The adaptation of evolutionary thinking in its public circulation: the case of "Evolution: a Journal of Nature," 1927-1938

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Abstract

The teaching of evolution was the subject of intense controversy in the United States in the first decades of the twentieth century. Both the validity of the theory and its ethical, political and religious implications were in dispute. This article analyzes a magazine intended to popularize science in this context, *Evolution: a Journal of Nature* (1927-1938). The objective is to demonstrate that the dynamics of the public circulation of knowledge represented by the magazine cannot be reduced to a process of simplification, eliminating details and exceptions of little use to the general public, but rather consisted of a complete adaptation, creatively connecting scientific knowledge to questions of great importance in the public arena.

Keywords: science communication; knowledge in transit; anti-evolutionism; history of Darwinism; science and religion.

On February 28, 1922, the newspaper *The New York Times* published the article "God and evolution," one of the main milestones in the campaign against teaching evolution in US schools. The contribution was signed by invited author Williams Jennings Bryan (1860-1925), a democratic politician who had run for president three times and had been secretary of state under President Woodrow Wilson (Kazin, 2007). The article addressed topics ranging from the scientific method to the personal life of Charles Darwin, but Bryan's criticism had a single, precise focus around which everything else revolved:

> The only part of evolution in which any considerable interest is felt is evolution applied to man. A hypothesis in regard to the rocks and plant life does not affect the philosophy upon which one's life is built. … The evolution that is harmful – distinctly so – is the evolution that destroys man's family tree as taught by the Bible and makes him a descendant of the lower forms of life (Bryan, 28 feb. 1922, p.242).

Concern about the philosophical implications of the origin and development of man seem to have really been a central element in the political controversy around the theory of evolution in the United States at the start of the twentieth century. Although the biological fact of descent with modification was already commonly accepted among naturalists during that period – with only the explanatory mechanisms of the evolutionary process under discussion (Bowler, 1992; Largent, 2009) – conservative religious leaders and some lay people still militantly resisted accepting it (Lienesch, 2007). Bryan spoke not only on his own behalf, but on behalf of a growing anti-evolutionist movement.

During the nineteenth century, the resistance to evolutionism in the United States, especially in its expressions following Darwin's publications, remained relatively contained within the walls encircling the intellectuals of the country (Moore, 1979). The important anti-Darwinist discourse – such as that of Harvard zoologist Louis Agassiz (1807-1873), and of the director of the Princeton presbyterian seminary, Charles Hodge (1797-1878) – despite being influential, had a rather limited scope, compared to the size of the population of the country (cf. Livingstone, 2001).

The question became more widespread and popular only in the early decades of the twentieth century, due to the reformulation of US public education. In a process catalyzed by the First World War (1914-1918), high schools – which until then had had low attendance and had been intended only to prepare the few students who sought to enter a university – became schools for "education for life," or in other words education to better allow students to understand and interact with daily life, and also offered the professional training required by the United States' new economic reality (Goldin, Katz, 1999).[1]

In this context, the number of students attending these high schools grew markedly. In 1890, about 360,000 students aged 14-17 had enrolled in one, or 6.7% of the population in this age range. In 1920, the number had already reached 2,500,000 students countrywide, representing 32.3% of this same group (DeBoer, 1991, p.39). Furthermore, the curriculum, previously restricted to reading, writing and arithmetic, was broadly reformulated, with a national recommendation that at least 25% of students' time be dedicated to the sciences (DeBoer, 1991, p.41).

In this context, the idea of evolution was presented to many youths for the first time and, as a result, to parents and community leaders, thus producing the conditions in which broad debate on the topic would take place. As observed by Andrew Jewett, speaking of "science" in this context was to speak of much more than a collection of knowledge, methods or institutions. In the vocabulary of the progressive educational reformists, "being scientific ... meant behaving in accordance with specific ethical tenants or exhibiting particular ethical virtues. It entailed a mode of speaking, a form of interpersonal relations, even a comprehensive way of life" (Jewett, 2012, p.10). The hope of these reformers was that, in the context of social turbulence and fragmentation, science would serve, in fact, as the "basis for a full, cohesive modern culture" (p.9).

