NEO-LAMARCKISM IN PORTUGAL

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RESUMEN

El Darwinismo fue defendido en Portugal en la Universidad y por los partidos políticos progresistas durante la década de los años 60 del siglo XIX. El neo-darwinismo fue ignorado en su tiempo y así continuó la aceptación de la herencia de los caracteres adquiridos a lo largo de las primeras décadas del siglo XX. Los profesores de biología, con formación médica, de la Universidad de Oporto apoyaban en los primeros años del siglo XX las teorías neo-lamarckianas. El primero fue el profesor de botánica Américo Pires de Lima (1886-1966), cuya disertación doctoral defendiendo el darwinismo temprano y el neo-lamarkismo se presentó en 1912. En este trabajo se comenta y discute esta tesis, así como unas pocas publicaciones neo-lamarckistas de importancia antropológica.

SUMMARY

Darwinism was championed in Portugal by the University and progressionist political parties from the 1860's on. Neo-Darwinism was neglected in its proper time and so the acceptance of the inheritance of acquired characters continued over the first decades of the 20th century. Men of medical education who were professors of Biology at the University of Oporto supported neo-Lamarckian theories in early 20th century. The first one has been Américo Pires de Lima (1886-1966), professor of Botany, whose doctoral dissertation sustaining early Darwinism and neo-Lamarckism was presented in 1912. This thesis, as well as a few neo-Lamarckian publications with antropological significance, are commented and discussed in the present paper.

INTRODUCTION

Between the 1860s and the second decade of the twentieth century, dissertations on evolutionism[1] were a dominant feature of admissions procedures for lecturerships in Biology at Portuguese universities. It should be remarked that, with some exceptions during the period, such dissertations did not impose any requirement as to original research. They were almost invariably limited to critical studies in which the

[1] ALMAÇA, C. (1993). *Evolutionism in Portugal,* Lisboa, Museu Bocage, p.26; ALMAÇA, C. (1997), «Early evolutionism in Portugal», *Publicaçóes Avulsas,* 2ª. série, 1, 5-22, p. 5.

candidate was expected to demonstrate that he had up-to-date knowledge and a thorough understanding of the theories and experimental work covered by the chosen or set theme, in the hope that this would produce the best outcome.

The physician Américo Pires de Lima[2] chose 'The evolution of transformism' as the subject of his dissertation[3] in the competition for the post of assistant in Biological Sciences at the Faculty of Sciences of the University of Oporto. He presented it in 1912 and, when the admission examinations were postponed, added an appendix entitled, 'A study of Mendelism, with particular reference to its application to Man'. Pires de Lima had already recognised, though not elaborated on, the interaction between Mendelism and evolutionism. So, in a footnote[4] to the 'Appendix' he wrote: «I therefore availed myself of the opportunity [the postponement of the admission examinations] to develop this interesting and much-debated chapter in biology which was only touched on in the course of this work».

In the preface, Pires de Lima explains his intention to seek to «give simply a general idea of the various stages through which this theory [transformism] has passed over time … [mapping out] the wide highway of truth, disregarding the thousand dead ends and the thousand secondary, twisting paths that the learned have explored and still explore, in an insatiable urge to arrive at the truth». His presentation of the various evolutionary theories follows a chronological order and the dissertation ends with a chapter of conclusions in which Pires de Lima sets out his own ideas on evolution and its progress.

It is interesting to observe how a physician at the beginning of the century, already cognisant of the basic theories of evolution, comments on and evaluates them, and how he incorporates them into a unifying vision of nature. It is his path, constantly set against the science of his time, which I propose to follow, comment on and discuss in this article.

SPECIES TRANSFORM INTO OTHER SPECIES

This is the basic problem of evolutionism. Species do not owe their individual creation to God, wrote Lamarck. God created a natural order, which in turn gave rise

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[2] Américo Pires de Lima (1886-1966) graduated in Medicine in 1911. Assistant of the Faculty of Sciences of the University of Oporto in 1913. Full professor of Botany in the same Faculty in 1921. Integrated in the Expedition to Mozambique (1916) as a military doctor, during his mission in this Portuguese colony, Pires de Lima collected biological specimens and accomplished anthropological studies. From 1935 to 1956, date of his retirement, Pires de Lima headed the Botanical Institute of the University of Oporto and founded the Botanical Garden. Author of a large and varied bibliography, his papers on the Portuguese naturalists of the l8th century are well known.

