all the arguments and difficulties to and about Creation, could read Saint Thomas (...) and find some natural reasons in favour of our beliefs” (Martínez, 1606: 3).

REASON OF FAITH

For centuries the scientific theories on the origin of man and its varieties clung to the biblical account, however during the late fifteenth century Europeans found a “New World”, and the clash between faith and reason became inevitable. Beyond the technical and theoretical development that required the scientific cataloguing of America (Alcina Franch, 1988; Pastor Bodmer, 1992: 111 y sig.; Cañizares Esguerra, 2006: 14-45; Portuondo, 2009), it was necessary to “fit the piece into the puzzle”. Amongst other things, it was necessary to elucidate the humanity of its inhabitants (Maestre Sánchez, 2004). Although today may not seem so, the question was not easy because, as humans, the Indians were bound to be descendants of Noah. They had to belong to any one of the peoples of the West or the Middle East, founded and dispersed after the Flood. Thus during the sixteenth and seventeenth centuries, many of the works that sought to reconstruct the Natural History of America, tried to shape the reasoning about the origin of the Indians to the general account of the Scriptures (Huddleston, 1967: 11; Gliozzi, 1977).

Although the stories were numerous, in very general lines, it might be said that they showed two orders. The first and most widespread was strictly dogmatic. It was mainly developed by the Dominican missionary Fray Gregorio García (ca.1556-1627), but its origin could be found in some of the first scientific works about America. In them were raised the most diverse origins of the Indians, while some considered them the descendants of the Carthaginians (Venegas del Busto, 1569, l.II, c.XXI. ob.60-rev.63), for others they should be the inhabitants of the biblical region of Ophyr (Aria Montano, 1572: s.p., c. IX), or of the lost city of “Atlantica” (Zárate, 1555: s.p.).

Towards the end of the sixteenth century the Jesuit Father Jose de Acosta (1540-1600) questioned each of

these supposed origins (Acosta, 1608: 53)¹, and developed a second order of stories on the Natural History of America and the origin of the Indians. Although a fervent believer, obsessed with the imminence of the Apocalypse (vid. Cañizares Esguerra, 2006: 26), he nonetheless proposed one of the most rational scientific accounts of the time, capable of combining geological, biological and anthropological approaches, with unusual ease. He concluded that only a simple mind could be satisfied with the explanation of the holy book, without being tormented by a series of logical questions:

“If (the) imagination is not corrected and amended by the reason, and the understanding is carried away by it too, by force we will be deceived and err (...) when it comes about the creation of the world, our imagination starts looking for a past time, after the World creation, and it points also to a place where the world was made, and it can not see that in other way the World could be created, but it is true that the reason really show us, that it was no time before the movement (...) nor place before the universe itself that contains everywhere” (Acosta, 1608: 33).

Acosta had God as a reference of all knowledge in the proposal that dogma configured the only basis of reason. However, that reference did not seem sufficient to explain the natural facts. This meant that the dogma could set the limit of what is scientifically reasonable, but not of the rational function of things:

“The reason, because we are forced to say that men of the Indies came from Europe or Asia, it is to not contradict the Holy Scripture that teaches clearly that all men are descended from Adam, and so we can not give other origin to the men of the Indies (...) it is also forced to reduce the spread of all animals to those who left the Ark in the mountains of Ararat, where it made landfall: So that for men, and also for the animals, it is as if there were no need to seek the way which they would pass from the Old World to the New” (Acosta, 1608: 69).

From his point of view, the problem was obvious. If the Indians were descendants of Jews, Ethiopians, Atlanteans or any other European or Asian culture, how could his body have changed in such an extreme way? How could they have lost their cultural roots? (pp. 79-80). Even accepting the origin, how could it be possible that any of the peoples of the Old World had come to America, if none of them came to emphasize enough in fields such as navigation or astronomy to make voyages across open oceans? What had happened to the remains of material culture that allowed the undertaking of such a trip? (pp. 61-65). How to explain the existence of the other animal species? (p. 72). So:

“I have to believe that the new world, and the West Indies, have not been inhabited by men for many thousands of years, and that the first that entered in them, were wild men and hunters, not polished people of Republic (...). They did not enter browsing the sea, but

walking on land. And that way they did it without thinking, moving from sites and lands so slowly, and some settled the founded (lands), others were still looking again, they came after a while to fill the lands of India, of many nations, and nations, and tongues” (Acosta, 1608: 81 and p. 72 resp.).

Acosta’s contribution impacts positively on the development of the Natural History of America, however its commitment to establish a margin between dogmatic and scientific reasoning had in our opinion very little significance at first (cfr. Huddleston, 1967; Cañizares Esguerra, 2006). This marked the development of some further studies on the origin of the Indians and generally on the origin of man.

In the early seventeenth century, the theory *On the Origin of the Indians* of Gregorio Garcia, recognized the erudition and effort of Acosta’s work, but in the absence of an empirical evidence on the intercontinental step, he preferred to perfect the dogmatic argument. Taking the biblical text, the Dominican friar reviewed thoroughly all the classic works that, he believed, had attested that the Indians were a people of the Old World. Plato, Aristotle, Seneca, Plutarch, Lucian, Pliny... all of them, he said, had a “sense” of the existence or prophesied the “discovery” of America, which means that somehow they knew of their existence, and that the facts of a journey to this land must have circulated among scientists (García, 1607: 51-63).

Ultimately, Garcia was carried away by the previous lexicographical analysis of Aria Montano. He noted that the most probable origin of the Indians must have been in the mythical town of Ophir, which was also identified with the Biblical city of Tarshish, locating this place on the island of La Española (Santo Domingo) or more probably in Peru (García, 1607: 318). The Book of Kings (9:28; 10:11; 22: 48...) points out repeatedly that in Solomon’s time, the Hebrews made constant trips to these two regions, looking for the gold and precious stones that were necessary for the construction of the Temple of Jerusalem. The dogma states that the lineage of Ophir was a descendant of Jectan, which in turn was the son of Heber, the grandson of Salé, great-grandson of Arphaxad, and great-grandson of Shem, at least the youngest son of Noah (Genesis 10:22-32). As Semitic people, the lineage of Ophir was related directly with Abraham, i.e. they were not one of the people descendants of Cham, which were a cursed people according to the story of “Noah’s drunkenness” (Genesis 9:18-29), and considered therefore physiologically inferior.

The rejection of Garcia to the positions of Acosta cannot be regarded as a capricious choice or a mere detail. Both presented their theories about the origin of the Indians combining the rational arguments of classical naturalism with the dogmatic reasoning of Catholic tradition. But ultimately what they really offered was two different and antithetical ways, to face the Natural History of Man (Huddleston, 1967).

Garcia offered a general cosmological argument, which established a necessary relationship between the

natural history of the physical and moral man and the providence. As Acosta objected, that vision forced a double argument, physiological and cultural, that clearly lacks coherence. In his view these dogmatic theories took for granted that at some point in their history Indians had belonged to a superior culture, civilized to a point never known in the West, provided with better laws, able to develop a knowledge of astronomy and navigation, which had been inaccessible to Western men until very recent times. However they had not been able to leave a single material proof of that greatness. Also, at the physiological question, Acosta objected that if these men were descendants of the peoples of the Old World, it was hard to believe that their physiological qualities were markedly different from any other people known. It would be logical that they had kept some similar features or that the features of all the indigenous groups were similar to each other, which obviously was not the case.