In this modernization project, biology occupied a central position, promoting social behaviors and values associated with the progressive reformism of the period (Pauly, 2000). An example of this intertwining of biology and social reform is the textbook widely adopted during that period, *Civic biology* (1914), by George W. Hunter. In it, the "life sciences" content was very frequently combined with political and social proposals. An explanation of cell theory led to an affirmation of the need for and urgency of public policies on sanitation, quarantines and personal hygiene. The section on metabolism reflected on the effects of alcohol on the body and on the importance of a properly calculated diet. The discussion on reproduction and hereditariness suggested measures for a moderate sex life, and so on (cf. Shapiro, 24 set. 2008).

As argued by Adam R. Shapiro (2013, p.77), this "modern culture" proposal affirmed values that were clearly situated in time and space; it had "Northern origins, industrial origins, union origins and progressive origins. Beginning in the 1910s, with a change from city-level education to state-level education, the new curricula aligned with this educational reform began to reach not only the large metropolises, but also small, rural towns. Consequently, very traditional communities had to adopt books and curricula that they saw as "an attempt to change their culture and instill foreign values" (p.83).

In this context, local leaders began to rise up against what they saw as an intrusion by the urban elites into education in their region. The theory of evolution, seen as the height of "modern culture" (for reasons we will discuss below), became the main target of this protest. In return, scientists, liberal theologists and science communicators also engaged strongly in the polemic created around this subject (Clark, 2008).

One of these pro-evolution efforts was *Evolution: a Journal of Nature* (EJN), a publication devoted to popularization of science.[2] Launched in December 1927 by L.E. Katterfeld, a former member of the Socialist Party of America (SPA),[3] the magazine was distributed nationally with the goal of "combat[ting] bigotry and superstition and develop the open mind by popularizing natural science" (Katterfeld, Dec. 1927, p.8). In this effort, its contents combined reproductions of scientific articles, original contributions from science popularizers, philosophical texts with an evolutionary inspiration, news and updates on the teaching and research situation in the United States and worldwide; in addition to jokes, poems and cartoons on the topic of evolution. The authors of the magazine included mainly scientists, teachers, writers and journalists. Its price, aligned with its objective of broad circulation, was only 10 cents for 16 pages of content printed in black and white, with many images and few ads (Caldeira, 2018).

This rich mosaic, composed of scientific, artistic, ethical and political content, eloquently expressed the diversity of meanings and interests invested in the controversy surrounding evolution in the country. Previously interpreted as "science *versus* religion," the controversy in question has been addressed recently in historiography as a phenomenon with greater complexity, including religious perspectives and scientific pretensions on both sides, involving conflicting reform plans in the political, social and educational realms, and expressing conflicting lifestyles and moral orientations (Larson, 2006; Lienesch, 2007; Moran, 2012; Numbers, 1993; Shapiro, 2013).

Aligned with this perspective, this article intends to demonstrate the multidimensionality of evolutionary thought as presented by *Evolution* in its clash with the anti-evolutionist movement in the United States in the early decades of the twentieth century. More specifically, we will seek to demonstrate that the public affirmation of the theory of evolution by the magazine made substantial use of arguments based on its moral value, not just theoretical or empirical explanations. In other words, we will discuss how "evolution applied to man," echoing Bryan's terms, could "affect the philosophy on which life is built."

Throughout this article, we will argue that the circulation of evolutionary thought among a wider public during the controversy period resulted in a complete adaption to that historical situation, with its characteristic questions, values and interests. Compared with the "canonical narrative" (Shapin, 1990) of the popularization of science, that is, the understanding that communication of science to the greater public consists solely of simplification or dilution of content produced by specialists, we sustain that, although certain aspects of the knowledge communicated are really suppressed when transmitted to the public, other elements are always added, developed or given new meaning.

In the specific case of the magazine *Evolution*, we seek to demonstrate that, while certain nuances and details of knowledge related to the topic of evolution were frequently "simplified" – such as the distinction between the theories of Darwin and other authors, the specificity of the biological processes in relation to other natural dynamics, and the plurality of coexisting interpretations for the same evidence – other elements, from theological considerations to state recommendations, were added.

Naturally, this phenomenon is not exclusive to the materials analyzed here. Recent studies on the history and philosophy of science communication have drawn attention to this creative dimension of the circulation of knowledge. Since the mid-1990s, researchers have systematically questioned the assumption that there is a division between production, communication and reception of science.[4] As Ralph O'Connor summarized (2009, p.336), "the mosaic of case studies in current scholarship confirms that popular science worked, not as a one-way process of knowledge transfer, but as a heterogeneous network of cultural exchanges and feedback loops between different social groups."