[3] PIRES DE LIMA, A. (1912), *A evoluçáo do transformismo,* Porto, Enciclopédia Portuguesa.

[4] *Ibidem*, p. 117.

to all we see about us[5]. Are there lost or exterminated species, despite all the natural processes that ensure their perpetuation? Is it not possible that the fossil lineages we consider extinct are, in fact, still represented today, but by species that have changed? If so, the issue of so-called lost species would be an erroneous one[6].

Lamarckism is rooted in this view, offering, as might be expected, an explanation for the causality of change. He named the process by which successive changes result in a chain of differing species 'transformation', and the theory substantiating it 'transformism'. Because other methods of species formation, especially the one that appears to be most common (multiplication) were not proposed for many years, transformism and evolutionism were regarded as synonymous by many authors.

However, the gradual transformation suggested by the fossil mollusc series, and to which Lamarckian causality was applied, encountered an insurmountable obstacle in the concept of the species which held sway at the time. If the species is defined by its essential characteristics, and if these are constant, how then to explain that some essential characteristics gradually give way to other, equally essential ones?

Lamarck extracted himself easily from this difficulty because he was not an essentialist. Rather, he regarded himself as a nominalist, as had Buffon at certain stages of his career[7], though he conferred on the 'species' a specific supra-individual status, which orthodox nominalists denied. According to Lamarck, taxonomic categories, including the constant species, are abstractions, and individuals[8] are the only reality: «… nature did not in reality create classes, nor orders, nor families, nor genera, nor constant species, but only individuals that succeed one another and resemble those that produced them». He asserted that a species only remained constant while the circumstances affecting all its individual members remained constant, and that some of these individuals, in changing, formed races which grade with individuals of neighbouring species[9]. Lamarck's concept of the 'species', very advanced for his time, was the only one that sought to justify evolution through transformation.

Pires de Lima understood this clearly - hence the emphasis which he places on the issue of the 'species' from the very beginning of his treatment of Lamarckism. His critique of the Lamarckian concept of the species is taken too far, however, perhaps because he felt the boundaries were ill-defined (because of Lamarck's recognition of intra-species variability). He has no hesitation in classing it as 'conventional', forget-

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5 LAMARCK, J.B.P.A. (1809), *Philosophie zoologique*. Reprinted in 1994 by Flammarion, Paris.

6 LAMARCK (1994), p. 114.

7 Buffon' species concept changed with time. Nominalist in the first phases, Buffon became essentialist in his last period. Compare Buffon' species definitions in volumes 1 (p.38), 2 (p.437) and 4 (pp. 384-385) with those in volumes 4 (pp. 386 and 389) and 13 (p. l) of his *Histoire naturelle*.

8 LAMARCK (1994), p. 79.

9 *Ibidem*, p. 101.

ting that even more conventional was the essentialist concept which ignored a constant of nature - variability[10].

From the Lamarckian interpretation of 'lost species', Pires de Lima derived the idea of evolution operating exclusively by means of the transformation of species, and the universality of transformism as an evolutionary theory. He demonstrates his critical ability by commenting extensively on Lamarck's sensible theories on the conservation of the biological equilibrium[11], which in general received little attention. He presents well-founded arguments to discredit spontaneous generation[12], which Lamarck considered common in 'less perfect animals', to the point of demonstrating the sequencing of this form of the generation of life[13]. Finally, he comments on the laws of use and disuse and of the inheritance of acquired characteristics, following Lamarck's examples. He criticises Lamarckian causality, which he regards as trivial, rightly emphasising, however, that Lamarck invariably attributed transformation in living beings to alteration in their circumstances and never to an alleged will to respond to the requirements imposed by those conditions.

