

Third Misconceptions Seminar Proceedings (1993)

Paper Title: MISCONCEPTIONS OR SOCIAL
RECONCEPTUALIZATIONS? - the case of evolutionary biology
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In this paper I focused on the ways some key-concepts have been treated, trying to show that knowledge has been shaped by extra-scientific factors.

Following the tendency of seeing chronologies of the development of scientific knowledge as "myths of rationalism" (Wertsch), I have called the constellations of these myths *social reconceptualizations*, which would occur in different levels, in a hierarchical way.

Students at high-school level have contact with several of these "myths", which could possibly account for some of the traditional misconceptions that have been recurrently reported.

Keywords:
General School Subject:
Specific School Subject:
Students:

Macintosh File Name: Bizzo - Evolutionary Biology
Release Date: 12-15-1993 C, 11-4-1994 I

Publisher: Misconceptions Trust
Publisher Location: Ithaca, NY
Volume Name: The Proceedings of the Third International Seminar on
Misconceptions and Educational Strategies in Science and Mathematics
Publication Year: 1993
Conference Date: August 1-4, 1993
Contact Information (correct as of 12-23-2010):
Web: www.mlrg.org
Email: info@mlrg.org

A Correct Reference Format: Author, Paper Title in The Proceedings of the
Third International Seminar on Misconceptions and Educational
Strategies in Science and Mathematics, Misconceptions Trust: Ithaca,
NY (1993).

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MISCONCEPTIONS OR *SOCIAL RECONCEPTUALIZATIONS*?

THE CASE OF EVOLUTIONARY BIOLOGY

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ABSTRACT

I have tried to understand the ways in which evolutionary knowledge has changed on its way from Down House, the home of Charles Darwin, to its presentation to Brazilian high-school students. Adopting a socio-cultural perspective, attention was given to several different ways Charles Darwin's theories have been re-interpreted by well known scholars and offered to the public. I have analyzed the approaches taken by Emanuel Radl (1873-1942), John C. Greene, Robert Maxwell Young and Ernst Mayr, to assess the diverse ways darwinism has been conceived. I have then assessed the presentation of this controversial knowledge to the public in two major popular books written by respected scientists, Julian Huxley and Kettlewell's "Darwin and His World" and Richard Dawkins' more recent "The Blind Watchmaker".

In this paper I focused on the ways some key-concepts have been treated, trying to show that knowledge has been shaped by extra-scientific factors.

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Students at high-school level have contact with several of these "myths", which could possibly account for some of the traditional misconceptions that have been recurrently reported.

I-COMPETING SCHOLARS: FOUR DIFFERENT PERSPECTIVES

When a Biology teacher faces the task of teaching Evolution at the high school level, it is not likely that *Origin of Species* will be the first reading in the course. Accordingly, it is not reasonable to think that any of Darwin's books will be suggested as students' readings. The striking point, however, is that this possible option would probably bring a great deal of trouble to the teacher, because current Brazilian biology textbooks present a version of darwinism that can hardly match Darwin's own words.

The question is more complex than educators have admitted in the last few years. Some eminent biologists have produced excellent materials presenting evolutionary theories as a straightforward chain of statements and deductions (see Moore, 1984¹, for instance). Ernst Mayr, a celebrated evolution scholar concerning evolutionary thought, recently has acknowledged that reading Darwin's original books may be more difficult than expected:

*"On most any subject he dealt with - and this includes nearly all of his theories - he not infrequently reversed himself"*².

It is clear that the simple and apparently easy question "what is darwinism" admit different answers, depending on the parts one may select or stress.

It is naive to assume that one may come to know what Darwin would like to be known for by studying his works deeply. Despite the great number of books with the title "What Darwin Really Said", one could easily remember the first words written by Leonard Darwin, son of Charles, in a book intended to make his father's work worthwhile, when it was not unanimously accepted by scientist:

"Dedicated to the memory of

M Y F A T H E R

for if I had not believed that he would have wished me to give such help as I could towards making his life's work of service to mankind, I should never have been led to write this book.