Assuming the dogmatic argument was supposed to give credit to a process of physical and moral involution of those men, with respect to their ancestors, with the will of God as the only reason. That those men were chosen by Him, and later without apparent reason they lost the divine grace. The God of Acosta, being the same as García's, was not as humanely capricious and voluble to allow such a thing. Contrary to Acosta, García does not occupy his time in answering these questions. He values with suspicion any separation between the natural and the divine, and he linked the fate of those peoples to their ability of compliance with the Law of God, that was "the true bread and delicacy for the soul" (García, 1607: 105):

"So the Indians learned of the Creation of the World, of the General Flood, of Noah and his sons, and they lost this news that served as their light, and axe to know and see some truths with the eyes of understanding, and they were filled with the shadows of ignorance and darkness and night that prompts, and moves to sleep (...) What they had previously known, and heard, could only be dreamed now, and they only composed thousand fables, lies and balderdash, whose architect and teacher was, who always was master of lies, Satan (...). And this I say about the Peruvian Indians, is also understood from others" (García, 1607: 491 y 535).

Fittingly, to reinforce his idea he broached the "Metamorphoseos" of the poet Ovid, showing the real reason for their changes:

"Everything that happens to these (Indians) was because of their sins, God allowed them to be blinded in such a way, that never could come up with the simple and honest truth" (pp. 491-492).

OF GODS AND MONSTERS

Huddleston holds that at least until 1729, the construction of the theories about the origin of the Indians, and their necessary relation with the theories about the origin of man, were developed without strong opposition,

on the antithetical lines of the "Acostians" and "Garcians" scientific thought. "By then", says the author, "the question of the biological origin of the Indian had been relegated to a position of minor importance: the question had become largely a matter of cultural origins" (1967: 143). Clearly, the general sense of this assessment must be only understood in the context of a history of science, interested in knowing how the origin of the Indians was composed from an objective anthropological reasoning, but in practice the matter was so far from that path.

The opposition that transcends the theories posed by García and Acosta about the origin of the Indians, refer to a cosmic vision on the origins of human beings and the world at large, which was much higher than the specific issue they pretended to address. In this sense, the positions of these authors were not the trend, but the result of the different ways to include the previous forms of natural thought. To give the most characteristic example, in the very first *Natural History*, given in the first century by Pliny "the Elder" (ca.25-79), he showed that any judgment about the natural history of men required the establishing of a major differentiation with other animal species. Unlike those, men should be studied based on the peculiarities of their kind, that is to say, the variety and uniqueness of their people. In addressing these "peculiarities", Pliny was not so much interested in the physical or moral differences, as in the marked cultural or civilization differences (Plinius Secundus, 1499, I.VII, c.II)². From this scientific perspective the issue of the cultural origin was not exactly a minor problem, but rather the contrary.

The Christian cosmology, showed in the Catholic doctrinal scientific positions of authors like García, proposed the hallmarks of a way of thinking about human origins that spread strongly throughout European scientific thinking through the 17th and 18th centuries. Thereby, more than seven decades later authors such as the Mexican astronomer and pre-historian Carlos de Sigüenza (1645-1700), still gave pabulum to ideas such as "Neptune was the son of Misraim, Cham grandson, great-grandson of Noah and the progenitor of the Western Indians" (1680: 11 y sig). It was not an isolated or peculiar case as many other scientists, intellectuals and artists articulated ideas in the same or similar terms (Katzew, 2011: 33-47). However, it is clear that the successive scientific theories did not show the conformism of the first authors regarding the more dogmatic questions. At that point the more inquisitive mind of Acosta was becoming the model, although not necessarily in the specific "rational" terms on which the author had proposed.

Like any other cosmogony, the certainty that God had created the first man and that their degrees of "evolution", or more correctly variation, were linked to his providence, found support in various disciplines. Certainly, this gave the problem a new form, arguably more rational, but no less dogmatic, at least not immediately. The case of medical science is perhaps the most symptomatic, but is not alone.

For centuries, doctors faced the relationship between the species and its variations without setting a precise differentiation between the phylogeny, or the origin of the

specific form of being, and the ontogeny, origin of its individual form. Naturally, they were aware of the existence of both phenomena, as well as its link with the act of generation and biological heredity, however, as we know, neither the Greek tradition, nor the Roman, nor any of the following, at least until the mid-nineteenth century, considered a strict separation between these two facets of human physiology (Gould, 2010: 23-28; Lain Entralgo, 1978: 82-83). This situation involves different reasons. From the classical naturalist view, human variations were related only to material causes, such as heredity, weather, geographic location or feelings, all of which could act at the same time as internal or biological factors, and as external or environmental factors. However, in a physical sense, the natural essence or, what is the same, the physiological traits of the species were invariable, so that everyone showed a natural tendency to the original shape, even though some generations could be reproduced with the peculiarities of his predecessors (Aristóteles, 1994: b.I, 721b; Hipócrates, 2003: 247-257)³.

When in the late second century Medicine began to be influenced by the dogmatic reason, the principle of invariance of human essence remained commonly accepted, but its first cause was derivate to the divine action. By then, the dominant medical paradigm was already established on the system of Galen and the generation of the variations in the human type sought shelter under his explanation of “*actio depravata*”, phenomena that affected the sensory ability of the individual making desired things contrary to their nature or vitiating a part of their physiology, for excess or defect (Vallesio Cobarruviano, 1625: 281-284)⁴. Viewed from the dogmatic thinking of Catholicism, the application of galenic preternaturality to the study of generational defects began to give preference to the analysis of the vagaries of moral, over the physical factors, and at that precise point physicians did not treat the sick, but literally monsters⁵:

“But supposing they are men of whom these marvels are recorded; what if God has seen fit to create some people in this way, that we might not suppose that the monstrous births which appear among ourselves are the failures of that wisdom whereby He fashions the human nature, as we speak of the failure of a less perfect workman? Accordingly, it ought not to seem absurd to us, that as in individual people there are monstrous births, so in the whole humanity there are monstrous people. Wherefore, to conclude this question cautiously and guardedly, either these things which have been told of some of these people are not real at all; if they are not, they are not human; but if they are human, they are sure descended from Adam” (Hipona, 2000, b. XVI, c.VIII)⁶.

Clearly, neither Augustine, nor the much later writers about monsters and phenomena, such as the French surgeon Ambroise Paré (1987)⁷, the writer and translator Pierre Boaistuau (1564), or the Spanish physician Joseph Rivilla Bonet y Pueyo (1695), made an explicit classification taking the racial variations or the slight deviations in a race as monstrosities⁸. The problem is that without a

clear concept of the operation of heredity, these men blurred the boundary between the normal and the monstrous, and linked it with a simple identification of the natural law and divine law. Meaning that unlike the animal, the monster “properly human” must be distinguished by its “vegetative, sensitive and rational soul” (Rivilla Bonet y Pueyo, 1695: 11).

