

The big issue between science and religion: purpose vs. uncertainty

Aldemaro Romero, Chair and Professor, Department of Biological Sciences, Arkansas State University

Abstract

The way scientists responded to evolutionary ideas can yield powerful insights into understanding the historical resistance against the idea of evolution by means of natural selection as understood in current neo-Darwinian thinking. From the beginning, evolutionists, including Darwin himself, struggled in trying to find an explanation for the loss of features during evolution, particularly the loss of eyes and pigmentation among many cave organisms. Although Darwin responded to this challenge by embracing the neo-Lamarckian ideas, most biologists, at least until the advent of the Modern Synthesis, strongly advocated directional evolution propelled by more or less mystical forces. Even today, many biospeleologists still employ jargon that epitomizes this view of evolution. Today's controversies surrounding the evolution-creation debate are not really about biblical literalism versus scientific evidence but rather on the disgust created in many quarters of viewing evolution as a materialistic, purposeless process.

Introduction

To understand the rejection by many to the idea of evolution by means of natural selection, I have chosen to examine the interpretations by scientists themselves to evolutionary phenomena that defy conventional Darwinian wisdom. To that end, I have chosen a phenomenon that Darwin himself found puzzling and that even late twentieth-century scientists had trouble dealing with: the explanation for the loss of phenotypic features (e.g., eyes and pigmentations) among cave animals.

Let me state from the onset that when I say "evolution by means of natural selection" I refer to a purely naturalistic explanation of changes in both genotype and phenotype, regardless of the fact that other mechanisms such as genetic drift may play in the process.

When it comes to the explanation of loss of features, particularly among cave organisms, many scientists since Darwin have embraced a number of mechanisms that regardless of their labels (e.g., Lamarckism, neo-Lamarckism, orthogenesis, vitalism), they all share two common threats: they are progressionist in nature (believing that evolution moves in a direction aiming at more complexity and/or "perfection") and they have in some degree a mystical component to them.

It is particularly interesting, for example, that despite the fact that Lamarck's evolutionary ideas preceded those of Darwin's for more than half

century, Lamarckism never encountered the resistance from the religious establishment as Darwinism did.

By the end of this paper, I hope I will convince you that what has driven this resistance against materialistic evolution is the deep belief among humans that there is a purpose in nature, ranging from subtle expressions in natural laws along the lines of natural theology to direct divine intervention in everyday life.

Early evolutionary ideas

Evolutionary ideas and their mystical interpretations predate the writings of the two most famous names in evolutionary biology: Lamarck and Darwin¹.

In fact, the first generation of Greek philosophers (ca. 600-550 BCE) came out with evolutionary interpretations that were quite naturalistic and materialistic. Thales of Miletus, Anaximander of Miletus, and Empedocles epitomize that generation by operating in an environment in which there was no belief on a single god, revealed truth, or dogmatic book. Probably influenced by Middle Eastern cultures, most of them believed that: (1) the creation of the world was the product of the forces of nature, (2) that there was no design, (3) that what happened was the result of necessity, and (4) in general, rejected supernatural explanations in favor of materialistic ones. An exception to that line of thought was Anaxagoras who believed that there was a plan in nature.

The second generation of Greek philosophers (ca. 550-400 BCE) epitomized by Pythagoras, Heraclitus, Alcmaeon, and Hippocrates continued that materialistic tradition that now included beliefs in the inheritance of acquired characters, the principle of use and disuse and spontaneous generation.

The third generation of Greek philosophers (ca. 400-322 BCE), however, had many representatives that took a turn towards idealism and progressionism. Plato, for example, believed in creation by supernatural powers while his student Aristotle founded teleology, that is, the doctrine of purposiveness in nature.

The advent of Christianity as the official religion of the Roman Empire meant the end to all rational thought regarding the workings of nature by using Christian beliefs to explain everything including the belief that all species were designed by God.

In Medieval Times (ca. 500-1450) explanations about the natural world developed in closed conjunction with Christian thought which was dominated by the concept of creation, that all the knowledge is in the “revealed” book and the birth of natural theology, i.e., that God exists because of the order and harmony of the world which requires an intelligent being. The eleventh century also saw the rise of scholasticism which further meant: (1) lack of freedom of

¹ This summary was based on Mayr, E. 1982 where the sources for this information can be found. Some other ideas on the history of evolution in general are from Romero 2001 and from an unpublished manuscript for a chapter of a book I am preparing on Cave Biology to be published by Cambridge University Press.

thought, (2) that truth was determined by logic, not observation, and (d) blind faith in the “Authorities” (such as Aristotle).