To put Darwin's work in the context of service to mankind Leonard wrote "The Need For Eugenic Reform"³ at a time when Eugenics was in common use in United States as a guide to immigration policies and sterilization of criminals⁴. In chapter XXI, "The Elimination Of The Less Fit", he wrote:

*"If the race is now deteriorating because of the higher rate of multiplication of the less fit, and if, as it is certain, further efforts are continually being made to lower the death-rate of these inferior types, the rate at which this deterioration is taking place is probably increasing, and the need for action being taken is becoming more and more urgent."*⁵

The solutions would obviously be, in clear malthusian terms, compulsory "continence and contraception".

The following chapter was, as one might expect, "The Multiplication of the More Fit". Not only an increase in the birth rate of the "more fit" was advocated but also a differential reduction of the death rate, as to drive health care public services towards such part of population.⁶

Leonard Darwin's life work shows that neither academic recognition nor even first degree relationship provides authoritative arguments for a simple, and single, answer to the question of the meaning of darwinism. Different scholars have different interpretations of it. Many of them have tried to convince us that Darwin himself did not want to apply his theories to humans, or that the one who has tried to do so did not know Darwin enough, even if it was the case of a dear son.

Admittedly Darwin scholars are divided as to whether the theory was originally intended to include human beings or not in *Origin of Species*. The major trends in Darwin scholarship are that he "was convinced that natural selection had worked on man, but he decided not to say it explicitly - he intended to be silent on the topic of human evolution" (Cooke, 1990⁷) or that he decided to avoid the topic entirely when writing "Origin of Species" (see, for instance, Bowler, 1989⁸). Michael Ruse, another recognized scholar, is close to Peter Bowler's arguments, as the reasons why Darwin did not mention man in "Origin of Species" would be bound to pure speculative approaches (Ruse, 1992, personal communication).

It should be clear enough that Darwin's work is subject to different interpretations and we have to rely primarily on *first-hand* studies to have new accounts of it. These studies have as a starting point Darwin's own words, not only taken from his published books but also his notebooks, personal letters etc., which have been called generally "Darwin Papers".

Robert Maxwell Young was one of the authors we have included in our arbitrary sample of *first-hand* studies about darwinism. Young⁹ would agree that Leonard Darwin was quite right when he wrote the frontispiece of his book, as darwinism should not be divided into two different trends: one "clean-darwinism", applied to non-humans, and a "dark-darwinism", comprising non-authorized applications of the theory, especially to humans.

Young believes that a now dominant trend in Darwin studies focuses on particular details of the development of Darwin's work. These studies were promoted by publication of Darwin's early works, especially notebooks "M" and "N", Stauffer's *Natural Selection* and other manuscript materials. But Young remarks that these studies, "done mainly by biologists", ignore the wider social context of the nineteenth century. The result of this exclusion, Young says, was the construction of "myths of rationalism" (Wertsch) in the form of different "whiggisms"¹⁰.

"Primary whiggism" was called the tendency to present the past leading directly to the present, giving no notice of other issues of the time. It would also mean, according to Young, that scientists of the past do not hold clear views until they hold the views we remember them for. "Secondary

whiggism" would be the belief that the scientist's "immature" views lead only to his or her "mature" views.

Young proposes a "tertiary whiggism", which would ignore other scientists of the same period, and even a "quaternary whiggism" which would disregard the importance of the scientist's work to a debate considered old fashioned nowadays. He cites the contribution of darwinism to phrenology, something most Darwin scholars would rather not to be recalled upon.

One could propose an additional whiggism: the tendency to call the scientists' colleagues - or even sons - who defended the scientist's views as having been "unable to understand their master" simply because their opinions are no longer accepted. Darwin's "bulldog" is a typical example of a list that could include Leonard Darwin as well. Thomas Henry Huxley knew Darwin's work well enough as to clash with the Bishop of Oxford, Samuel Wilberforce, winning the day for darwinism, in an almost mythological happening. However, some scholars believe he was ignorant when defending the emancipation of the slaves in United States, arguing that our "prognathous relative" should be freed in order to compete with his "bigger-brained" and "smaller-jawed" rival, "in a contest which is to be carried on by thoughts and not by bites". With the end of slavery, the social ranking of Negroes would be determined by "Nature"¹¹.