The increasingly complexity of the animal series also provoked complete agreement from Pires de Lima. He does not mention, however, the principle on which Lamarck based it, which was a basic and essential aspect of Lamarckism, often overshadowed by a deceptive concentration on use and disuse. In the absence of this principle, Lamarckian evolution would not pursue, as its author intended, a direction of growing complexity. It would instead be erratic, reflecting external conditions. Lamarck understood this well and so predicated everything on a plan by nature which would tend to make organisation continually ever more complex. It was the interaction of external conditions with this intrinsic tendency of life that would determine growing complexity —because this tendency is more powerful than everything else— but it would be irregular because conditions could, to a certain extent, work against it[14]. This would explain why the principal groups of the Animal Kingdom can be arranged in order of growing complexity but, within themselves, show examples of structures widely differentiated from one another (for example, Molluscs, Acephala and Cephalopods).

Finally, Pires de Lima evinces great admiration for Lamarck's original genius, while recognising that, at the time, scientifically testable mechanisms for proving Lamarckian causality were still unknown.

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10 PIRES DE LIMA (1912), p. 11.
11 LAMARCK (1994), p. 101.
12 PIRES DE LIMA (1912), pp. 15-16.
13 LAMARCK (1994), p. 316.
14 *Ibidem*, p. 153.

TRANSFORMING NATURAL SELECTION: UP TO WHAT POINT?

Darwin resurrected the idea of the non-fixity of species, contrasting it with the existence of variability and asserting that natural selection is the principal, but not exclusive, process at work in modification.

While accepting the idea of gradual evolution, like Lamarck, he was similarly confronted with the insurmountable obstacle of the typological-essentialist view of the species which still reigned at the time. He therefore went to some lengths to demonstrate that the boundaries between the 'species' and the 'variety' are vague and tenuous, and that not even the sterility of hybrids constitutes a credible genetic criterion for distinguishing varieties from species. If it were so, how then to explain the many wild species that do not reproduce when males and females are kept in captivity, while widely differentiated domesticated varieties do so easily, and produce fertile hybrids?

With reproductive isolation discredited as a differentiating criterion for the 'species' or 'variety', it was necessary to emphasise the role of variability, in other words the opposite of fixity of species. But what caused variability? Darwin explains[15]: «Variability is governed by many unknown laws, more especially by that of correlation of growth. Something may be attributed to the direct action of the conditions of life. Something must be attributed to use and disuse. The final result is thus rendered infinitely complex …» Thus, habit, use and disuse, and correlative variation allow man to create widely differentiated races by means of methodical cross-breeding (artificial selection).

From this point, Darwin sets off in the direction of natural selection. However, in the absence of a premeditated plan, what might be the cause of this selection? It is the finite nature of resources (in the widest sense of the word) which leads to the perpetuation of only some of the individuals of each species produced in each generation. Thus, in the struggle for existence, those individuals which possess some advantage, however slight, in relation to others will have a higher probability of surviving and leaving descendants. The disadvantageous variations will tend to disappear because of their inability to survive or because of the lower reproduction rate of their bearers. Darwin remarks[16]: «This preservation of favourable variations and the rejection of injurious variations, I call Natural Selection».

Pires de Lima emphasised, rightly, that Darwin had not presented natural selection as the cause of variability. Natural selection leads to the perpetuation of accidental useful variations, however small, nothing more. Pires de Lima doubts, however,

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15 DARWIN, Ch. (1859), *The origin of species.* Reprinted in 1981 by Penguin Books, Harmondsworth, p. 100.

16 DARWIN (1981), p. 131.

that the slowness of this process could explain progressive evolution[17]. If it is continuous, slow and gradual, how then to explain the absence of links between successive species? Darwin took refuge in the incompleteness of the fossil record to explain this, using morphological and embryological characteristics to establish parentage.

To sum up, Pires de Lima draws the following basic points[18] from Darwinism: (1) there is no absolute distinction between species and varieties because species themselves begin as varieties of older species; (2) species exhibit variability (which Pires de Lima contrasts with 'immutability'), the causality of which is problematic; (3) natural selection, by perpetuating useful variations and eliminating prejudicial ones, transforms species into other, more perfect, ones; (4) thus, all species in a progressive succession have evolved from one or a few initial prototypes, while many others have meanwhile become extinct; (5) in consequence, natural classification should be exclusively based on genealogy, relating species more or less closely according to their parentage.

NEO-TRANSFORMISM: WITH OR WITHOUT THE INHERITANCE OF ACQUIRED CHARACTERISTICS?