At that time other cultures had less of an issue with natural explanations of the world. The Chinese, for example, were more interested in the practical applications of science than on speculation. Islam, for its part, was sympathetic to science regardless of its origin: Greece, India or China. Muslim scholars were also more interested in practical pursuits and saw scientific discoveries (including evolution) as a confirmation of their religions tenants.

With the Renaissance some major changes took place. Facts like the discovery of species of plants and animals not mentioned in the Bible meant that such a book could not be taken as the sole source of the truth. That and the advances in observation of nature by using new instruments such as the telescope and the microscope and the experimentalism defended by Francis Bacon meant that knowledge could be acquired via personal experience not just by reading books.

With the advent of Modern Science (ca. 1650-1800) we see the how: (1) direct observation replaces scholasticism, (2) the first attempts are made to classify living being based on biological similarities, and (3) how the center of gravity of science moves from the Mediterranean to Northern Europe.

That does not mean that materialism replaced religious mysticism, but rather that teleological explanations using divine intervention were ideal to link religion and the new scientific observations. Everybody believed that species were fixed but, for example, when the nature of fossils was confirmed as extinct species, people asked if they were created by God, what their purpose was. Furthermore, how come some species such as parasites looked “imperfect” and if so, how they could be produced by divine designer?

Two divergent lines of thought: mystic Lamarckism and its derivatives and materialistic Darwinism

To see how scientists confronted a materialistic view of evolution versus a mystical one, we need to look at the way Lamarckism and its allies and the different brands of Darwinism confronted the issue of evolution of cave animals. This confrontation had numerous overtones, not only religious but also political and sociological ones.

Lamarckism and its derivatives

Nineteenth century biology first developed in France. By the time the first evolutionary ideas were articulated by French naturalists, there was a strong mystical view of history and society in that country. For example, Marie-Jean-Antoine-Nicolas de Caritat, marquis de Condorcet, used the idea of progress into virtually all of his historical interpretations and beliefs that humanity’s destiny was progressive perfection. This vision set the foundations for the

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positivism of the French philosophers August Comte and Marcel de Serres who saw life as a manifestation of progressive perfecting.

Within that intellectual environment, virtually all French naturalists² embraced some sort of “transformism” as evolution was known then. Paradigmatic of these points of view was Jean-Baptiste Lamarck who called himself a “naturalist-philosopher”. Although a naturalist by training, Lamarck relied heavily on speculations and metaphysics and used the classification of animals, particularly invertebrates, to sustain his view that nature was organized along clear lines of increasing progress toward complexity³.

Although some of Lamarck’s ideas (mostly wrong) were naturalistic such as: (1) “use and disuse”, (2) belief in spontaneous generation, and (3) that fossils represented species that had evolved into new ones, many more were mystical. They included: (1) the existence of a metaphysical “power of life” as the main mechanism leading toward increasing complexity and (2) that “needs” (*besoins*) created by a changing environment are experienced by a “sentiment interieur,” an unconscious reaction to external stimuli found in animals with central nervous system, able to direct “Vital Fluids” that promote changes in parts of the body and that those changes were inherited by the next generation⁴.

What about when complexity decreased as in the case of parasites? He proposed two possible explanations: (1) they were either a recent product of spontaneous generation (and therefore they had had no time to “progress” towards complexity) or (2) they lacked the “desire” to have such organs. He proposed that the lack of teeth in whales and eyes in subterranean moles were evidence of his ideas.

Although some of these explanations for evolutionary mechanisms were dismissed (and even ridiculed) by some of his contemporaries, he and his followers never faced any significant religious opposition. Somehow the Catholic Church never saw in these mystical ideas the threat that materialistic Darwinism would pose later in Protestant England and America.

Even Georges Cuvier, a creationist and an adversary of Lamarck, believed in “progression” in the succession of the geologic record. Other French naturalists took an even more mystical/religious position: Geoffroy Saint-Hillaire, a protégé of Lamarck, saw nature so logically aimed toward perfection that when he was forced to explain the origin of vestigial organs he interpreted them as “disgraces” of natural beauty. Similar tenants can be found in *Naturphilosophie*⁵.

² The only major exception was Georges Cuvier.

³ See (Burkhardt, R.W. 1977, p. 58 & fol.).

⁴ Lamarck’s ideas are often confusing, difficult to follow and even contradictory. Most of the ones cited here can be found in Lamarck, J.B. 1809, 1815.