Young offers the opinion that darwinism is a part of a wider theoretical framework, which could be called a "world view". Darwinism would have been constructed according to the ruling ideas of the social context in which it was conceived. Accordingly, there would not be something like a "social darwinism", the *dark version*, and a "non-social darwinism", the *clean version*. Darwinism would be social for the simple reason that science itself so would be.

Even within the same ideological trend there are divergences, and Young recounts the debate between Edward Thompson and Perry Anderson, when Thompson presented Darwin as an empiricist and inductive scientist, and Huxley as a political and ideologically tainted publicist. This case may well be used to prove that such alleged whiggism could also be found on left wing

perspectives. Not only first hand studies but all sorts of histories of biology - right or left wing ones- would be bound to interpret science with such bias.

The first comprehensive book on the *History of Biological Theories* was written, as far as I know, by Emanuel Radl at the beginning of this century¹², between 1905 and 1909. His views include, in Ernest Mayr's opinion, "plenty of prejudice against Darwin". The major "prejudice" seems to be Radl's weak attempt to adjust Darwin's theories to late twentieth century beliefs, not a very simple task at that time.

The reason for Radl's "failure" is quite evident. Writing in a time when Mendel was not yet a recognized "rediscovered scientist", and more than twenty years before any serious attempt to reach an evolutionary synthesis, Radl had on his hands a quite unfair theory. Furthermore, biology could hardly be recognized as a unified science. As Smocovitis (1992)¹³ has convincingly argued, the evolutionary synthesis of the 1930's signaled the unification of the biological sciences. This is why Radl's version is so interesting. He thinks he is speaking of a theory that was thought to be strong enough as to create a revolution in human understanding and even in religion, but, by that time, was not so appealing as it used to be in previous years. The "myth of rationalism" here had to deal with an unsuccessful theory, where the traditional approach of progress leading to the present were of no use.

Radl tries to show Darwin's philosophical roots and the influences he received from the ruling political and economic ideas of his time, when this approach to history was not classified as an intellectual crime by the then emerging internalists. Radl traces the way in which German naturalist philosophy was directed towards modern science, approaching the perspective of English utilitarians such as John Stuart Mill.

Radl tries to prove that Darwin's work not only was influenced by other sources of knowledge, but Darwin himself influenced fields wide ranging as astronomy, linguistics, pedagogy, criminology (Lombroso and phrenology were quite fashionable by then) and many other aspects of biology.

Without recognizing Mendel's work yet, Radl discusses extensively Darwin's theories of heredity, highlighting what could be the first distinctive feature among evolution scholars: Darwin did have a theory of heredity, and his theories of evolution relied on it.

A second distinctive feature among evolution scholars is that darwinism is not clearly identified as a scientific revolution, in the khunian sense of the term. Soon after the publication of Thomas Khun's famous book¹⁴, Darwin was at once appointed as the biological example of scientific revolutions, a model that was primarily based on physico-chemical sciences. When the controversy was still alive, this idea was seriously questioned.

John C. Greene, another scholar included in our sample, proposed that the development of Darwin's work in a narrow sense, or evolutionary biology in a broader sense, did not follow the stages and the sequence established by Kuhn. First, early attempts to construct a paradigm different from the static-divine were done during the Eighteenth Century, and did not result from any weakness or crisis of the ruling paradigm. Second, the non-cumulative nature of a scientific revolution is hardly evident in Darwin's case. Greene argues, on the one hand, that Linnæus, Jussieu, de Candolle, Cuvier and Agassiz represent a clear distinct scientific tradition, once their methods and working hypotheses were not followed by Darwin. On the other hand, the works of Buffon, Erasmus Darwin, Lamarck, Étienne Geoffroy St. Hilaire and Charles Lyell, were evident inspirations for Darwin. Another reason to question the label of kuhnian scientific revolution pointed out by Greene is that what can rightly be called an "evolutionary paradigm of biology" did not appear before 1930 and resulted from Darwin's work only in a limited sense. His subsidiary genetic theories, his views on the ways the environment could influence the reproductive organs, the *softness* of gemules, his views on *reversion* etc. were no longer relevant to the New Synthesis, proved to be wrong and were completely discarded. They appear in the period post-Synthesis in Lysenko's work, within a different framework¹⁵.