After two decades of vigorous debate about evolution and its causes, a new direction was suggested, totally free of Lamarckian mechanisms. Weismann, rejecting the inheritance of acquired characters, demolished the role of use and disuse in evolution. By doing so, he severed early Darwinism from its Lamarckian component, which still persisted, albeit in a milder form. Darwinism thus became purely selectionist. Romanes[19] designated this new version of evolution 'neo-Darwinism' or 'Ultra-selectionism'.

Lamarckism, having by now been developed for close on a century, also changed, above all in divesting itself of the vague notion that an 'intrinsic tendency towards complexity' was inherent in living beings. At the time, there were various versions of Lamarckism, which were grouped together in 1884 under the name 'neo-Lamarckism', a school of thought which set itself up in opposition to neo-Darwinism.

Pires de Lima, clearly stating his conviction —shared, incidentally, by many biologists of his time— that gradual evolution is only possible through transformation of species, groups[20] the adherents of these various approaches under the title of 'neo-transformists'. Rejecting the somatic/germinal duality, Pires de Lima holds that somatic variations are necessarily hereditary, and calls on his clinical training to prove it.

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17 PIRES DE LIMA (1912), p. 17.
18 *Ibidem*, pp. 42-44.
19 ROMANES, G.J. (1895), *Darwin, and after Darwin*, London, Longmans, vol. 2, p. 12.
20 PIRES DE LIMA (1912), p. 49.

He refers to the case of identical twins brought up in different ways, resulting in adults who differ markedly in robustness. Pires de Lima has no doubt that their children will exhibit very different constitutions, manifesting the physical traits acquired from their respective parents. The distinction between genotype and phenotype was recent (1909) and clearly unknown to Pires de Lima.

In another example, he accepts that the children of the same parent - who is initially healthy but later tubercular - will have different physiques and that the children conceived during the latter period will be more vulnerable to the disease, even if unexposed to infection.

Pires de Lima leans, therefore, towards neo-Lamarckism, though he criticises the excesses of some of his fellow adherents. While he regards Le Dantec as representative of this school, he rejects what he claims is Le Dantec's reduction of biological phenomena to mere mechanics. According to Pires de Lima, the quantification of biological phenomena, being as complex as they are, confers on them a merely apparent simplicity[21].

In this chapter, Pires de Lima also discusses the role of embryology in evolutionism and ontogenetic recapitulation. He mentions[22] the line taken by Darwin on the subject: «Embryology rises greatly in interest, when we thus look at the embryo as a picture, more or less obscured, of the common parent-form of each great class of animals.» Pires de Lima turns to Fritz Müller and Haeckel, together with the latter's critics Hertwig and Vialleton, to excise from the law of recapitulation the exaggerations which Haeckel had conferred on it[23].

GRADUALISM OR SALTATIONISM?

Unfailingly transformist, whatever manner of the evolution of species he is discussing, Pires de Lima comments next on Mutationism. Attracted by the reasons advanced by De Vries for opposing gradualism —Lord Kelvin's estimate of time and the absence of intermediate species— Pires de Lima recognises in the experiments undertaken by the Dutch botanist an important contribution to clarifying evolutionary causation.

The totality of De Vries's reasoning is synthesised in Pires de Lima's dissertation. The earlier conflict —that of the species which, by being defined by its essential characters, was not able to change gradually— is now apparently resolved by ele-

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[21] *Ibidem*, p. 63. Pires de Lima was probably referring to Le Dantec's book, *Théorie nouvelle de la vie*, 3rd edition, 1904, Alcan, Paris. In this book, Le Dantec approaches different biological issues through physical and mathematical elementary processes.

[22] *Ibidem*, p. 41.

[23] DARWIN (1981), p. 428.

mentary species, the true units of evolution. Mutation - abrupt, hereditary and irreversible - is responsible for the appearance and perpetuation of elementary species. This would explain the appearance of new forms in a short space of time and the enormous known bio-diversity, as well as the absence of intermediate species. Natural selection would be limited to conferring some competitive advantage on certain species.