⁵ This was a romantic philosophy that sought metaphysical correspondences and interconnections within the natural world. It was generated in early nineteenth century Germany by Friedrich Schelling and G.W.F. Hegel who were essentially idealists. This philosophical current was extremely popular among scientists particularly in Germany

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Even when Darwin's *Origin* was translated into French, it was colored with dramatic Lamarckian overtones. The translation, by the French feminist Clémence-August Royer, was done with the explicit intent of using Darwin's work as a confirmation of Lamarck's ideas⁶. She chose to translate Darwin's third edition of the *Origin* which was more Lamarckian than previous ones in the explanation of the loss of organs among cave organisms and added a preface and footnotes along the lines of "I told you so, Lamarck was right" and then changed the word "selection" for "election" giving the impression that in nature things did not occur by chance but by design.

If that was not enough she changed the title of Darwin's book to *De l'origine des espèces, ou Des lois de progrès chez les êtres organisés* (The origin of species, or the laws of progress among organized beings) giving the impression that Darwin emphasized the idea of progress, something for which he was ambiguous at best. Thus, Darwin's work was presented to the French public⁷ as a confirmation of Lamarck's mystical ideas about nature. No wonder French Catholics in particular and Catholics in general never expressed a strong, generalized anti-Darwinian sentiment since their version of Darwinism was a mystical one.

But was this it? Not really. When Louis Pasteur demonstrated that spontaneous generation was a fallacy in 1859, such scientific victory was seen as a victory of experimentalism over materialistic simplifications. Further, the political and military humiliation of the French by the Prussians during the 1870-1871 War, was seen by many as a confirmation of the Spencerian notion of "survival of the fittest" and therefore was rejected in France and supplanted by mysticism in the belief that France would continue to progress until achieving national grandeur. Therefore, the implication of natural selection as an ineludible law of nature was dismissed.

Post-Darwinian French biologists in general and biospeleologists in particular developed French neo-Lamarckism that emphasized two major features: progressionism and mysticism in the form of vitalism. The father of these neo-Lamarckian ideas in France was Henri Louis Bergson⁸. Bergson was a philosopher (among other things) familiar with the American neo-Lamarckism that we will discuss later. He championed the idea of and popularized the term

which at that time was one of the most important science centers of the world, this its influence. Contrary to experimentalist and observational science, it believed that spirit and/or mind were closely connected to the body.

⁶ See Harvey, J. 1999.

⁷ Because French was a major scientific language at that time, many scientists did not read Darwin's *Origin* until it had been translated into French. See Romero, A. 2006 for an example of that in Latin America.

⁸ See Bergson, H. 1907.

orthogenesis, the idea that evolution occurred along specific directions aiming at increasing complexity and perfection⁹.

Bergson was also an intense French patriot who dismissed the notion of natural selection not only because his abhorrence of the implication that Prussian victory over the French meant the survival of the fittest but also because it was materialistic. He proposed in 1907 the idea of the *élan vital* or vital impetus¹⁰. He used this term to refer to a characteristic of life that, according to him, always pushes life in the direction of complexity; that, for Bergson, was the mechanism of orthogenesis, which directed evolution from the domain of the divine into the natural world. Since Bergson could not find strong evidence supporting the inheritance of acquired characters, he thought that the *élan vital* was the mechanistic explanation for evolution.

For Bergson evolution was impregnated with finalism¹¹ and what made it possible was his mystical force, *élan vital*. Catholics found no problem with this interpretation because that mystical force could be synonymized with God's will and above all, it was not materialistic. Bergson, a Jew by birth, felt so close to the Catholic mysticism that he almost became a Catholic.

Others followed Bergson's path: the French Lucien Cuénot expanded Bergson's ideas by arguing that species succeed in a particular environment because they were "preadapted." The term he coined was *préadaptation*¹² and it served perfectly the aims of progressionists: species could succeed in new environments because they had been "programmed" to that end. And who else could have programmed those species but God?

At the beginning of the twentieth century virtually all speleologists were French or French educated and they all showed the philosophical influence of their compatriots. Such was the case of Édouard-Alfred Martel. He was known for his pioneer work in 1894 on the physiography and accessibility of caves, and he was who coined the term speleology (in both French and English) in the 1890s¹³. In 1895 he founded the *Société de Spéléologie* in France and later became a professor of subterranean geography at the Sorbonne (the first speleological academic post in the world). He is often called "the father of modern speleology" and his publication record includes more than 1,000 articles

⁹ This term was first proposed by Haacke (1893) while others used different terminologies to express the same thing: ortho-evolution (Plate, L. 1922, p. 11), nomogenesis (Berg, L.S. 1926, p. 8), aristogenesis (Osborn, H.F. 1933), and the omega principle (Teilhard de Chardin, P. 1955).

¹⁰ This term is so obscure that it is usually left untranslated; yet it is somewhat similar to Lamarck's "power of life".

¹¹ This idea also known as a teleologism was originated by Aristotle and is based on the idea that things have ends or purposes into themselves and that is why they happen..

¹² See Cuénot, L. 1911, vol. IV, p. 306)

¹³ See Martel 1894, 1896.