Greene also produced a brilliant overview of darwinian studies that deserves the special attention of those interested in first-hand scholarship (Greene, 1975).

The long way between original darwinism and what is now called neo-darwinism found a decisive shortcut with August Weismann's ideas as Fred Churchill called "a break from tradition" (Churchill, 1968; see also Churchill, 1979¹⁶). Weismann's ideas on reproduction and heredity were clearly contrary to Darwin's pangenetic ones. Reproduction, according to Weismann, would be part of a *continuum* in the species' evolutionary life, a conservative process aimed at perpetuating a small group of cells. The body - *soma* - would have a far less important role in evolution than what had been acknowledged to that point. In the then-prevailing conception, a new individual was something like a "black box", in which a mixture of existing characters as well as "silent travelers" of previous generations would meet, and because of unknown processes governed by unknown laws, only some of these characters would appear in the individual. The possible contribution to forthcoming generations could be seen on its own body.

Another scholar included in our sample is Ernst Mayr. In his philosophical and historical works he recurrently summarizes the right and now acceptable contributions of darwinism (see, for instance, Mayr, 1991, 1986 and 1982). He often recognizes, especially in his most recent publications, incorrect explanations that Darwin proposed for a variety of phenomena, even if he tries to justify those explanations with arguments based on "availability". In other words, in Mayr's perspective, Darwin did what could have been done at that time.

One of the extraordinary contributions of Mayr is that he is a permanent source of "fresh" information of the positive and sound ideas modern evolutionary thought owes to Darwin. Any new idea on the biological field is promptly referred to Darwin's original works, as to have new insights of it from an historical perspective. This is good news and bad news.

Good news because we have a source of revised theories, and excellent summaries of original contributions. Mayr's books provide excellent explanations of evolutionary processes.

The bad news is that we do not have a balanced account of the right and wrong contributions Darwin could possibly have given to modern

evolutionary thought. This one-sided approach creates striking situations, which have a very powerful repercussion on other authors, who write to the public. This bias affects evolutionary theories as well as the image of what a scientist is like is. The example below clarifies the point.

Mendel's work relied on the assumption that hereditary "factors" traveled unaltered through generations. This lack of plasticity in the hereditary material would be a decisive reason to make Mendel's work of no importance to Darwin. Mendel did know Darwin's "Origin of Species"; in fact he owned an issue of the third edition where the passages on variation are carefully underlined (de Beer, 1963¹⁷). Mendel's views were clearly anti-darwinian. He argued that crossing two organisms with seven characters would allow not less than 16,384 (4^7) different *combinations* (A, Aa, aA, a) and 2,187 (3^7) different *genetic constitutions* (A, Aa, a) Taking into account that seven characters is far too little even for small organisms - a reasonable number would be 3,000! - it is not difficult to understand why the idea of fitter individuals coming out of random processes could seem absurd. This may explain why the emergence of mendelism caused a prompt rejection of strict darwinian interpretations (see for instance Bowler, 1983¹⁸).

One who visits the Manuscripts Room at Cambridge University Library (UK) interested in looking for Darwin Papers will be handed a catalogue, organized by Peter Vorzimmer in the early 1960's. In the reprint collection, the one numbered 112 was written by Herman Hoffman and brings a revision of 159 studies on hybridization. Page 136 reports on the 1865 work of Mendel, and brings some annotations made by Darwin. He disputed some of the results reported by Hoffman, especially, and rightly, the ones on *Phaseolous multiflorus*, one of the genera on which Mendel had experimented together with sweet peas. He asked his son Francis to carry out some experiments to disprove Hoffman's conclusions.

These facts are quite well known to Darwin scholars in the last thirty years at least. However, the alleged fact that Darwin did whatever was possible at that time - the image of the infallible scientist - brings London fog to the picture of the Shropshire scientist Mayr draw. For as in a recent publication he restates that Mendel's work was "unknown to Darwin" and that "Darwin never heard of Mendel's work and was never able to solve the

problem."(Mayr, 1991¹⁹). This position descends, with no modification, from Bateson, who stated at the beginning of this century, that if Mendel's work had reached Darwin's hands the history of evolutionary philosophy would certainly have been different²⁰. Darwin is traditionally forgiven for not having taken Mendel's results into account but I have never seen the opposite argument. Mendel could be forgiven for not having taken Darwin's results into account as well. Both arguments are inaccurate, from the historical point of view, but there is a clear unbalance in favor of Darwin.