The ideas about the physiological process of monstrosity were used as a necessary argument to “rationalize” the dogmatic explanations about the History of the variations of human being⁹. The physical and moral differences between the races was explained as a “logical” consequence of a biological phenomenon sustained by the gradual departure of these men from the law of God, and that in turn affects the strengthening of the biblical story as the first scientific explanation. Thus, in his Catechism for Ethiopians, the Jesuit Alonso de Sandoval (ca.1576-1652), considered that in order to understand the Natural History of these people, it was necessary to recover the stories “about the causes of the generation of monsters” (Sandoval, 1647: 310). Previously some chroniclers such as the Father Luis de Urreta, had dropped the idea that many of the Ethiopian peoples could be the result of the bestial relations between apes and men (Urreta, 1610: 253). In a less explicit way the also Jesuit, Juan Eusebio Nieremberg y Otin (1595-1658), pointed out that the physical form and moral condition of all mankind was united to God through the fact of Adam creation, and that their conservation depends on the vigilance of a kind of “guardian angels”. That was the reason why the people in India, Africa or Ethiopia, were gradually subjected to the different kind of monstrosities, deformations or degenerations, because they had been separated from the truly religious. Opposed to them, Europeans had maintained the flame of their faith alive, and therefore they had kept the original shape of the human kind given by God (Nieremberg, 1644, b. I, c.XVI, p.12).

All these theories found valuable support in a long series of studies aimed at strengthening the objectivity of the Genesis account. Many of these works used a global perspective, able to combine different scientific, geological, geographical, physical or biological levels. This regard was a principal part in the extensive work of the multifaceted Jesuit scientist Athanasius Kircher (ca.1601-1680)¹⁰, especially of his peculiar study aimed at providing objective evidence of the construction of Noah’s Ark, and the most likely distribution of the different animal species (Kircher, 1675). Also relevant was his further demonstration of the historical event of the Tower of Babel and the subsequent differentiation of the human races and cultures (Kircher, 1679). Both texts were preceded by no less relevant studies such as the mathematical and astronomical work of the Irish Archbishop James Ussher (1581-1656), that established a historical chronology of the Old Testament dating with pinpoint precision events such as the creation of the world, that took place on Saturday 22 October of the year 4004 BCE, around 19:00 (British Time), or the Flood, which took place on May 5, 2348 BCE (Ussher, 1650).

Although the theme of these works may seem trivial or absurd in the eyes of the modern reader, these texts are symptomatic of how the decadence of dogmatic reasoning was countered by a rational objectification of the biblical facts. From this point of view, out of its dogmatic sense, the Genesis account does not lose its interest as a rigorous source for the new “scientific” theories. A good example was the appearance of the work of Isaac La Peyrère (1655), defending the pre-Adamic origin of some men, and establishing as a logical extension of this theory, the existence of separate human “species” that have lived up to the present as different races. The work, considered as heretical, is generally recognized as one of the first denials of the dogma of creation, and therefore of the foundations of the scientific monogenist theories, betting on a polygenist interpretation of the human origins, and gave scientific racism its first foundations (Huddleston, 1967: 138-147; Gliozzi, 1977: 514-621; Popkin, 1993). However, although the break with the dogma is clear, this ran not together with a separation of the account, in fact as we know, the basis of the positions of La Peyrère continued in the literal interpretation of the biblical text. Specifically, he focused his explanation in the internal inconsistencies of the dogma of the creation of man comparing Genesis (1:27) with (2: 20-25), which was exactly the same mistake that gave rise to the Talmudic story of Lilith, first woman created in the image and likeness of God. He also interpreted that the letter of Paul to Romans (5:12-21) spoke about those men created by God previous- or contemporaneously to Adam (La Peyrère, 1655, b.III,c.I: 116-132).

DEGENERATED

Although in very different terms from those posed by La Peyrère, the definitive break with the dogmatic reasoning was widespread throughout the eighteenth century. The rationalism of the Enlightenment brought a radical change in the way to confront the problem of human nature. Nevertheless, as pointed out by the historian Carl Lotus Becker, most of the enlightened philosophers and scientists were not willing to give up the word of God (1932: 43-128). In practice religion continues to offer an indisputable source of reason for anyone purporting to reconstruct the origin of the earth, the natural history of man or the leading causes of its variations (Capel Sáez, 1982) and only a few were able to transcend that belief (Blom, 2010). A major work such as the *Sistema Naturæ* of Carl von Linné (1770) was an explicit proposal to catalogue and organize the work of God, recognizing the homo sapiens as the most perfect of His creations (vol.I: 7)¹¹.

No one can deny however, that the Enlightenment changed the terms in which the relationship between science and dogma had been expressed. It might be that Linné, along with most other scientists, decided to continue considering that the world should be the work of God, but in any case, it could be accepted that His work was governed according to their wishes or whims. The old equivalence between the law of God and the law of nature had

disappeared, and a new Natural theology became “the framework within which the Enlightenment naturalist carried out their investigations”. Nonetheless this new theology was manifested in very different ways, as it was “a house of many mansions” as resourcefully illustrated by Lorraine Daston (2004:101).

Thus, although the men of the eighteenth century dared to “confront their gods” (Manuel, 1959) and deprive them of a greater part of the power they had exercised over their lives and institutions, that fight was not with fire and sword. The alleged secularization took several centuries to be a reality, able to shed the influence of a Christian dogma that had given substance to many of their theories. Although conflicts between science and religion increased, they were usually not due to the break within the framework of beliefs about the origin of the human being, but rather made the effort of providing them with a more rational, less dogmatic and more acceptable form.

Few men were as relevant in this particular field as Georges Louis Leclerc, Comte de Buffon (1707-1788). When he began publishing his Natural History in 1749, he faced the task with the logical opposite of which most of his predecessors had shown, and refused to adapt to their study of dogmatic criteria of the faith. As he says “the wonders consisting by faith (could) not be in the ordinary course of things” (Buffon, 1802: 268)¹², so that the only “rational” way to explain phenomena as the origin and variation of man, should respond to natural events. However, Buffon, continued looking in the scriptures of the general explanatory framework which could allow him to unravel the study of the origin of natural processes, because even being understood as natural realities within themselves, he continued watching them as the work of God.

“once centuries had passed, once continents had been crossed, and once many generations had degenerated by the influence of different climates (...) their mutations were so large and visible that we would have reasons to believe that the Black, the Lapp and the White are different species, if on the other hand, we did not have the evidence that *God did not create more than one man*” (Buffon, 1766: 311).

As is well known (vid. Caponi, 2008), the answer that Buffon gave to the problem of animal species variation was a strictly biological phenomenon he called “*dégénérescence*”, degeneration (Buffon, 1766). Contrary to the dogmatic interpretation of Natural History, Buffon did not believe that God had created all animals in their present form, but only those which he defines as the 15 genera and the 9 isolated species, from which he sensed the foundations of a primitive and general design, something like if “all animals derived from a single animal that, over time, produced, as improvement or as degeneration all the races of the other animals” (Buffon, 1754).

That pattern referred necessarily to a common phylogenetic origin, unique to each species (Buffon, 1749), that

subsequently was called “*unité de type*”, unity of type (Flourens, 1844: 89, 164 y sig.). Although Buffon did not use these terms, it seems obvious that the unit of type was performed in a phylogenetic sense, as an essentially unchanging and naturally recurring state, while the changes that had resulted in the variety of species to their form in the present, must be interpreted in an ontogenetic sense, as an effect of the adaptation of living beings to external and accidental events, forced by the changing environmental conditions. These biological changes, whether essential or accidental, could be transmitted by heredity. Thus, although the phylogeny of the species was essentially static, their ontogeny or specific organic configuration could be stabilized for a long period of time:

“In order to understand the change of the colour in the human species, some individuals of the black breed of the Senegal should be *brought* to Denmark, where the difference of breed and the opposition of colour are larger, because men are commonly white, with blond hair, and blue eyes. These Blacks *should be locked* with their wives, their breed *should be preserved* carefully, *without allowing them to mix* with Whites. That is *the only way to know* how much time would be needed to *restore the human nature* in this particular, and in the same way, how long has needed to move the White into Black” (Buffon, 1766: 249-250).