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and books on the subject. In 1904 Armand Viré, another Frenchman, coined the term biospeleology (*biospeleologie*)¹⁴.

However, the two figures that would ultimately consolidate biospeleology as a science and gave it many of the distinctive features that it has today were Emil G. Racovitza and René Gabriel Jeannel. Racovitza, a Rumanian-born, French-educated naturalist, started exploring caves in the Pyrenees in 1905 together with his protégé Jeannel. In 1920 Racovitza founded in Cluj, Romania, the world's first speleological institute. He was greatly influenced by the American neo-Lamarckians (see below) and had a great deal of distaste for natural selection.

Racovitza's two main publications dealing with biospeleological theory were his 1907 *Essai sur les probleme Biospeologiques* (Essays on biospeleological problems, published at the same time that Bergson was proposing his *élan vital*) and his little known 1929 *Evolutia si problemele ei* (*Evolution and its problems*) book. In those publications he clearly delineated his evolutionary thinking about cave organisms, which can be summarized as follows: (1) all cave organisms were "preadapted" to the cave environment, (2) lack of use made eyes disappear among cave animals, (3) natural selection is of little importance because natural variation is virtually non-existent, and (4) evolution is directional. Similar views were endorsed by his student Jeannel¹⁵, and these ideas continue to have a tremendous impact on biospeleologists all over the world as evidenced by the common usage among many of the them of the term "regressive evolution" when referring to the loss of eyes and pigmentation among cave animals.

Thus, the founders of biospeleology were not only progressionists in their views of evolution but also mystics when it came to explain its mechanisms. Thus, all these ideas were entirely compatible with Catholic mysticism and, therefore, the Catholic Church never had a major problem with evolution as presented by Catholic or neo-Catholic thinkers.

However, how things were going in Protestant England, Germany and the United States?

Enter Darwin

To understand Darwin's influence in the debate about the loss of eyes and pigmentation among cave animals, we need first to examine the state of biospeleological research in the U.S. before Darwin's ideas came into play. At the time of the publication of Darwin's first edition of *The Origin*¹⁶, biospeleological research in the U.S. mainly involved descriptions (both taxonomic and morphologic) of the species being collected at Mammoth Cave, Kentucky. This cave opened to tourism in the 1830s, and some of the wealthy

¹⁴ See Viré, A. 1904.

¹⁵ See Jeannel 1950, p. 7.

¹⁶ Darwin, C. 1859.

visitors from the east coast took specimens of its fauna back to scientists in New England. Thus beginning in the 1840's, numerous papers describing the fauna of Mammoth Cave were published, including the first description of a blind cave fish, *Amblyopsis spelaea*¹⁷.

Unlike papers describing species being found elsewhere, the reports on species from Mammoth Cave generated a lot of speculation about the origin of such fauna. Most of the discussions concerned the question of why these animals were blind and depigmented in the first place. Jeffries Wyman, for example, described *A. spelaea* as with "imperfect" eyes and proposed in a Lamarckian fashion that this "might be owing to a want of stimulus through a series of generations"¹⁸.

August Otto Theodor Tellkamp when studied *A. spelaea* concluded that "While it is true, in general, that all animals retain their essential form, and that no species passes over into another by transformation, we know that less material changes of form are produced by external influences such as changes in climate or food, lasting though many generations of the same species". Obviously he was not embracing evolution at the species level but rather temporal influences on development that led to the loss of eyes and pigmentations¹⁹.

To test this hypothesis Jean Louis Rodolphe Agassiz, America's most famous naturalist of his time and later a rabid anti-Darwinian, proposed a "Plan for an investigation of the embryology, anatomy and effect of light on the blind-fish of the Mammoth Cave, *Amblyopsis spelaeus*" which essentially called for raising these fish under both conditions of light and darkness with the hope that his creationist ideas will be vindicated²⁰.

Agassiz's ideas originated from his belief in *Naturphilosophie* and its idealistic view that all nature must be deducible from a single first principle which could be equated with the concept of God. Since pantheism is the principle that God is in nature everywhere, it is not difficult to understand why Agassiz believed in special creation, i.e., the direct intervention of God in the design and destiny of each species.

Thus, American thought about biospeleology at the time of Darwin's publication of the first edition of the *Origin* in 1859 was a mixture of creationist views and intriguing questions about environmental effects on development.

Darwin on cave biology

From Darwin's correspondence we know that one of the aspects that interested him the most about cave fauna was the question about the cause of the phenomenon of rudimentation or the loss of organs, i.e., the eyes among cave

¹⁷ This fish was described by James DeKay in 1842. For historical essays on this discovery see Romero, A. 2002a and Romero and Woodward, 2005.