Another important feature in Darwin scholars' narratives is the *epistemological gap* that have been noticed by some scholars, such as Jon Hodge (1989), in the historiographical approach given to the subject. Biological theories seem to jump one hundred years, between 1837, when Darwin was having his first thoughts about natural selection, and 1937, when Dobzhansky published his famous *Genetics and the Origin of Species*. Hodge wrote that "Dobzhansky's text (...) is linked, through such direct and indirect sources as Muller, Wright and Weismann, to a historical succession descending from the published Darwin and, beyond him, the Darwin of the original zoonomical explanatory programme."(Hodge, 1989; about his zoonomical programme, see Hodge, 1982).

Theories of evolution together with heredity and reproduction are seen as having been developed independently, especially by Mayr, and resulting from distinct schools of thinking. As Hodge (1989) has pointed out:

"Mayr's treatment of evolution in relation to heredity in the century from Darwin to Dobzhansky is conditioned directly by the most fundamental distinctions he draws within biological thought itself. There are, Mayr holds, 'two biologies', evolutionary biology, the subject of his text, and physiological biology, a subject appropriate to a separate volume. Moreover, within evolutionary biology, Mayr distinguishes evolution as such from variation and its inheritance. Accordingly, Mayr takes us from Darwin to Dobzhansky under the heading evolution, postponing such heredity theorists as Francis Galton, August Weismann, Hugo De Vries and H. J. Muller for the section on variation and its inheritance, and keeping physiology for another occasion altogether."

This epistemological gap has a great influence on the narratives that other authors conceive, when writing books aimed at the public or at schools. Contributions of other scientists to the development of evolutionary thought do not appear as relevant to the establishment of what could rightly be called an "evolutionary paradigm".

It is interesting that the work of Lamarck is seen as having decisive importance to the conception of an evolutionary perspective of natural phenomena. Twenty years ago Mayr (1972) published an important work showing some of Lamarck's contributions in this regard. If Darwin did what was possible at his time, what could be said about the French *Chevalier* ?

It should be clear enough that the group of theories that have been called "darwinism" show great complexity and that different approaches result in different interpretations. The constellation of "myths of rationalism" that can be found in Darwin scholars' narratives would constitute our first level of *social reconceptualization* of evolutionary knowledge.

This complex scene of darwinian studies cannot reach classrooms directly, and one could argue reasonably that in fact it should not.

The following step towards the public and classrooms will be done by recognized scientists who will "translate" this complexity into simpler terms. As a result of a subsequent *social reconceptualization*, a different picture will emerge.

II-THE SURVIVAL OF FIT SCHOLARS: MATCHING AND MISMATCHING SOCIAL VALUES

Knowledge generated at the previous level of *social reconceptualization* cannot reach the public directly. Recognized scientists, however, do publish books for the general public and their possible impact on biology textbooks cannot be discarded.

I believe that another level of *social reconceptualization* of scientific knowledge is provided by recognized scientists who have tried to translate evolutionary biology for the lay public. Our arbitrary sample comprises two books that have influenced biology textbooks in Brazil and

probably in other countries as well, as they have been translated into other languages including Spanish and Portuguese.

Julian Huxley and H. Kettlewell's *Charles Darwin and his World*²¹ is a powerful example the conversion of darwinism for the public. The book shows the image of a scientist devoted to a single and glorious theory. There is no mention of Darwin's' views on heredity or reproduction.

It is worthwhile to give examples of some points that would not be taken seriously in the previous level of *social reconceptualization*.

One of them is Darwin's illness, presented as due to Chagas disease, which is caused by a protozoan (*Trypanossoma cruzi*) transmitted by an hemiptera insect. The chronology of Darwin's life in the book includes the exact date on which Darwin was supposedly infected by *benchugas* (*Triatoma infestans*) in Chile. The date is 26 March 1835, when his diary includes some annotation that Darwin and his colleagues had been serious bitten by those insects.