Although this phenomenon of degeneration could be common to all living beings, Buffon noted that it did not operate exactly in the same way in animals as in humans: “This extension of our nature comes not so much from the properties of our body, but from our soul” (Buffon, 1766: 248). According to Buffon, the soul offered men an exceptional ability to produce feelings and intelligence, and to use them to develop and materialize their culture in order to improve their capacity to adapt to the environment. This means that although the degeneration in humans should be manifested in material or physical changes (as in the rest of animals), the roots of the human process should have a deep psychic origin. That was the reason that while the assessment of the essential type in the animal species was a simple work of comparative anatomy, the selection criteria of the type of the first man could not be valued only for its “racial” or physiognomic characters (cf. Voegelin, 1998: 61-62), because in a “rational” way they should be secondary to the moral characteristics. That is, the selection criteria must be based on the aspects of civilization. It was precisely at this point when his theory of natural history gave way to the irrational feeling of the monogenists ideas, opening the door to the dogmatic reasoning.

Taking as a basis some of the explanations from the previous centuries, in *Les époques de la nature* Buffon postulated that in the origin of man, degeneration should be materialized as a variation of the physiological conditions due to a drastic worsening of the environmental conditions. This in turn should have caused a pronounced decrease in the intellectual abilities of the first men causing a “civilizing” decline that affected their ability to real-

ize their culture in concrete scientific and technical developments. The assessment of these developments was established as a reliable pattern of civilization with which he thought it could be possible to compare the physical and moral degeneration of the humans, with respect to the first men. This standard was found in the region of *Tartar*, in today’s Siberia (Buffon, 1802: 303-306).

According to Buffon in some remote time in the past, this place had combined some specific climatic and environmental factors, which produced a spectacular development of the physical conditions of the first men, causing the growth of their culture. The Tatars were the first civilization capable of performing the “lunisolar period of 600 years”, the same that the Genovese astronomer Giovanni Doménico Cassini (1625-1712) “re-discovered” in (1689) and the same that, according to the Pharisee historian Titus Flavius Josephus (ca.38-101) must have been known to the antediluvian Patriarchs: Mahalaleel, Jared, Enoch and Methuselah to Noah (Josephus, 1554, b.I, c. III, anv.: 5)¹³.

At some point immediately after Noah, some kind of cataclysm must have varied the favourable climatic conditions and, in consequence, the special biological and physiological balance that had led to the development of the first culture, ended. However, the remains of this progress were evident. Cassini (1693) explained that the Indian peoples of America and some Asian cultures, had given evidence to knowledge of the astronomical theories of the Tartars. That could be interpreted as a proof of a common biological past. Unfortunately, those peoples seemed to lack the material and intellectual resources to explain those theories. Leaning on the work of the French astronomer Jean-Sylvain Bailly (1781: 109-128)¹⁴, Buffon concluded that the scientific and theoretical mediocrity of those peoples should be the necessary result of degeneration. But he noted too, that the process had not been the same for all people, that before the cataclysm some humans had begun a slow and progressive period of development of their physical and moral capacities, that gave birth to the Babylonian, Greek, Roman and European cultures, producing a civilization that again was able to put some of the men in the ascending line:

“...after 30 centuries of lights followed perhaps as many of ignorance. Of all these beautiful and primordial fruits of human understanding, nothing remained but their dregs: the metaphysics of their false religion, since it could not be understood, did not need of a study (...) The man of this time, submerged in the darkness of ignorance, ceased, so to speak, of being a man; (...) the good manners degenerate into vicious habits (...) the man anyway, without education, without morality, reduced to pass a lonely and wildlife, was not presented in its highest nature, but as a downgraded creature lower than the beasts” (Buffon, 1802: 313-314).

In practice the position of Buffon gave a “rational” justification of the superiority of European men, but this reason was not exactly founded on the anatomical racial differences, rather in a necessary civilizational aspect. The more advanced man was he who more perfectly re-

flected the physical and moral characteristics of an essential type, shared by those first men about whom the scriptures had spoken.

Buffon was not a dogmatic man; he did not search the main basis of his Natural History using faith, but he could not, or would not, escape from the religious principles on his cultural background. Others, leaning on his work, showed no such temperance, or even while showing it, continued to use the revealed Word as a main source in the defence of their “rational” arguments.

Previous to the publication of *Les époques*, the French naturalist and surgeon Claude-Nicolas Le Cat (1700-1768) attempted to explain the way in which the “progeny of Adam” could “dégénérer en negres” (Le Cat, 1765: 5). He began evaluating the different ideas that the dogmatic reasoning had built on human variation, such as that blackness was the result of “the mark of Cain” or of Noah’s curse over the Canaanites. Having raised all these possibilities he concluded that “the tradition cut the knot” of the speculations “about the origin of *the Blacks*, but do not unravel it”. In other words, that the book of Genesis could not give a scientific explanation, but it should be understood as the way to “the truth”, because contrary to the opinions of the classical and naturalistic, men had not “born of the earth like mushrooms”, and all were born of the same white mother: “There cannot be several Eves” (p.11). So, how to explain the change of colour?

Le Cat’s answer of this question was “new”, it should be a disease guided by defects in the hereditary mechanism, but it was really the same. Supported in previous authors such as the German physician Georg Leopold Hoyerius (1737), Le Cat postulates that the hereditary mechanism that marked the change of the skin should be caused by the disturbances of the soul of the mothers, shackled by their mental weakness and their tendency toward sin. It was the same morbid mechanism, that produces for example the birth of “children with two heads”, apparently the same as from the beginning had made them monsters, “like any other”.

MONSTERS OF AN AWAKENED REASON

Initiated the nineteenth century, the analysis of the origin of the human variations, continued combining his progressive rational development with interpretations of the biblical text. In the late eighteenth century were published some of the texts of the Dutch physician Petrus Camper (1722-1789). Even sharing the ideas of a clearly desist monogenism, his work valued the racial differences with a less stringent criterion (Meijer, 1999), stating explicitly the irrelevance of the colour of the skin of the first men:

“No one who, considering without prejudice the whole of the mankind, placed on earth, could doubt that it should be treated as a single genus, that was originated thanks to the divine creator of the heaven and the earth. He subsequently, formed him as a couple, centuries after the existence of the Earth (...) from this couple they were inhabited in a slow process all the parts of the in-

habited world. The difference of colour can not take our consideration here, because everything was subject to change, rather than the epidermis what matters here is the issue of the education” (Camper, 1792: 3).

His work demonstrates how even when the analysis of human variation began to be developed from a rational perspective, the idea of the monogenic origin remained strongly linked to the principles of the original dogmatic formulation: the belief that God had created all men equal from Adam.