¹⁸ See Wyman 1854, p. 19.

¹⁹ The original quote can be found in Tellkamp 1844, p. 393; see also Romero, 2002b.

²⁰ The original proposal is in Agassiz 1847, p. 180. See also Romero, 2001.

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animals. An analysis of Darwin's writings, including his notebooks and correspondence, shows that he saw this phenomenon as part of a larger compensatory-process issue, i.e., the enlargement of other sensory organs, regardless of whether compensation occurred among cave fauna or not. In other words he only saw a naturalistic explanation to this phenomenon.

He had also concluded that cave fauna had derived from eyed and pigmented forms found in areas surrounding caves. However, in his correspondence with American naturalists sympathetic to his ideas, Darwin was receiving messages related to the idea of progress.

In a letter from James Wright Dana dated 8 December 1856 about the cave fauna of Mammoth Cave, the American naturalist told Darwin, that progress was "a law which involves the expression of a type-idea in forms or groups of increasing diversity, and generally of higher elevation; always resulting in a purer & fuller exhibition of the type" and that "it is the simple before the complex"²¹. Here we can see how strong the idea of progressionism was in the minds of naturalists even before evolutionary ideas became a matter of discussion. Also, Darwin was reading in this account a message of order in nature, not necessarily an evolutionary one, but one confirming the idea of the Great Chain of Being already present in Plato's and Aristotle's writings. According to this account, nature is characterized by plenitude, continuity, and gradation. The universe is "full" of everything that is possible, in other words that the universe is composed of an infinite series of forms, each of which shares with its neighbor at least one attribute, and these elements in nature can be arranged in hierarchical order from the smallest, simplest type of existence to God himself.

At first Darwin considered the mechanisms of both natural selection and disuse to explain blindness and depigmentation as well as the enlargement of some sensory systems and appendages. To Darwin, this meant a "contest (...) between selection enlarging and disuse alone reducing these organs"²². He did not seem to make up his mind about which of the two mechanisms was the real one acting in this case.

By the third edition of *The Origin* Darwin de-emphasized the importance of natural selection by eliminating the speculation of a "contest" between selection and disuse. In fact, in the first two editions, in the paragraphs relative to cave animals and rudimentation, he used the words disuse and selection seven times each; by the third edition, it was five and two, respectively. Despite this use of a Lamarckian mechanism, Darwin never accepted any of the mystical portions of Lamarckism and his explanations were always naturalistic in what it was view as materialism in the more religious quarters, especially when he used the same arguments to explain human evolution.

²¹ Burkhardt and Smith 1990, p. 299-300.

²² Darwin, C. 1859, p. 296.

Thus, most of the attacks on Darwin's ideas were not against evolution as a phenomenon but its mechanism: natural selection which was viewed as a force without any purpose and whose result was the survival of the fittest without any plan or design and, therefore, godless.

Although Darwin was never explicit about progress, there is no question that he held a modified version of the Great Chain of Being of seeing nature ordered in a hierarchical way²³. This was a pre-Darwinian idea championed by the Swiss naturalist Charles Bonnet and the French Philosopher Jean-Baptiste Robinet who happened to endorse the idea of organic progress²⁴. Bonnet, in particular, articulated the idea of progressive development in 1770. Essentially he wrote that changes in earth conditions allowed for already existing forms of life to manifest higher levels of complexity. For Bonnet, the term "evolution" meant the unfolding of a providential plan to replenish the earth with life²⁵.

When Darwin avoided mentioning any purpose or plan, he was considered a heretic. Thus for his contemporaries the issue was not that he had proposed evolution (many had done so well before him without creating any major controversy) but that he saw the process as devoid of any spiritual connections.

The American neo-Lamarckism

The publication of Darwin's *Origin* in 1859 stimulated American naturalists not only intellectually but also sociologically. With the exception of Agassiz who dismissed the idea of transmutation of species altogether, the rest of the American naturalists participated in one form or another in the development of neo-Lamarckism in the United States.

One of the founders of American neo-Lamarckism was Alpheus Hyatt. Hyatt was a former student of Agassiz, visited Mammoth Cave in September 1859 and collected specimens of its fauna²⁶. Hyatt's evolutionary ideas were based on three tenants: (1) species have, as do individuals, an inevitable life cycle that includes decline as age advances, (2) for a species the preceding step before extinction is "degeneration" of the species (cave creatures with their lack of eyes and pigmentation epitomized to him this degeneration), and (3) species "transmutation" is the result of the speeding ("acceleration") or slowing ("retardation") of development which, in turn, is caused by use and disuse²⁷.