The Polish physician and philosopher Ludwik Fleck, in the early twentieth century, had already proposed a similar idea. According to the author, "simply communicating knowledge is not in any way comparable to dislocating a body in Euclidean space: it never occurs without transformation" (Fleck, 2010, p.163). Drawing on the reflections of Fleck, Bernardo Jefferson de Oliveira (2012, p.136) highlights that the ideas and techniques are always "re-articulated, adjusted, acclimated and adapted" when "introduced into a different

social context than that in which they were created." This movement, also according to the author, does not result only in simplification, but also in "complexification, since it takes into account several other factors that are artificially abstracted in science when variables are isolated and phenomena are decontextualized and transposed into arbitrary 'Standard Temperature and Pressure Conditions'" (Oliveira, 2012, p.130, nota 7).

Even so, the "canonical narrative" mentioned above continues to reign outside the small circle of academics focusing on this subject. This article intends to contribute to this effort to demonstrate the "other side of the coin" of the circulation of knowledge – "complexification." Additionally, when analyzing this dynamic through the magazine *Evolution*, we intend to also contribute through the inclusion of this periodical – until now rarely explored – in the historiographic debates on the controversy over evolution in the United States.[5]

To this end, in the first section of this article we will examine the position of *Evolution* in the context of the dispute over the teaching of evolution in the United States. We will highlight its opposition to the main anti-evolution group of the period – the fundamentalists – and we will analyze the magazine's self-understanding as part of this clash. In the second section, we will indicate some accusations of a moral tenor against evolution by the fundamentalists in the context in analysis and we will examine how, in some situations, authors of articles in the magazine attempted to avoid them, resorting to a delimitation of the idea of evolution, restricting it to a causal explanation of biological facts. Finally, in the third section, we will show how, at other times, contributors to *Evolution* argued in favor of the value of evolutionary thinking beyond biology, and even proposed it as an alternative to the traditional religious worldview.

War: the conflict thesis and evolution as a secularist weapon in *Evolution*

"Fundamentalists Announce a New Campaign" (Katterfeld, Dec. 1927, p.8). With this title, the first editorial of the magazine *Evolution: a Journal of Nature*, dated December 1927, informed its readers of a referendum that would be held in Arkansas. The population was to vote, the following year, for or against the legality of public schools in the state teaching that "man ascended or descended from a lower class of animals." This "new campaign" was, in fact, a new step in the political and educational clashes of the period – not because it tried to employ legislation to fight the teaching of evolution, but because it directly involved the population in the controversy.

As mentioned earlier, opponents of the theory of evolution had publicly launched a crusade to ban this content from school curricula as early as 1922. Taking advantage of ordinary legislative dynamics, namely obtaining the support of a congressman who could propose a bill to be voted on in congress, the movement had managed to pass three laws against the teaching of evolution by 1927 (Oklahoma, 1923; Florida, 1923; Tennessee, 1925). The result, however, still seemed unsatisfactory to the anti-evolutionists, who had already proposed more than fifty resolutions in 21 states. The movement then decided to employ a new tactic: submitting the issue directly to a popular vote (Gray, 1970; Laats, 2010; Larson, 2003)

The principal actors leading this effort – and North American anti-evolutionism in general since the beginning of the twentieth century – were known as "fundamentalists." Despite the term "fundamentalism" being in common use today, in a generic way, to label intransigent or violent religious expression, especially those of an Islamic nature, its origin dates back to a very different context: a theological controversy that began in the United States in the second half of the nineteenth century. At that time, two main groups, the conservative theologians (who called themselves "fundamentalists") and the liberal theologians (also called "modernists") engaged in a fierce dispute for institutional control of the mainline Protestant churches in the country (Longfield, 2000; Marsden, 1998).

Until the 1910s, when involved in these disputes, fundamentalism maintained a markedly intellectual character, circumscribed within the theological polemics of the period, as expressed by the publication of the 12 volumes of the anti-modernist work *The Fundamentals* (1910-1915), to which theologians from important North American and European churches and universities contributed articles on several crucial themes in the theological discussions of the period. In the following decade, however, the fundamentalist movement became increasingly popular – both in the sense of reaching and mobilizing a larger public, and in detaching itself from its academic origin, engaging in increasing fiery but less sophisticated arguments (Moore Jr., 1968; Sandeen, 1967).