Valued from a broad perspective, we found that the survival of these traditional principles played a key role in alienating a great part of the European scientific tradition of an explicit racism, in which the differences between men could be considered as essential and irreversible facts. Somehow, it was generalized as some kind of trust in the soul of men as a malleable entity, and therefore that the physical and moral perfection was a future attainable goal for anyone who had a greatly strong will, and a good physical and moral guidance. However, this supposed ability to physiological redemption, did not fail to provide to an older way of discrimination, more general and no less harmful.

Authors like Camper, refused to see blackness as a specific disease, but associated it with an evident state of physical and moral inferiority, and reinforces his theory by providing “objective” data. He, for example, claims to have demonstrated that in a comparison of pieces of skin from different nationalities and races, the skin of the prostitutes had a darker hue (Camper, 1792: 3-4). Many years later, taking his theories, the science writer Carl Gottfried Wilhelm Vollmer was legitimized to claim that the European was the “race” closer to “the perfection”, while all the other, especially the black, shared physical and moral characteristics closer to the animals. There were of course some exceptions such as those black men whom because of their social class, or their Western manners, should be recognized as “intelligent and talented men” (Zimmermann, 1865: 9-10).

The old dogmatic reasoning that saw the human variation as the result of a progressive separation of the model created in the image and likeness of God, was paving the way to a moral discrimination that was expressed increasingly in a rational way. According Vollmer “theologians” had been the first to conduct a scientific assessment of the human variation, and they had shown that the man:

“was the most sublime when it left the Creator’s hand, it was a perfect being, less similar to the angel than to God, accused by divine revelation of all human knowledge, no needed, in short, of more than the omniscience and immortality to be divine. This humanity, they say, is currently in a state of degradation or imperfection which it is nothing more than a consequence of Original Sin (Sündenfall)” (Zimmermann, 1865: 7-8).

By this time, there were not only the theologians who preached this “new” doctrine. By the mid-nineteenth century new theories began to appear in continental Europe

that, inspired by the idea of Buffon, denounced the existence of a strictly biological process of degeneration of the race. In 1857 the French psychiatrist Bénédict Augustin Morel (1809-1873) raised his “theory on the formation of degenerate states”. Morel tried to “clarify the true distinctive characters of natural changes” suffered by the human species, “as well as their pathological changes (...) in order to apply appropriate remedies” to find a cure or treatment (p. 487). Like other authors, Morel was guided by monogenistic principles. He considered that the human race had been subjected to a hereditary process of biological degeneration.

This question, inheritance, had a transcendental importance in his work (Huertas García-Alejo, 1987: 32). In this particular labour Morel used the theories about the mechanisms of inheritance proposed years earlier in the work of the Parisian physician Prosper Lucas (1808-1885). Inspired by the Teratology studies of E. Geoffroy and Isidore G. Saint-Hilaire (É. G. Saint-Hilaire, 1818-1822; I. G. Saint-Hilaire, 1837), the inheritance theory of Lucas had suggested that the generation of new human beings was ruled by laws. Commonly, Nature was aiming to *reproduce* in children the characteristics of their parents, which was what Lucas called “loi de l’imitation”, but it can also *produce* types different from the “original forms”, (loi de l’invention) (Lucas, 1847-1850, vol. I: 24-25). In this second case, variations were ruled by a series of laws or mechanisms (Lucas, 1847-1850, vol. I: 2), that could be anticipated.

As is well known, the proposal of Lucas reduced significantly the margin of probability attributed by scientists to heredity. That greatly facilitated the development of a preventive medical reasoning about a *hard heritage* during the second half of the nineteenth century (López Beltrán, 2002: 238-239; Vallejo, 2013). However, Lucas’ theory only allows foreseeing a modification of the type, not the modification itself. In this regard Lucas values the heritage as a “polymorphic” process, or what later was called “dissimilar” process. Consequently, the process of inheritance continued to be dominated by uncertainty (Campos Marín, 1999: 436).

That uncertainty was precisely what allowed Morel to search for the answers in the Bible text. Considering that human variations could not be materialized, he links them to a general, dilated and irreversible process of physical and moral decline, whose origin was established in a specific event:

“I have reason to believe that (...) the difficult question of degeneration in humans, should be studied for its origin, and scientifically pursued by examination of the new conditions that had to create in man the great event of the Original Sin (*chuté originelle*)” (Morel, 1857: 2).

According to this, Adam was created in the image and likeness of God and therefore he had enjoyed an almost divine and primal physical and moral perfection. But after the Sin this perfection disappeared, and it was gradually decreasing in his offspring.

Morel’s theory made it difficult to see the environmental issues as the *first cause* neither of degeneration nor, by extension, of variation. From his point of view, it was impossible that general aspects such as climate, food or geographical location, could have different effects over similar human groups. These may only be *direct causes*. Of course, he refused to analyse the problem from an explicit racist point of view, as authors like Joseph Arthur de Gobineau (1853) indeed had done. Contrary to this, he thought that degeneration should be above the racial differences. Like the rest of variations race should have been the effect of a particular act: the rupture of the “law of God” or the “loi moral”.

Since inheritance was the engine of degeneration, a good physician should be able to act against their causes, but being inheritance a dissimilar or polymorphic phenomenon, a preventive action against the general or direct causes would never be effective. A good physician would act against the first cause, because:

“The moral law (...) is one, is universal, it is true, and it gives everyone the possibility to accept and practice it. It provides a certain proof of the unity of the species, from which we can deduce the union and the spread of the different human races. (...) not all these races have been provided with the same degree of civilization. Within themselves civilized nations, there are the *fallen classes*, that barely catch a glimpse of the upward movement of the upper classes, to which they can not access if they are abandoned to their fate. (...) the application of moral treatment to these disinherited masses is presented as one of the noblest, but also the most difficult subjects of study to which the true friends of humanity may aspire” (Morel, 1857: 4).

Morel had just established a framework of interpretation, in which the sociological, the biological and the moral were merely different facets of the same reality. A reality where the biological potential of individuals was marked by the relationship between moral behaviour and biological conditions, as well as for the biological damage caused by moral failures of their predecessors. Thus, the degenerate became a special being, a “fallen angel” (Huertas García-Alejo y Peset Reig, 1986), and the Sin reached the category of pathological fact, indelible but absolvable.

In 1859, only two years after the publication of the work of Morel, Charles Darwin would present a theory of the evolution of men (Darwin, 1859, 1868). Shortly afterwards, those who advocated the transformation and variation of the human species as result of the wishes of a mystical being, they began to be a minority. Until the rediscovery of the works of Mendel, the laws of inheritance began to be interpreted on the greater adaptability of individuals to a hostile and variable environment. The Catholic mysticism lost much of its meaning, and the dubious scientific value of all his theories began to be evidenced.

By then, however, the value of the socio-biological reasoning of Morel’s theory had already left an indelible mark.

In less than half a century the idea of degeneration came to emanate an extraordinary aura of interest, which reached through literature, politics and philosophy (Huertas García-Alejo, 1985a, 1985b; Pick, 1989; Greenslade, 1994; Fuentes Peris, 2009; Wenley Stannard, 2011; Laszakova, 2014). It was even the fundamental support for the emergence of new disciplines, such as criminology (Peset Reig, 1983: 149 y sig.). It articulated ultimately the cultural “degenerative hypochondria” of the *fin-de-siècle* society (Herman, 1998: 125-126; Goodall, 2002: 185 y sig.; Saul, 2014: 54-63).