In other words, Hyatt was given species a life cycle as if they were individual organisms. Hyatt, of course, had no proof of that and his ideas were influenced by Agassiz himself, through his version of *Naturphilosophie*, based on Lorenz Oken's German idealism and transcendentalism and Ernst Haeckel's (also a German) "Principle of Recapitulation" in the form of progressionism

²³ Bowler, P.J. 1983, pp. 55-59.

²⁴ Burkhardt, 1977, p. 8-84.

²⁵ Richards, 1992, 2002.

²⁶ Bocking, 1988

²⁷ For a summary of Hyatt's ideas see Brooks 1909.

known as “Biogenic or Biogenetic Law” (i.e., “ontogeny recapitulates phylogeny”) or the recapitulation theory.

Although Haeckel was impressed with Darwin’s *Origin*, like most contemporaries he was not very enthusiastic about natural selection and preferred Lamarckian explanations. Its materialism ran against his romantic idea of nature.

The other early champion of progressionism in the U.S. was Edward Drinker Cope. Together with Hyatt he developed what was to be known as the Hyatt-Cope school, which emphasized an alleged parallelism between embryology and phylogeny. Cope was also against natural selection as an important evolutionary force²⁸ and preferred Lamarckian mechanisms. He even amplified Lamarck’s ideas by representing evolution as a phenomenon governed by trends: “The method of evolution has apparently been one of successional increment or decrement of parts along definite lines”²⁹. This is what was later called orthogenesis, the view that evolution has a life of its own that can take it in certain directions. As Hyatt had also done, Cope proposed evolutionary principles such as the “Law of the Unspecialized” which when applied to cave organisms meant that these cave creatures without eyes and pigmentation were at the end of their phylogenetic life because they were too specialized to evolve into something else; therefore, the next step had to be extinction³⁰.

No wonder cave fauna gave to Hyatt, Cope, and their followers bases on which to build the idea that evolution was governed by mystical trends and that natural selection was an unimportant mechanism. In fact these ideas have remained extremely popular among biospeleologists despite the fact that natural selection has been demonstrated to be a major factor in the evolution of cave organisms³¹.

Despite the tremendous popularity of American neo-Lamarckism, some European researchers were not satisfied with the metaphysical explanations for the evolution of cave fauna in particular and the general dismissal of natural selection as the major driving force of evolution. The main opposition came from August Weismann and Edwin Ray Lankester, both pro-selectionists with a very skeptical view of the idealism contained in *Naturphilosophie*. For Lankester the loss of eyes among cave animals occurred as follows: some animals are, by chance, born with defective eyes, and occasionally a few of them, some of which have normal eyes and some defective eyes, fall or are swept into caves. Then in each generation, those that have good eyes are able to see the light and escape while only those that are blind will remain in the cave³².

²⁸ See, for example, Cope, E.D. 1864.

²⁹ See Cope, E.D. 1896, p. 24.

³⁰ See Cope, E.D. 1896, pp. 172-174.

³¹ See a summary of the arguments in Romero and Green, 2005.

³² See Lankester, 1839.

The impact of the Modern Synthesis (1936-1947)

By incorporating population genetics to evolutionary ideas, the architects of the Modern Synthesis proved that you did not need to assert metaphysical ideas to explain evolution and by doing so they furthered a neo-Darwinistic materialistic agenda.

A key element of the development of the Modern Synthesis was the incorporation of Mendelian genetics into Darwinism. However, Mendelism was also rejected or simply ignored by most French biologists during the first half of the twentieth century, a rejection that was largely due to the fact that Mendelism was incompatible with the mysticism of neo-Lamarckism³³. In fact, one can argue that Mendelism was a purely materialistic explanation of heredity, the weakest area of Darwinism up to that time.

So when the non-French biologists of the 1930's and 1940's saw how Mendelism would provide a strong support to evolution by means of natural selection, they rushed to combine both and explicitly disprove any mystic idea of evolution.

Theodosius Dobzhansky when dealing with cave fauna made very clear that the rudimentation of loss of eyes and other characters were the direct result of natural selection and mutations. He further emphasized the role of opportunism to explain the ubiquity of life with no plan or design attached to it³⁴. Ernst Mayr also acknowledged that "(the) evolutionary phenomena dealing with regression and the loss of structures (...) are entirely consistent with the synthetic theory of evolution"³⁵.

Despite these clear statements by some of the most influential biologists of the twentieth century, they seemed to have had little impact among biospeleologists who consciously or unconsciously were pushing the mystical agenda of neo-Lamarckism. Part of the problem was that biospeleology as a science continued to flourish in France and somehow those ideas found a good reception among neo-Lamarckian Americans.