The great appeal of the fundamentalist discourse is explained, in part, by the fact that its "religion," like the "science" of progressive education reformers, developed in the US public context was something much greater than specific assertions and practices. Rather, it was a complete culture, a sufficient foundation for building the nation. If, initially, being a fundamentalist meant adhering to a specific way of interpreting the Bible and history and defending it against the "relativization" proposed by liberal theologians, in the 1920s being a fundamentalist had become an urgent mission for a significant part of the population, especially in the South, which felt it was under the threat of the growing irreligiousness in the country and its supposed harmful effects on a wide range of spheres of life (Lienesch, 2007).

It is important to remember that this population had its roots in a social reality in which "jurors had to believe in God; teachers, to read the Bible and, in some states, religious observance of the 'Lord's Day' was a legal obligation" (Commager, 1969, p.174). There was still a provincial reality in which the local community and the religious congregation were hard to distinguish; that is, a reality radically different from that of the flourishing metropolises in the North, which were culturally diverse, demographically mixed and anonymous and – paraphrasing Weber (2004, p.48) – "indifferent to God and the prophets."

Thus, united by a common religious identity and using an already well-established mobilization network (churches, bible institutes and other religious support organizations) and employing a variety of means and strategies (the promotion of public debates, congressional lobbies and heavy use of the media), the fundamentalists expanded their influence throughout the United States, becoming a powerful pressure group. And the main target of their attacks in the 1920s was, without a doubt, the theory of evolution (Lienesch, 2007).

The idea of evolution was considered, by many fundamentalists, as the epitome of depravation of Christian civilization, and became especially threatening after its

penetration into the public education system. Their fixation on the theme can be explained by several reasons. In addition to the previously mentioned association between evolution and "modern culture," there were other, more specific, criticisms. According to the main spokesperson for the anti-evolutionist campaign during that period, William Jennings Bryan (1921, p.43), "the Darwinian doctrine leads people into agnosticism and pantheism, plunged the world into the worst of wars, and is dividing society into classes that fight each other on a brute basis." If Bryan believed, as did so many other fundamentalists, that evolution was a basic foundation of atheism, German militarism and class struggle, opposing it was nothing less than defending, on a single front, Christian tradition, world peace and social cohesion in the country (Laats, 2015, p.25-72).

However, those that defended teaching evolution thought that the fundamentalists were doing just one thing: "Undermining our educational system." According to an editorial in *Evolution* given precisely this title, "Children by the millions are being 'legally retarded in their mental and moral development' – and that at the instigation of religious leaders!" (Whitenack, Sept. 1928, p.9; emphasis added). The great threat represented by them, according to the editorial, was not limited to their specific opposition to the teaching of evolution, but, more generally, to their claim to hold a "monopoly on the truth." "Did not this very assumption cause the execution of Socrates, the Crucifixion of Jesus, the burning of Bruno, and the damnable humiliation of poor old Galileo?" asked the editor. "And will it not wreck our educational system completely wherever it is put into practice?" (p.9).

Understanding the image that the magazine *Evolution* had of itself is of fundamental importance to understanding its presentation of evolutionary thought. In short, the magazine considered itself a participant in a "conflict between those who see life through the eyes of science and those who look upon it chiefly through the misty superstitions of the past" (Katterfeld, Dec. 1927, p.8). This conflict, far from being considered something specific to its own time, appears in the magazine as a necessary and eternal dynamic, a "war of extermination" between science and religion – or between freedom and tradition – the same in which Bruno, Galileo and Darwin fought, on the one hand, and the Inquisition and witch hunters, on the other.

This understanding of the historical relationship between science and religion is not, as is well known, an original product of the magazine. Known in historiography as the "conflict thesis," this narrative was developed in the second half of the nineteenth century, in a context of professionalization of science and secularization of higher education in the United States and the United Kingdom.[6] On the pages of *Evolution*, the "conflict thesis" was also part of a secularist political language, marked by opposition to the influence of religion on scientific activity. For the magazine's contributors, promoting the theory of evolution and weakening ecclesiastical authority seemed to be a single mission. As one of the magazine's editorials stated, "What is more important to humanity … is the further extension and democratization of the evolutionary concept. It was this that overthrew medieval theology, and completed the enlarging of the mental horizon of humanity" (Crew, Mar. 1929, p.8). In this same spirit, one of the covers of *Evolution* features Charles Darwin as "the great emancipator of the human intellect" (see Figure 1).