All of this seems to greatly highlight that defended at the beginning of the work. Although the scientific reasoning made a gradual development to empirical and rational positions, able to prevail over the dogmatic reasoning, religion and faith remained as recurring arguments for science. Arguments that ultimately allowed science to take a moral position against the different being to take defensive actions against those individuals who by their supposed physical or moral abjection, never ceased to be seen as “monsters”, monsters of a reason that were now revealed as awake.

NOTES

- 1 The first edition of the work was Acosta, José de (1590).
- 2 The work of Plinius dates from the first century, ca. 77-79.
- 3 Aristotle's text *On Reproduction of Animals* was written in the fourth century BCE (ca. 347-335), while Hippocrates observations on generation (*Peri Gónes*) come from the fifth century BCE (ca. 420-400).
- 4 The original edition of Valles' work was published in 1556.
- 5 The historical literature on the importance of monstrosity for science, has not stopped growing since the late twentieth century. In this regard, the most comprehensive work remains in (Daston y Park, 1998). Much of the works was focused on the study of monstrosity in the eighteenth century. Quite remarkable are (Tort, 1980; Todd, 1995).
- 6 The work is dated ca. 412-426.
- 7 The first edition of Paré's work on monstrosity was as the second book of Paré, Ambroise (1573: 365-582).
- 8 Paré was one of the most careful writers in this regard; he pointed twelve natural and supernatural causes of monstrosity, including “the glory of God” or “His anger” or “the demons and devils”. He also distinguished different types of monstrosity, the most striking was related to the multiplication of members or hybridisation with strange shapes, but there were also less apparent monstrosities. The mangy, those suffering from gout, leprosy, smallpox or measles, the born “mutilated (...) blind, one-eyed, hunchbacked, lame or those with six fingers and toes, or nose too sunken as flat, or thick and protruding lips, or closing of the genital area of the maids due to hymen, or due a superfluous flesh or the hermaphrodites, or those with spots, warts, tumours, or something else”. They were not less monsters, by being more common (Paré, 1987: 21-23).
- 9 Boia, (1997: 83-85), noted the role that had these theories in justification of colonization, warning of how they evolved in the interests of the conquistadors and chroniclers.
- 10 Works on Kirchner are numerous. Especially important is the project developed by Stanford University focused on the analysis of his correspondence with other scientists vid. <http://web.stanford.edu/group/kirchner/cgi-bin/site/> (18.01.2016). The website includes a specific section with numerous references about the author.
- 11 First edition of the work was Linnæi, Caroli (1735).
- 12 The first French edition of this work, was published as a supplement of the *Natural History*: Buffon, (Leclerc, Georges-Louis) (1778).
- 13 The work of Josephus must have been written sometime in the last decade of the first century, ca. 93-94.
- 14 Buffon probably used the first edition of the work published in 1775.

REFERENCES

- Acosta, José de (1590) *Historia natural y moral delas Indias. En que se tratan las cosas notables del cielo, y elementos, metales, plantas, y animales dellas: y los ritos, y ceremonias, leyes, y gobierno, y guerras de los Indios*. Casa de Iuan de Leon, Sevilla.
- Acosta, José de (1608) *Historia natural y moral de las Indias. En que se tratan las cosas notables del cielo, y elementos, metales, plantas, y animales dellas: y los ritos, y ceremonias, leyes, y gobierno, y guerras de los Indios*. Casa de Alonso Martín, Madrid.
- Alcina Franch, José (1988) *El descubrimiento científico de América*. Anthropos, Barcelona.
- Aria Montano, Benedicto (1572) *Phaleg sive, de gentium sedibus. Primus, orbisque terrae situ, liber*. Excudebat Christophorus Plantinus Prototypographus Regius, ad sacri Apparatus instructionem, Antuerpiæ (Amberes).
- Aristóteles (1994) *Reproducción de los animales*. Gredos, Madrid.
- Bailly, Jean-Sylvain (1781) *Histoire de l'Astronomie ancienne, depuis son origine jus qu'a l'établissement de l'Ecole d'Alexandrie*. Chez de Bure fils aîné, quai des Augustins, près de la rue Pavée, Paris.
- Becker, Carl Lotus (1932) *The Heavenly City of the Eighteenth-Century Philosophers*, Yale University Press, s.l.
- Bloom, Philipp (2010) *Gente peligrosa. El radicalismo olvidado de la Ilustración europea*. Anagrama, Barcelona.
- Boaistuau, Pierre (1564) *Histoires prodigieuses, extraictes de plusieurs fameux auteurs, Grecs et Latins, sacrez et prophanes*. Pour Vicent Norment, et Iehanne Bruneau, Paris.
- Boia, Lucian (1997) *Entre el ángel y la bestia. El mito del hombre diferente desde la antigüedad hasta nuestros días*. Editorial Andrés Bello, Santiago de Chile.
- Buffon (Leclerc, Georges-Louis) (1749) “Histoire Naturelle de l'Homme. Varietes dans l'espece humaine”. *L'Histoire Naturelle, générale et particulière, avec la description du Cabinet du Roi* Vol. III. L'Imprimerie Royale, Paris: 371-530.
- Buffon (Leclerc, Georges-Louis) (1754) *L'ane. Histoire naturelle générale et particulière, avec la description du Cabinet du Roy*, Vol. IV. L'Imprimerie Royale, Paris: 377-436.
- Buffon (Leclerc, Georges-Louis) (1766) “De la dégénération des animaux, et des mulets”. In: *Histoire naturelle générale et particulière, avec la description du Cabinet du Roy*, Vol. XIV. L'Imprimerie Royale, Paris: 311-374.
- Buffon (Leclerc, Georges-Louis) (1778) *Histoire Naturelle, Générale Et Particulière, Contenant Les Époques De La Nature*. Vol. Supplément. Tome Neuvième. L'Imprimerie Royale, Paris.
- Buffon (Leclerc, Georges-Louis) (1802) “Las Épocas de la Naturaleza”. En Castel, René-Richard de (Ed.), *Compendio de la Historia Natural de Buffon, clasificado según el sistema de Linéo por Renato Castel*, Vol. II. Imprenta de Villalpando, Madrid.
- Camper, Peter (1792) *Über den natürlichen Unterschied der Gesichtszüge in Menschen. Verschiedener Gegenden und Verschiedenen Alters; über das Schöne antiker Bildsäulen und geschmittener Steine; nebst Darstellung einer neuen Art, Allerlei Menschenköpfe mit Sicherheit zu zeichnen*. In der Vossischen Buchhandlung, Berlin.
- Campos Marín, Ricardo (1999) “La teoría de la degeneración y la clínica psiquiátrica en la España de la Restauración”. *Dynamis*, 19: 429-456.
- Cañizares Esguerra, Jorge (2006) *Nature, Empire, and Nation. Explorations of History of Science in the Iberian World*. Stanford University Press. Stanford, California.
- Capel Sáez, Horacio (1982) *La física sagrada. Creencias religiosas y teorías científicas en los orígenes de la geomorfología española*. Ed. del Serbal, Barcelona.