Among the French writers that supported that view of life were Lucien Cuénot, René Gabriel Jeannel, Maurice Caullery, Jean Rostand, Pierre-Paul Grassé, and Albert Vandel. They kept espousing neo-Lamarckian mechanisms for heredity as well as a rabid finalism through orthogenesis. The saint patron of these ideologues was the French Jesuit priest and paleontologist Pierre Teilhard de Chardin. He went so far as to propose that evolution was constantly pushing living things toward some sort of point of perfection (the "Omega point"). The fact that he was a priest and a paleoanthropologist who explained evolution in mystical terms, made his evolutionary philosophy not only palatable among many Christians but also a paradigm in the Catholic Church.

³³ For a good summary of this issue, see Bonneuil 2006.

³⁴ Dobzhansky, T. 1970, pp. 405-407.

³⁵ Mayr, E. 1960, p. 351.

Thus, it is not surprising that evolution was much better welcomed among Catholics than among evangelical Protestants who tended to view Catholic vision of the world with suspicion.

To be sure, some liberal protestant thinkers also espoused orthogenetic ideas. Samuel Alexander, Jan Smuts, Alfred North Whitehead and Michael Polanyi are examples of that.

Other influences

In addition to the above-mentioned philosophical currents, I think it is time to explore two other movements on their influence on American neo-Lamarckian ideas. One of those is Romanticism. This intellectual and artistic movement originated in the late Eighteenth century Europe and had, among other characteristics, a rebellion against the rationalization of nature. Recent research has shown that this movement had a tremendous influence on the way science was viewed, developed and utilized during the nineteenth century³⁶. Heringman, for example, cites passages from English geologist William Smith that are quite revealing³⁷. In Smith's publications that date as far back as 1815-1817, one can read teleology all over the interpretation of the geological strata³⁸. As I showed, one of the leading American post-Darwinian naturalists, James E. DeKay, spent long periods of time in contact with the leading representatives of the American Romantic literary movement³⁹. It has also been argued that Friedrich Wilhelm Joseph von Schelling, one of the founders of both *Naturphilosophie* and the Romantic Movement was an evolutionist⁴⁰.

Another angle that still requires exploring is whether both, American neo-Lamarckism and the popular opposition and/or skepticism toward Darwinian evolution is the product of what has been termed "American Exceptionalism"⁴¹

Conclusions

I believe that based on the examples presented above, the big real issue in today's controversy in the United States is not evolution vs. creationism and all of its versions including "intelligent design." The real issue is between believing whether our existence as humans in the universe is the result of chance or part of someone's elaborated plan, whether that plan is guided minute

³⁶ See for example Richards 2002, Heringman 2003a and Fulford *et al.* 2004.

³⁷ Heringman 2003b.

³⁸ "there seems to have been one grand line of succession, a wonderful series of organization successively proceeding in the same train towards perfection" in Heringman 2003b, p. 63, which is not only a romantic narrative, as Heringman argues, but also almost perfectly consistent with the American neo-Lamarckism wordiness of the late nineteenth century.

³⁹ Romero 2002a.

⁴⁰ See Richards 2002, p. 311.

⁴¹ For a review of this movement see Lipset 1996.

by minute as the more fundamentalist evangelicals assert or just by an spiritual force laid in nature.

Neither natural selection nor Mendelism provide any of the mystical characteristics that are palatable to the Biblical literalists in particular, nor to most of those who see the history of life on earth as guided by a superior being in general.

That is the real big divide: whether we want to believe that we, humans, are the result of probabilistic events or the desired outcome of someone's wisdom.