Professor Américo Pires de Lima at 67
Courtesy of Professor Roberto Salema

Pires de Lima also refers to the results of experiments with *Oenothera lamarckiana*, together with the laws which De Vries derived from these results[24]. As he ex-

[24] Pires de Lima follows the French translation (1908) of the well known De Vries' book, *Species and varieties*, 2nd edition.

plains, these laws settle the issue of evolutionary gradualism and the transmutation of species, the latter of which, in the explanation he offers[25], can be seen to be true evolutionary transformation. Pires de Lima also comments on De Vries's typological definition of a regressive variety (loss of a characteristic of the original form) and an elementary species (with characteristics lacking in the original species), and on his distinction between fluctuation and mutation. He comments, too, on the myth of progressive perfection which, from a teleological perspective, would give significance to the appearance of variations.

Pires de Lima sees in Mutationism the collapse of neo-Darwinism, not foreseeing that, on the contrary, mutation as a source of aleatory variation would give redoubled force to neo-Darwinism. He criticises as unprovable a conclusion by De Vries whose results are reminiscent of present-day punctualism[26]: «Summing up, we may assert that species remain unchanged for indefinite periods, while at times they are in the alternative condition. Then at once they produce new forms often in large numbers … all facts point to the conclusion that these periods of stability and mutability alternate more or less regularly with one another».

Blaringhem, a mutationist, and Le Dantec, a neo-Lamarckist, are the authors whom Pires de Lima contrasts for a wider explanation of evolutionary causality. It appears to escape him, however, that Blaringhem includes both mutationism and Le Dantec's version of neo-Lamarckism in Lamarckian philosophy[27]. These developments are no more than «two separate parts of Lamarck's complex philosophy.» This was also the view of Giard, a noted neo-Lamarckist, who considered the theory of mutation as complementing Lamarckism and Darwinism. This complementarity, however, was based on the imprecise distinction Giard established between, on the one hand, gradual evolution and continuous variation, and on the other, saltationism and mutation[28].

THE SYNTHESIS

Neo-Lamarckian theories bring together a heterogeneous group of ideas, all of which share two basic elements[29]: (a) the inheritance of acquired characters, and (b) vertical evolution consisting of progressive adaptation. In comparison with early Lamarckism, neo-Lamarckian theories had lost the finalist component - the 'intrinsic tendency towards perfection' which Lamarck thought provided the impulse for all living matter.

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25 PIRES DE LIMA (1912), p. 87.

26 DE VRIES, H. (1912), *Species and varieties*, 3rd edition, Chicago, The Open Court, p. 699.

27 BLARINGHEM, L. (1911), *Les transformations brusques des êtres vivants*, Paris, Flammarion, p. 324.

28 *Ibidem*, p. 329.

29 MAYR, E. (1982), *The growth of biological thought*, Cambridge, Massachusets, Belknap/Harvard, pp. 526-527.

To conclude his dissertation, Pires de Lima proposes a synthesis of evolutionary causalities. This confirms once again the author's neo-Lamarckian leanings. Pires de Lima combines early Darwinism, which, it will be remembered, includes Lamarckian causalities, with mutation, the experimental proof of which as a source of variation had attracted him. He had already accepted the inheritance of acquired characters, justifying it on the basis of his own clinical experience[30].

In adopting early Darwinism, Pires de Lima automatically accepts natural selection as an evolutionary factor. However, what kind of selection and what kind of evolutionary efficiency? These and other issues are briefly discussed below.

DISCUSSION

Pires de Lima's thesis brings to an end a series of dissertations on evolutionism which the higher education institutions of the time (Escola Politécnica de Lisboa, Universidade de Coimbra and Academia Politécnica do Porto) had been debating since the 1860s. It is interesting that it includes Mutationism, which had been gaining adherents since the beginning of the twentieth century. Where facts are concerned, the dissertation contains nothing new. In terms of theories, it ends with a curious synthesis - one of several that fall within the scope of neo-Lamarckism. Nevertheless, it is a work of considerable interest to the history of science, representing as it does the perspective of someone with a biological education and more or less up-to-date knowledge involved in the controversial and intensely-debated theorising that was taking place in the 1910s.

The influence of the French schools on the author is noticeable. Besides, French thinking had a strong influence in Portuguese scientific circles up to the Second World War. Impelled by his education and medical and biological experience towards neo-Lamarckism, Pires de Lima was a pioneer of this movement in Portugal. His leanings, as will be seen later, paid off. Now, however, for the other issues raised by his thesis.