- Caponi, Gustavo (2008) "Unidad de tipo y degeneración en la Historia Natural de Buffon". *Filosofía e Historia de la Biología*, 3:179-194.
- Cassini, Giovanni Domenico (1689) "Règles de l'Astronomie Indienne pour calculer les mouvements du soleil et de la lune". *Recueil d'observations faites en plusieurs voyages par ordre de sa Majesté, pour perfectionner l'astronomie et la géographie. Avec divers Traitez Astronomiques*. De L'Imprimerie Royale. Par la Veuve de Sebastien Mabre-Cramoisy, Imprimeur de Sa Majesté, et Directeur de son Imprimerie Royale., Paris: 1-64.
- Cassini, Giovanni Domenico (1693) De l'origine et du progrès de l'Astronomie, et de son usage dans la Géographie et dans la Navigation. *Recueil d'observations faites en plusieurs voyages par ordre de sa Majesté, pour perfectionner l'astronomie et la géographie. Avec divers Traitez Astronomiques*. De L'Imprimerie Royale, Paris: 1-43.
- Darwin, Charles R. (1859) *On the Origin of Species. Or the Preservation of Favoured Races in the Struggle for Life*. John Murray, London.
- Darwin, Charles R. (1868) *The Variation of Animals and Plants under Domestication*, Vol. II. John Murray, London.
- Daston, Lorraine (2004) "Attention and the Values of Nature in the Enlightenment". En Daston, Lorraine; Vidal, Fernando (Eds.), *The Moral Authority of Nature*. The University of Chicago Press, Chicago. London: 100-126.
- Daston, Lorraine; Park, Katharine (1998) *Wonders and the Order of Nature, 1150-1750*. Zone Books, New York.
- Ellis, Anthony (Ed.), (2015) *God in History. Reading and Rewriting Herodotean Theology from Plutarch to the Renaissance*. HIS-TOS, Newcastle.
- Flourens, Jean Pierre (1844) *Buffon. Histoire de ses travaux et de ses idées*. Paulin, Libraire Éditeur, Paris.
- Fuentes Peris, Teresa (2009) "Alcoholismo, anarquismo y degeneración en La Bodega de Vicente Blasco Ibañez". *Journal of Spanish Cultural Studies*, 10 (4): 485-503.
- García, Gregorio (1607) *Origen de los Indios de el Nuevo Mundo, e Indias Occidentales*. Casa de Pedro Patricio Mey, junto a San Martín, Valencia.
- Gliozzi, Giuliano (1977) *Adamo e il nuovo mondo. La nascita dell'antropologia come ideologia coloniale: delle genealogie bibliche alle teorie razziali (1500-1700)*. La Nuova Italia Editrice, Firenze.
- Gobineau, Joseph Arthur de (1853) *Essai sur l'inégalité des races humaines*, Vol. I. Didot, Paris.
- Goodall, Jane R. (2002) *Performance and Evolution in the Age of Darwin. Out of the Natural Order*. Routledge, London.
- Gould, Stephen Jay (2010) *Ontogenia y filogenia. Ley fundamental biogenética*. Crítica, Barcelona.
- Greenstade, William M. (1994) *Degeneration, Culture, and the Novel, 1880-1940*. Cambridge University Press, New York.
- Harnack, Adolf (1886-1897) *History of Dogma*. Wipf and Stock Publishers, Eugene.
- Herman, Arthur (1998) *La idea de la decadencia en la historia occidental*. Andrés Bello, Santiago de Chile.
- Hipócrates (2003) "Sobre la Generación". *Tratados Hipocráticos VIII*. Gredos, Madrid: 231-257.
- Hipona, Agustín de (2000) "La ciudad de Dios (Edición Bilingüe)". *Obras Completas de San Agustín*, Vol. XVI y XVII. Biblioteca de Autores Cristianos, Madrid.
- Hoyerius, Gregorg Leopold (1737) "De Corrupta matris imaginatione in deformando foetu". *Acta Physico-Medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum*, IV: 381-382.
- Huddleston, Lee Eldridge (1967) *Origins of the American Indians. European Concepts, 1492-1729*. Institute of Latin American Studies. The University of Texas Press, Austin-London.
- Huertas García-Alejo, Rafael (1985a) "Degeneración y muerte en la obra literaria de E. Zola". *JANO*, (647-H): 53-62.
- Huertas García-Alejo, Rafael (1985b) "Herencia y degeneración en la obra literaria de E. Zola". *Asclepio*, XXXVII: 3-37.
- Huertas García-Alejo, Rafael (1987) *Locura y degeneración: psiquiatría y sociedad en el positivismo francés*. Consejo Superior de Investigaciones Científicas, Madrid.
- Huertas García-Alejo, Rafael; Peset Reig, José Luis (1986) "Del ángel caído al enfermo mental: Sobre el concepto de degeneración en las obras de Morel y Magnan". *Asclepio*, 38: 215-240.
- Josepho, Flavio (1554) *Los Veynte Libros de las Antigüedades Iudaycas, y su vida por él mismo escrita, con otro libro suyo del imperio dela Razon, en el que trata del martyrio delos Machabeos: todo nuevamente traducido de Latin en Romance Castellano*. En Casa de Martín Nucio, Anuers (Angers).
- Katzew, Ilona (2011) "La saga de los orígenes: una reinterpretación americanista de los cuadros de Cristóbal de Villapando". *Anales del Instituto de Investigaciones Estéticas*, XXXIII (99): 33-70.
- Kircher, Athanasius (Kircheri, Athanasii) (1675) *Arca Noe, in tres libros digesta*. Apud Joannem Janssonium a Waesberge, Amstelodami (Amsterdam).
- Kircher, Athanasius (Kircheri, Athanasii) (1679) *Turris Babel, sive Archontologia*. Ex Officina Janssonio-Waesbergiana, Amstelodami (Amsterdam).
- La Peyrère, Isaac (1655) *Praedamitæ. Sive exercitatio super Versibus duodecimo, decimotertio, decimoquarto, capituli quinti Epistolæ D. Pauli ad Romanos. Quivus Inducuntur Primi Homines ante Adamum conditi*. s.e., s.l.
- Lain Entralgo, Pedro (1978) *Historia de la Medicina*. Salvat, Barcelona.
- Laszkova, Lana (2014) *Degeneration Theory in Victorian Literature*. Masaryk University in Brno. Faculty of Arts. Department of English American Studies, Brno. Master's Diploma Thesis.
- Le Cat, Claude-Nicolas (1765) *Traité de la couleur de la peau humaine en général, de celle des nègres en particulier, et de la métamorphose d'une de ces couleurs en l'autre, soit de naissance, soit accidentellement*. s.p., Amsterdam.
- Linnæi, Caroli (1735) *Systema Naturæ, Sive Regna Tria Naturæ Systematice Proposita Per Classes, Ordines, Genera, Et Species*. Typographia Joannis Wilhelmi de Groot, Lugduni Batavorum (Leiden).
- Linné, Caroli (1770) *Systema Naturae, per regna tria naturae, secundum classes, ordines, genera, species cum characteribus, et differentiis*. Typis Ioannis Thomae nob. de Trattner, Caes. Reg. Aulae. Typographi et Bibliop, Vindobonae (Viena).
- López Beltrán, Carlos (2002) "De perfeccionar el cuerpo a limpiar la Raza: sobre la sangre y la herencia (c.1750-c.1870)". *Relaciones. Estudios de historia y herencia*, XXIII (91): 235-278.
- Lucas, Prosper (1847-1850) *Traité philosophique et physiologique de l'hérédité naturelle dans les états de santé et de maladie su système nerveux avec l'application methodique des lois de la procréation au traitement général des affections dont elle est le principe*. Chez J.B. Bailliére, Paris.
- Maestre Sánchez, Alfonso (2004) "“Todas las gentes del mundo son hombres”. El gran debate entre Fray Bartolomé de las Casas (1474-1566) y Juan Ginés de Sepúlveda (1490-1573)". *Anales del Seminario de Historia de la Filosofía* (21): 91-134.
- Manuel, Frank E. (1959) *The Eighteenth Century Confronts the Gods*. Harvard University Press, Cambridge.
- Martínez, Henrrico (1606) *Reportorio de los Tiempos, y Historia Natural desta Nueva España*. En la Empronta del mismo autor, México.
- Meijer, Miriam Claude (1999) *Race and Aesthetics in the Anthropology of Petrus Camper (1722-1789)*. Editions Rodopi, Amsterdam-Atlanta.
- Morel, Bénédic A. (1857) *Traité des dégénérescences physiques, intellectuelles et morales de l'espèce humaine et des causes qui produisent ces variétés maladives*. Chez J.B. Bailliére, Paris-London-New York-Madrid.
- Nieremberg, Juan Eusevio (1644) *Curiosa Filosofía y Tesoro de Maravillas de la Naturaleza, examinadas en varias cuestiones naturales*. Pedro Cavalleria y a su costa, Barcelona.
- Osborne, Robin (2003) "The polis and its culture". En: Taylor, Charles W. (Ed.). *From Beginning to Plato*. Routledge, London. New York: 9-46.
- Paré, Ambroise (1573) *Deux Livres De Chirurgie*, Chez André Wechel, Paris
- Paré, Ambroise (1987) *Monstruos y prodigios*. Siruela, Madrid.