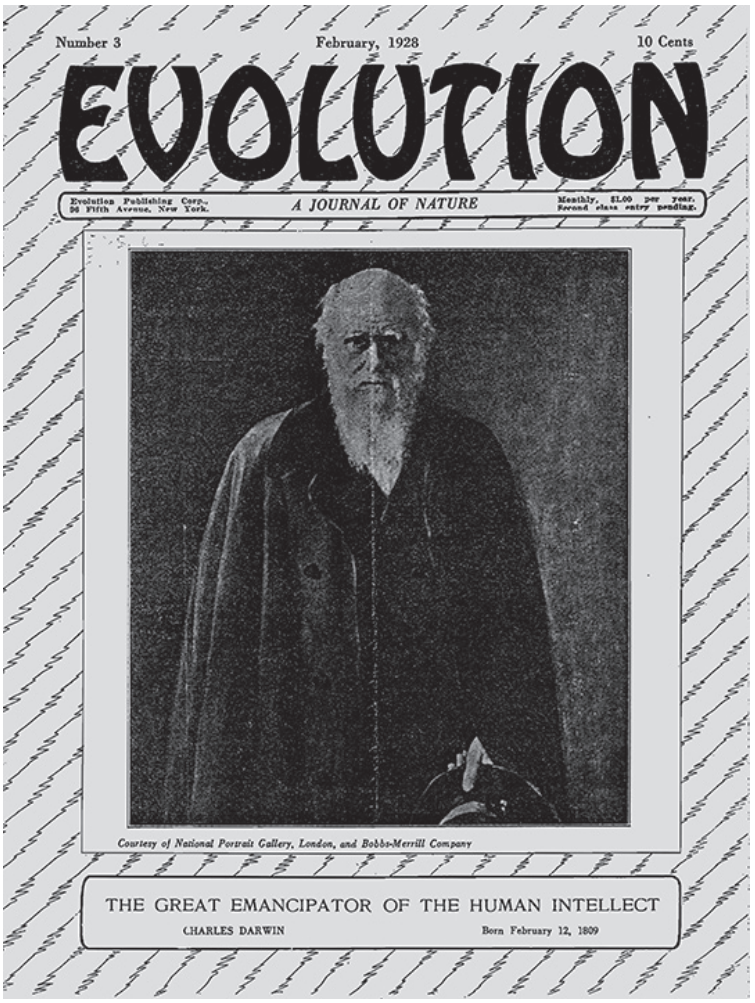

Figure 1: Photogravure by Leopold Flameng, from oil painting by John Collier, son-in-law of T.H. Huxley, 1881. The work was commissioned by the Linnean Society of London to adorn a wall in one of its halls. For an analysis of this work and other pictorial representations of Darwin, see Browne (2009) (*Evolution*, v.2, n.2, cover)

The awareness of being part of a very long historical process, with clearly identified enemies and a bright hope ahead – the "emancipation of the human intellect" – provided crucial guidance not only to the magazine's editors and contributors, but also to the magazine's readership in its engagement with the publication. Of the 142 readers' opinions published in the section From Our Readers, 48 referred explicitly to the "war" between science and religious thought. One of them stated: "It always gives me a thrill to hear something about evolution and natural science, not because it is my hobby just now but because its mission is to free the world from superstition and slavery" (Katterfeld, July 1928, p.14). "Your magazine is like a sharp hatchet chopping the tree of theology" (Katterfeld, Aug. 1928, p.14) writes another reader. "I think [the magazine *Evolution*] is one of the greatest steps forward that has ever been taken to beat down superstition and get the people out of their mental bondage" (Katterfeld, Apr. 1928, p.14) praises yet another.

One could say that the complex network of sociability woven around *Evolution* was sustained and held together, in large measure, thanks to the worldview and historical understanding of its agents, united to fight the old "fanaticism and the superstition" and usher in a new era of "open minds" by popularizing science. But, in the end, what science would this be? How exactly would it bring about this intellectual emancipation of humanity? What was the role teaching evolution in this process? And, furthermore, what exactly was the "theory of evolution" promoted by the authors of the magazine?

In the trenches: the defensive retraction of the concept of evolution

In the first article in the first issue of the magazine, "Who Believes in Evolution?," David Starr Jordan (1851-1931), an eminent zoologist and co-founder of the University of Stanford, defines evolution in the following terms: "The word evolution as commonly accepted compromises two distinct conceptions, the making of the material universe and the development of life and mind on the earth" (Jordan, Dec. 1927, p.2). In another article for the magazine, "Meaning of Evolution," Jordan (Jan. 1928, p.5) suggests an even broader definition. "The general theory of evolution is simple enough. All material objects change with time and space, and these changes are not random but due to definite causes, meanwhile as a whole and in detail following an orderly system."