The obsession with transformism

The title of Pires de Lima's dissertation —'The evolution of transformism'— is pregnant with meaning, a promise which is amply repaid in the course of the work. In this interpretation, evolution would be solely vertical, occurring by the slow and gradual adaptive transformation of species. It is a tribute to early Lamarckism, since

[30] PIRES DE LIMA (1912), p. 76.

Lamarck himself referred explicitly to the formation of new species through the transformation of previously existing ones[31]. Moreover, the entire section which Lamarck entitled 'On so-called lost species' suggests that the author did not believe in the extinction of species; they have not disappeared, but been transformed[32].

This concept was not abandoned by prominent evolutionists until quite late[33], despite the fact that the concept of the multiplication of species (horizontal evolution) had progressively gained ground since Darwin, who was categorical about this evolutionary process. Le Dantec, who noticeably influenced Pires de Lima, to judge by the latter's repeated citations of the author, chose to call Darwinism[34] 'variation transformism', in contrast to Lamarckism, which he named 'adaptation transformism'.

Pires de Lima does not take into account the gradualness and slowness that characterise the process of transformation of species, factors which cannot be omitted from a transformist theory. He gives this designation also to mutationism, denying this saltationist process of species formation the title of transmutation «… because the parent species continues to live unaltered alongside the offspring species …» According to Pires de Lima, 'transmutation' only occurs if the whole of the parent-species gives rise to a different species[35].

Innovative natural selection?

Natural selection is the touchstone of evolutionary theories. A negative selection, or one that adjusts for small environmental variations - that was all very well. But creative selection, operating by means of differential reproduction, was too much for non-Darwinian theories. Lined up against the latter concept were the neo-Lamarckians, mutationists, Mendelians and other early twentieth century evolutionists.

Let me give some examples. Giard wrote[36]: «Selection creates nothing: choosing is not inventing …» And Cuénot[37]: «Selection is purely conservative, not creative … it eliminates the sickly, but maintains the average state, it is not creative …» And later[38]:

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31 LAMARCK (1994), p. 106.

32 *Ibidem*, pp. 114-117.

33 See, for example, CUÉNOT, L. (1932), *La genèse des espèces animales*, Paris, Alcan, 3rd edition; CAULLERY, M. (1931), *Le problème de l'évolution*, Paris, Payot.

34 LE DANTEC, F. (1910), *La crise du transformisme*, Paris, Alcan.

35 PIRES DE LIMA (1912), p. 76.

36 GIARD, A. (1905), «L'évolution dans les Sciences Biologique», *Revue Scientifique*, 3è série, 4, 193-205.

37 CUÉNOT, L. (1901), «L'évolution des théories transformistes», *Revue Générale des Sciences Pures et Appliquées*, 12, 264-269.

38 CUÉNOT, L. (1908), «Les idées nouvelles sur l'origine des espèces par mutation», *Revue Générale des Sciences Pures et Appliquées*, 19, 860-871.

«Selection guides species, destroying unfit species and individuals … but it is mutation that makes them…» Caullery peremptorily declares[39]: «Selection creates nothing».

De Vries was more explicit[40]: «It [natural selection] is the sifting out of all organisms of minor worth through the struggle for life. It is only a sieve, and not a force of nature, not a direct cause of improvement … it is only a sieve, which decides what is to live, and what is to die.» Morgan attributed little importance to selection, even if it created in a mechanistic way[41]: «… if it were true that selection of an individual of a certain kind determines that new varieties in the same direction occur as a consequence of the selection, then selection would certainly be creative … this possibility is disposed of by the fact that there is no evidence that selection determines the direction in which variation occurs … if you mean by a creative process that by picking out a certain kind of individual and multiplying its numbers a better chance is furnished that a certain end result will be obtained, such a process may be said creative».

Amongst these authors as a whole, there was a basic ambiguity in that they confused persistent mutations with new species, even when reduced to 'elementary species'. From this typological perspective, only mutation is creative, since it is seen to produce a new ‘species’. However, had they paid attention to the speciation of islands, as described by Darwin, they would have realised that natural selection can, in fact, be innovative. Emerging colonisers from the same parent species, populating different islands and driven by different selective pressures, will, over time, give rise to distinct species. The genetic variability that the colonisers carry with them, the mutations that occur in them and in their descendants, and the recombination of genes in successive generations are filtered by the particular environments of each island. This is what natural selection is. Its outcome is creative, because new and different 'types' of organisms result from the process.