Even at that time this version of Darwin's illness was no longer accepted for two main reasons. First, the symptoms of his illness appeared before the voyage of the Beagle, and second, they do not correspond to those commonly seen in affected people. All available evidences suggest that it had no organic cause (see for instance Colp Jr., 1976, and Bowlby, 1990).

Huxley and Kettlewell indicate that *Origin of Species* was a best seller from the very first day it appeared in the book shops, giving the impression that people rushed to the shops in other to buy it. They wrote that it had been "bought up on the day of publication", supposedly 19 November 1859. All available evidence, certainly known to the authors, suggest a different picture, however. Morse Peckham (1959), wrote in the introduction of his "Variorum Text", an extraordinary piece of scholarship encompassing all editions of *Origin* Darwin had worked on, that this interpretation "**must be revised**"²². A brief account of the book appeared on 19 November (The Athenaeum, 1673, 19 Nov. 1859, pg. 659-660), it was sold to booksellers on 22 Nov., and, Peckham says, the public began to buy it on the 26th. It was oversold on the 22th as there were 1192 volumes available and 1500 were

bought. J. Murray had then to provide a reprint to deliver to the shops all that was sold. That is the reason why a new reprint was promptly ordered. Darwin's book, even with the overselling, corresponded to less than 8% of the books sold by J. Murray on 22 of Nov.²³.

The third edition had to wait 16 months (April 1861), and the fourth appeared six years later (December 1866). In the period, the mean number of books sold correspond to less than one thousand per year, a modest amount even for that time. This time frame lend support to Peckham's conclusion that the sales figures of *Origin* requires re-examination. Unfortunately, this poor performance as a best seller appeared in Huxley and Kettlewell's words as:

"The first edition of 1250 copies at fifteen shillings was bought up on the day of publication. A second edition was published six weeks later, and from then on a stream of new and revised editions had to be prepared, and continued to sell"²⁴ .

Another example of how reconceptualization could be provided by the "*Karl Marx-Darwin affair*". Huxley's and Kettlewell's black and white book becomes colorful when describing the relations between the two great thinkers. It is said that Marx *venerated* Darwin and wanted to dedicate the English translation of *Das Kapital* to him, an offer Darwin would have educatedly declined.

The only evidence for this version is a letter dated 13 October 1880 where the author is about to publish a book and wants Darwin's opinion about it. The handwriting does not correspond to Marx's, the book is not named, and the second page of the letter is missing, so there is no reference to the author. The letter in which Darwin declined the offer contains no reference of who it was sent to.

At least two questions may arise: if Darwin's response located why is the name of the corresponding author missing? Similarly, why is the second page of the unknown author's letter missing? These unanswered questions led some to speculate that the letters could not be authentic, but there is no sound evidence to support this speculation(see Freuer, 1975²⁵, and the answer in

Colp Jr,1976²⁶). It is admitted that the letter was sent by Edward Aveling and the book was "The Student's Darwin" (Fay, 1979)²⁷.

This question is not simply a particular detail, but has to be remembered that it was written in the context of Cold War, when it was advocated. It clearly has a deep symbolic meaning. This allegory migrated to biology textbooks throughout the world, in an event which deserves further research in the future from a sociological point of view. It certainly gave students throughout the world a good idea of what political prudence was in a certain ideological perspective.

The colorful picture of the English naturalist that Huxley's and Kettlewell's book hopes to draw is presented with rather insubstantial justification. In an incursion into geology, Darwin would have been misdriven by the parallel roads of Glen Roy, in Scotland. Concluding that they were marks of the sea in early times he would have committed one of the few mistakes of his life.

"Never again would he draw conclusions before testing them against a vast body of facts collected for this very purpose."²⁸.

That would be the reason why he was scientifically - and politically - correct. His method of solving problems would not fail in the future.

This trend of presenting Darwin's work was not abandoned up to nowadays. On the contrary, clear pictures are still being conceived bearing this image of what a scientist - and science itself - is like.

My arbitrary sample of this level of social reconceptualization includes the more recent Richard Dawkin's book, "The Blind Watchmaker"²⁹. I would like to emphasize two aspects of the book: the image of the power of natural selection and the political implications of Darwin's work.

Following a long tradition, Darwin's natural selection is presented as a powerful mechanism, which could account for all known evolutionary phenomena.