- Pastor Bodmer, Beatriz (1992) *The Armature of Conquest. Spanish Accounts of the Discovery of America, 1492-1589*. Stanford University Press, Stanford.
- Peset Reig, José Luis (1983) *Ciencia y marginación. Sobre negros, locos y criminales*. Crítica, Barcelona.
- Pick, Daniel (1989) *Faces of Degeneration. A European disorder, c.1848-c.1918*. Cambridge University Press, Cambridge-New York-Melbourne.
- Plinius Secundus, Gaius (1499) *Naturae Historiarum Libri XXXVII*. Johannes Alvisius, Venezia.
- Popkin, Richard H. (1993) "The Philosophical Bases of Modern Racism". En Watson, Richard A.; Force, James E. (Eds.) *The High Road to Pyrrhonism*. Hackett Publishing Company, Cambridge. Indianapolis: 79-102.
- Portuondo, Maria M. (2009) *Secret Science. Spanish Cosmography and the New World*. The University of Chicago Press, London-Chicago.
- Rivilla Bonet y Pueyo, Joseph de (1695) *Desvios de la Naturaleza. O tratado de l origen de los monstros. A que va añadido un compendio de Curaciones Chyrurgicas en Monstruosos accidentes*. En la Imprenta Real, por Joseph de Contreras, y Alvarado Impresor, Lima.
- Saint-Hilaire, Étienne Geoffroy (1818-1822) *Philosophie Anatomique*. J.B. Baillière, Paris.
- Saint-Hilaire, Isidore Geoffroy (1837) *Histoire générale et particulière des anomalies de l'organisation chez l'homme et les animaux. Ouvrage comprenant des recherches sur les caractères, la classification, l'influence physiologique et pathologique, les rapports généraux, les lois et les causes des monstruosités, des variétés et vices de conformation, ou Traité de Tératologie*. Société Belge de Librairie Hauman, Cattoir et C^a, Bruxelles.
- Sandoval, Alonso de (1647) *De Instauranda Æthiopum Salute. Historia de Æthiopia. Naturaleça, Policia Sagrada y profana. Costumbres, ritos y Cathecismo Evangélico, de todos los Æthiopes co que se restaura la salud de sus almas*. Alonso de Paredes, Madrid.
- Saul, Nicholas (2014) "Germany and Northern Europe. Darwin in German Literary Culture 1890-1914". En Shaffer, Elinor (Ed.) *The Literary and Cultural Reception of Charles Darwin in Europe*. Bloomsbury Publishing, London- New York: 46-77.
- Scully, Stephen (2015) *Hesiods Theogony. From Near Eastern Creation Myths to Paradise Lost*. Oxford University Press, New York.
- Shapin, Steven (1998) *The Scientific Revolution*. The University of Chicago Press, Chicago-London.
- Sigüenza y Góngora, Carlos de (1680) *Teatro de virtudes políticas que constituyen a un príncipe. Advertidas en los monarcas antiguos del Mexicano Imperio, con cuyas efigies se hermosteó el Arco triunfal que la Ciudad de México erigió para recibimiento del Virrey Conde de Paredes, Marqués de La Laguna, etc.*. Por la Viuda de Bernardo Calderón, México.
- Todd, Dennis (1995) *Imagining Monsters. Miscreations of the Self in Eighteenth-Century England*. University of Chicago Press, Chicago. London.
- Tort, Patrick (1980) *L'ordre et les monstres. Le débat sur l'origine des déviations anatomiques au XVIIIe siècle*. Le Sycomore, Paris.
- Urreta, Luis de (1610) *Historia Eclesiástica, Política, Natural, y Moral de los grandes y remotos Reynos de la Etiopia, Monarchia del Emperador, llamado Preste Juan de las Indias*. En Casa de Pedro Patricio Mey, Valencia.
- Ussher, James (1650) *Annales Veteris Testamenti, a prima mundi origine deducti: una cum rerum Asiaticarum et Ægyptiacarum chronico, a temporis Historici Principio usque ad Maccabaicorum initia producto*. Ex Officina F. Flesher et postant apud L Sadler, ad Insigne Leonis deaurati in vico vulgò voc. Little Britain, Londini.
- Vallejo, Mauro Sebastián (2013) "El problema de la herencia en la medicina francesa (1800-1846)". *Llull*, 36 (77): 133-157.
- Vallesio Cobarruviano, Francisco (Valles, Francisco) (1625) *Controuersiarum Medicarum, & Philosophicarum Libri decem. Quibus Accessit Libellus de Locis manifeste pugnantis apud Galenum codem Vallesio authore*. Sumptib. Antonii Chard, Sub figno S. Spitiitus, Lugduni (Lyon).
- Venegas del Busto, Alejo (Vanegas, Alexio) (1569) *Primera Parte de las diferencias de libros que ay en el universo*. Alfonso Gómez impresor de corte, Madrid.
- Voegelin, Eric (1998) *The history of the Race Idea, from Ray to Carus*. Louisiana State University Press, Baton Rouge.
- Wenley Stannard, Michael (2011) *Degeneration Theory in Naturalist Novels of Benito Pérez Galdós*. Faculty of the Graduate School of the University of Minnesota Minnesota, Ph.D Thesis.
- Zárate, Agustín de (Çarate, Agustín de) (1555) *Historia del descubrimiento y conquista del Perú, con las cosas naturales que señaladamente allí se hallan y los sucessos que ha auido*, Casa de Martín Nucio, a las dos Cigueñas, Anvers.
- Zimmermann, W. F. A. (Vollmer, Carl Gottfried Wilhelm) (1865) *Der Mensch, die Räthsel und Wunder seiner Natur*, Vol. I. Gustav Hempel, Allgemeiner Theil, Berlin.