References

- Agassiz, L. 1847 [1848]. [Plan for an Investigation of the Embryology, Anatomy and Effect of Light on the Blind-fish of the Mammoth Cave, *Amblyopsis spelaeus*]. *Proceedings of the American Academy of Arts and Sciences* 1:1-180.
- Berg, L.S. 1926. *Nomogenesis*. London: Constable.
- Bergson, H. 1907. *L'évolution créatrice*. Paris: Félix Alcan.
- Bommeuil, C. 2006. Mendelism, plant breeding and experimental cultures: agriculture and the development of genetics in France. *Journal of the History of Biology* 39:281-308.
- Bowler, P.J. 1983. *The eclipse of Darwinism. Anti-Darwinian evolution theories in the decades around 1900*. Baltimore: The John Hopkins University Press.
- Burkhardt, F. and S. Smith (Eds.). 1990. *The correspondence of Charles Darwin. Volume 6. 1856-1857*. Cambridge: Cambridge University Press.
- Burkhardt, R.W. 1977. *The spirit of the system. Lamarck and evolutionary biology*. Cambridge: Harvard University Press.
- Cope, E.D. 1864. On a blind silurid from Pennsylvania. *Proceedings of the Academy of Natural Sciences of Philadelphia* 1864: 231-233.
- Cope, E.D. 1896. *The primary factors of organic evolution*. Chicago: Open Court.
- Cuénot, L. 1911. *La genesis de las especies animales*. Paris: Librairie Félix Alcan.
- Darwin, C. 1859. *On the Origin of the Species by Means of Natural Selection*. London: J. Murray.
- DeKay, J. E. 1842. *Zoology of New York or the New-York Fauna, Part IV, Fishes*. Albany: W. & A. White & J. Visscher.
- Dobzhansky, T. 1970. *Genetics of the Evolutionary Process*. New York: Columbia University Press.
- Fulford, T.; D. Lee and P.J. Kitson. 2004. *Literature, Science and Exploration in the Romantic Era. Bodies of Knowledge*. Cambridge: Cambridge University Press.
- Haacke, W. 1893. *Gestalt und verebung; eine Entwicklungsmechanik der Organismen*. Leipzig: Weigel.
- Harvey, J. 1999. A focal point for feminism, politics, and science in France. The Clémence Royer Centennial Celebration of 1930. *Osiris* 14:86-101.
- Heringman, N. 2003a. *Romantic Science. The Literary Forms of Natural History*. Albany: State University of New York Press.
- Heringman, N. 2003b. The Rock Record and Romantic Narratives of the Earth, pp. 53-84, In: N. Heringman (Ed.) 2003, *Romantic Science. The Literary Forms of Natural History*. Albany: State University of New York Press.
- Jeannel, R.G. 1950. *La marche de l'évolution*. Paris: Presses universitaires de France.

Forum on Public Policy

- Lamarck, J.B.P.A.M. 1809. *Philosophie zoologique, ou exposition des considerations relative à l'histoire naturelle des animaux*. Paris: Dentu et L'Auteur.
- Lamarck, J.B.P.A.M. 1815. *Histoire naturelle des animaux sans vertèbres*. Paris: Verdière.
- Lankester, E.R. 1893. Blind animals in caves. *Nature* 47:389.
- Lipset, S.M. 1996. *American Exceptionalism. A Double-Edged Sword*. New York: W.W. Norton & Company.
- Martel, E.A. 1894. La spéléologie. *Comptes Rendus de la Association Française pour le Advancement des Sciences* 22:60.
- Martel, E.A. 1896. p. 721 In: *Report of the Sixth International Geographical Congress: held in London, 1895*. London: J. Murray.
- Mayr, E. 1960. The emergence of evolutionary novelties, pp. 349-380, In: S. Tax (Ed.). *The evolution of life. Its origin, history, and future*. Chicago: The University of Chicago Press.
- Mayr, E. 1982. *The growth of biological thought*. Cambridge: The Belknap Press of Harvard University Press.
- Osborn, H.F. 1933. Aristogenesis, the observed order of biomechanical evolution. *Proceedings of the National Academy of Sciences USA* 19:699-703.
- Plate, L. 1922. *Allgemeine Zoologie und Abstammungslehre*. Jena: Gustav Fischer Verlag.
- Richards, R. 1992. *The meaning of evolution. The morphological construction and ideological reconstruction of Darwin's theory*. Chicago: The University of Chicago Press.
- Richards, R. 2002. *The Romantic conception of life. Science and philosophy in the age of Goethe*. Chicago: The University of Chicago Press.
- Romero, A. 2001. Scientists prefer them blind: the history of hypogean fish research. *Environmental Biology of Fishes* 62:43-71.
- Romero, A. 2002a. Between the first blind cave fish and the last of the Mohicans: The scientific romanticism of James E. DeKay. *Journal of Spelean History* 36:19-29.
- Romero, A. 2002b. The life and work of a little known biospeleologist: Theodore Tellkamp. *Journal of Spelean History* 36:68-76.
- Romero, A. 2006. The discovery of the first Cuban blind cave fish: the untold story. *Journal of Spelean History* (In press).
- Romero, A. & S.M. Green. 2005. The end of regressive evolution: examining and interpreting the evidence from cave fishes. *Journal of Fish Biology* 67:3-32.
- Tellkamp, T. 1844. Uber den blinden Fisch der Mammothhöhle in Kentucky. (*Muller's*) *Archives fur Anatomie und Physiologie* 1844: 381-395.
- Teilhard de Chardin, P. 1955. *Le phénomène humain*. Paris: Editions du Seuil.
- Viré, A. 1904. La biospéologie. *Comptes rendus de la Académie des Sciences du Paris* 139:826-828.
- Wyman, J. 1854. On the eye and the organ of hearing in the blind fishes (*Amblyopsis spelaeus* DeKay) of the Mammoth Cave. *Proceedings of the Boston Society of Natural History* 4:395-396.