Strangely, Pires de Lima does not deny the creative role of natural selection, not even when he is dismissively and sarcastically decrying Weismann's work. However, he is of the opinion that this process would be excessively slow, requiring an immeasurable length of time to produce very complex structures such as the mammalian brain from extremely simple initial species. Apart from this, continuous and gradual evolution operating by natural selection would leave numerous intermediate states which were unknown in reality. He accepts, however, the Darwinian argument that the incompleteness of the paleontological record help to explain this lack of knowledge.

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39 CAULLERY (1931), p. 291

40 DE VRIES (1912), pp. 6-7.

41 MORGAN, T.H. (1916), *A critique of the theorie of evolution*, Princeton, Princeton University Press, pp. 192-193.

Neo-Lamarckism and human evolution

The attractiveness of neo-Lamarckism at the time when Pires de Lima was writing his thesis was not felt by him alone. Mendes Correia, one of his colleagues at the Faculty, and like him a physician, shortly afterwards described with obvious enthusiasm what he considered the study of Man owed to neo-Lamarckism[42]: «Neo-Lamarckism is not significant only for the excellent systematisation which it brings to general biology; it also provides anthropology with a criterion of the first order for determining some of its most important issues, especially those relating to the origin of Man, heredity, upbringing and eugenics».

Mendes Correia accepts that all of the transformist doctrines contain an element of truth «…but neo-Lamarckism is among those which most widely and clearly deal with the issue of evolution.» He based that conviction on two basic factors in the theory: (a) the affirmation of a reciprocal relationship between living beings and the environment, and (b) the explanation, by means of adaptation, of the appearance and perpetuation of variation, i.e. of the basic raw material of evolution. The same arguments served him to repudiate neo-Darwinism which, because it rejects the inheritance of acquired characteristics and the influence of environment on evolution, considers evolution «as resulting from innate variations or those pre-determined in the embryo and fixed by natural selection».

Misunderstandings about the nature and role of variation and about the influence of environment on evolution were common at the beginning of the twentieth century. For some evolutionists, like Mendes Correia, these served as a justification for adopting neo-Lamarckism. The following statement comes from the end of the chapter[43] on 'Transformism' in his Antropologia (1915): «Adaptation, the inheritance of acquired characteristics, the influence of environment and diet - these are the terms from the Lamarckian vocabulary that should be constantly in the forefront of the minds of those who study the evolution of Man and the human races, and who aim to perfect it».

The force of his neo-Lamarckian convictions was to abate, however, in the (short) time that elapsed before the publication of his book, Homo, in 1921. In its second chapter[44] —'Evolution'— discussing and synthesising the numerous evolutionary hypotheses that had been put forward in the meanwhile, he reveals himself still opposed to neo-Darwinism, once again as a result of a misconception - that of a claimed paradox between selection and adaptation. His earlier enthusiasm has faded, however, and he no longer asserts that neo-Lamarckism is indispensable to the proper interpretation of human evolution.

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42 MENDES CORREIA, A.A. (1915), *Antropologia*, Porto, Imprensa Portugesa, p. 69.

43 *Ibidem*, pp. 57-69.

44 MENDES CORREIA, A.A. (1921), *Homo*, Porto, Lumen, pp. 47-86.

And that was where neo-Lamarckism came to rest in Portugal. The great development of population genetics and its role in the evolutionary synthesis, which was built up during the 1930s, finally put paid to Lamarckian evolutionary causalities.

It is suggestive that the neo-Lamarckian cause was taken up by two physicians, although one of them, Pires de Lima, was oriented towards Botany, while the other, Mendes Correia, leaned towards Anthropology. It should be noted, however, to complete the picture, that Pires de Lima also involved himself in anthropological studies while in Mozambique. The justification for their advocacy can be found in the difficulty of rigorously distinguishing in Man - whether from an anthropological or clinical perspective - which form of heredity was the more significant in each case, the biological or the cultural. The clinical examples cited by Pires de Lima reveal his inability to make the distinction, as do those of Mendes Correia when he links the inheritance of acquired characteristics to upbringing and diet.