Dawkins construct a metaphor as beautiful and elegant as limited to many evolutionary biologists. In a dialogue with Polonius, Hamlet says "Methinks it is like a weasel". Then, Dawkins argues that the possibility of fingering randomly on a typewriter would bring a very slight possibility of reconstructing the verse, with the 28 exact characters. Supposing it is a simple keyboard (and not that of a computer or of a Chinese typewriter), the possibility would be something like $1/27^{28}$, or, in "simpler" terms 1 possibility in 10,000 million million million million million. This would be too much for one step selection, but, to cut a long story short, it would be nothing for cumulative selection.

Beginning with any combination of 28 different characters and replicating them, as new "generations", selection would retain the "good" characters and rigidly destroy the "bad" ones, producing the phrase after 43 "generations".

Dawkins recognizes that the comparison cannot be taken literally, but, unfortunately, he ends by saying:

"As a matter of fact that is exactly what happened on this planet, and we ourselves are among the most recent, if not the strangest and most wonderful, of those consequences."³⁰

Dawkins' computer does four simultaneous tasks. The first is to keep the "good" characters unaltered - they are no longer subject to mutation or the like. The second is to destroy rigidly all "bad" ones in every generation. The third is to provide "fresh" material for all positions, in every "generation". Here he seems to refer solely to genic mutation. The fourth is perhaps the most important, as he needs just one individual for the journey through generations. The final image of what *adaptation* is can only be seen as everything except a populational event.

By the end of Dawkins' book the reason for the overselling of natural selection becomes clear. Darwin and Lamarck will appear, now as "Doomed Rivals" in chapter 11. Not only Dawkins will win the day for natural selection but also for his own political positions or prejudices. Dawkins wants to convince the reader that belief in the evolutionary power of the

effects of use and disuse, combined with the consequent inheritance of acquired characters, are strictly anti-darwinian, in the sense that Darwin did not really trust them. Furthermore, he wants to convince people that this "*ridiculous*" theory of inheritance of acquired characters is the keystone of all left wing theorizing.

He writes:

*"many people either believe, or would like to believe, in the inheritance of the acquired characteristics. Until this century it was the dominant theory of heredity among serious biologists too. Darwin himself believed on it, but it was not part of his theory of evolution so his name is not linked with it in our minds."*³¹

This said, Dawkins now is free to say whatever he wants against the idea of the inheritance of acquired characters, which suddenly becomes synonymous with "lamarckism", including that it was part of the left-wing movement, especially in the former Soviet Union.

Lysenko appears in this part of the book as an anti-mendelian and *therefore* as an anti-darwinian. Lysenko, according to Dawkins would defend *lamarckian* and, therefore, left-wing positions. With the acknowledged defeat of the one, one may wonder what would probably happen to the other³².

This tendency of linking left-wing thought to Lamarckism - or rather to the belief on the inheritance of acquired characters - and capitalism to Darwinism was explicitly used by Edward Wilson and his Swedish co-author Lumsden, in "Genes, Mind and Culture" (1981), where they advocated the view that capitalism is rooted in sound evidence, like darwinism, whereas socialism, as lamarckism, is not.

It is interesting that this level of reconceptualization explicitly refuses to present Darwin as *having* a theory to explain heredity. The word *Pangensis*, does not appear even once in Dawkins' text. It is far from being unique to Dawkins' approach.

In a recent exposition in the British Museum (Natural History), in London³³, the work of Darwin was being shown in an historical chronology.

Darwin's argument was divided into nine steps. The eighth was *natural selection* and the sixth was *inheritance*. Between these two steps there was the one dedicated to *genetics*, but there was a warning: "**IF YOU WANT TO FOLLOW DARWIN'S ARGUMENT, CARRY STRAIGHT ON TO SECTION 8**". To reach the theory of natural selection Darwin did not base his arguments on any idea on genetics (or rather *pangenetics*).

Another distinctive feature in this level of social reconceptualization is that darwinism is clearly seen as a scientific revolution. Huxley and Kettlewell's introduction states that darwinism let Man discover, for the first time, "his place and role in Nature". Dawkins compares Darwin's work to that of Newton. There is a clear wish to state darwinism as a kuhnian scientific revolution. Scholars in the previous level of reconceptualization have doubted that it could really be the case. It is well possible that these authors have provided another example of revolution, which might be called a *Bolivian* scientific revolution.

III- Conclusion: Misconceptions or *Social Reconceptualizations*?

I have suggested to cluster different "myths of rationalism", regarding evolutionary knowledge, as social reconceptualizations, which are subject to different sorts of influences, including non-scientific matters. Furthermore, I have also suggested to regard the creation of these clusters as a hierarchical process, consisting of different levels.

The images of Darwin as a scientist and darwinism as a set of biological theories that result from the publications we have focused on are quite different in the two levels of social reconceptualization, "*bio-historical scholarship*" and "*vulgarization of evolutionary knowledge*".

The data available on students' conceptions on evolution often refers to *misconceptions* (see Deadman and Kelly, 1978, Brumby, 1983, Bishop and Anderson, 1990, Lawson and Thompson, 1988, Lawson and Worsnop, 1992, Bizzo, 1991, 1993). The question I would like to rise is: what is the "myth of rationalism" we have to choose as a *national standard*?

My suspicion is that not only strict scientific arguments will converge to this issue.

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Acknowledgments

I wish to express my gratitude to many people who have given a great deal of help in many senses. Special thanks to Edgar Jenkins, Roger Hartley, Pat Greenwood and all CBL staff at Leeds (UK). I am grateful to Joe McIneney, who patiently read an early version of this paper. Finance support was given by CAPES, University of Leeds (School of Education) and University of São Paulo (CCInt).

¹-Moore, J.A., 1984. Science as a Way of Knowing - Evolutionary Biology. *Am.Zool.*,24:467-534.

²-Mayr, E., 1991. *One Long Argument: Charles Darwin and the Genesis of Modern Evolutionary Thought*. Allen Lane, The Penguin Press.(pg 108)

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⁴-It should be pointed out that several states in America had legal instrument leading to the sterilization of criminals, as well as several types of idiots. The objective was to improve the profile of coming generations. The first states to approve such laws were Indiana (1887), California, Connecticut (1909), Iowa (1911), New York (1912), Michigan, Wisconsin and Kansas (1913), Nebraska, South Dakota, New Jersey and Oregon (1917). More than 1.000 sterilizations were made in Michigan (Domingues, 1929).

⁵-Darwin, L. op.cit, pg 388.

⁶-Darwin, L. op.cit, pg 391 and followings.

⁷-Cooke, K.J., 1990. Darwin on Man in the Origin of Species: As Addendum to the Bajema-Bowler Debate. *J.Hist.Biol.*, 23:517-521 (pg 521).

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⁹-see Young, Robert Maxwell, 1985-a. Darwinism IS social. IN D.Kohn (ed), *The Darwinian Heritage*, Princenton University Press, Princenton; and Young, R.M., 1985-b. *Darwin's Metaphor: Nature's Place in Victorian Culture*. Cambridge University Press, Cambridge.

¹⁰-The term seems to have first appeared in Herbert Butterfield's (1900-1979) "The Whig Interpretation of History" (1931) .See C.B.Wilde, 1981, "Whig History", IN W.F.Bynum, E.J.Browne, R.Porter (eds.), *Dictionary of the History of Science* (pg 445-6). Butterfileld wrote: (Whig history tends)"to emphasize certain principles of progress in the past and to produce a story which is the ratification if not the glorification of the present"; and Wilde "In its crudest form 'Whig' history of science, like its political counterpart, degenerates into a tale of heroes (those who advanced ideas in accord with the present state of scientific knowledge) and villains." (pg 445).

¹¹-Quotations taken from Young, R.M., 1985-a, pg 617, op.cit.They appeared originally in *The Reader*, 20 May 1865 in an article entitled "Emancipation - black and white" by T.H.Huxley.

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- ²³-I am based on the data presented by Peckham (1959).
- ²⁴-Huxley and Kettlewell, op.cit., page 74
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- ³⁰-Dawkins, 1988, op cit., page 49.
- ³¹-Dawkins, 1988, op cit., page 290 (italics ours).
- ³²-Dawkins, 1988, op cit., see pg 292 and fol.
- ³³-It was being help in September/1992