It is noteworthy that Jordan's definitions group together organic and inorganic phenomena: vital, mental and material. They also present the evolutionary process as an organized phenomenon that fully leads to order. Although they seem out of place today, such aspects of the author's understanding resonated with a definition of evolution that was quite common in the second half of the nineteenth century, especially influenced by the works of Herbert Spencer (1820-1903), an author of great popularity in the United States due to his strongly progressivist perspective and his liberal ethics (Moore, 1979, p.166-169).

The term evolution, initially associated with embryological development and the succession of forms found in fossil records, would take on a new meaning in the 1850s, especially in English-speaking countries, due to the wide circulation of Spencer's works. The English philosopher, notably in his ten-volume work *A system of synthetic philosophy* (1862-1897), proposed the unification of universal philosophy under the idea of progress, understood as the gradual development from the simpler to the more complex, or from the homogeneous to the heterogeneous. This principal was to be used as an interpretive model both for the natural history of the cosmos, of life and of the mind and for the social, cultural and political history of human tribes and civilizations. After all, all of these different dimensions of reality, according to Spencer, were fundamentally integrated, forming a whole greater than the sum of its parts, governed overall by the law of progress (Bowler, 1975).

In light of this history of the concept of evolution, we can better understand, among other things, the relative frequency of articles on astronomy and geology in the journal *Evolution* – 23 of 233, about 10% of the total. For example, discussing the very long history of the formation of the Grand Canyon or the Milky Way was a way to argue in favor of evolution in a more general sense, namely of universally verifiable slow, gradual and

progressive development in nature – in radical opposition, of course, to the creationist conception of a relatively recent universe in a process of decay since the Fall.

However, the numerical preponderance of articles dedicated to biological evolution, 152 (65%), confirms its marked prominence in relation to the other components of the broader concept of "evolution." This is in line both with the journal's interests in its confrontation with fundamentalists and with the tone of the public and scientific debate in general. In *Evolution*, biological evolution had already differed to some extent from "cosmic" evolution, in a Spencerian sense – as suggested by Jordan's own phrasing of his concept of evolution ("two distinct concepts," "material" on the one hand and "life and mind" on the other).

In fact, in an article in the magazine about the contributions of Herbert Spencer to the theory of evolution, Alexander Goldenweiser, an anthropologist from the University of Wisconsin, argued in favor of the need to restrict the concept of evolution. According to him, the three aspects pointed out by Spencer as characteristics of the universal phenomenon of evolution, namely uniformity, gradualness and progressiveness, should be considered "obsolete or, at best, inaccurate. For social evolution[7] is neither uniform, nor always gradual, nor is it necessarily or even generally progressive" (Goldenweiser, July 1928, p.2). In Goldenweiser's article, the philosophical model proposed by Spencer was excessively ambitious in its synthetic pretension, comparing incomparable phenomena, and, in the author's opinion, this model would not withstand criticism nor the "accumulated facts" of modern anthropology.[8]

In his article "What is evolution?," science popularizer Henshaw Ward (Dec. 1927) was even more assertive about restricting the concept of evolution. "It is astonishing to see how often 'evolution' is misconceived by educated people, sometimes even by scientists" (p.5; emphasis in the original), laments the author. To clarify, Ward presents a history of the idea of evolution (without adding "biological" or "organic;" simply "evolution"), from Aristotle to Darwin, including Lucretius, da Vinci and Lamarck, focusing exclusively on the biological dimension of the phenomenon. Furthermore, Ward explicitly positions himself against comparing the phenomenon of organic evolution with any other type of inorganic or social development, as was common in previous years. According to him, "evolution is a very limited theory. 'It is purely biological.' No astronomer can reason from it to the history of nebulas; no sociologist can argue from it to any law of social development. No philosopher can prove from it anything about metaphysics or theology" (Ward, Dec. 1927, p.6; emphasis added).

Given the context in which the magazine was produced, it is not difficult to understand the commitment of authors such as Ward and Goldenweiser to "isolate" biological evolution from the older, more encompassing idea of evolution. A recurring argument by fundamentalists against teaching evolution during the period was that the social implications of acceptance of the theory would be disorder and violence. In 1921, as already mentioned, William Jennings Bryan (1921, p.43) had stated "that the Darwinist doctrine... plunged the world into the worst of wars." The idea that promoting the chaotic "law of the wild" would result in abandonment of "proper Christian conduct" was central to his discourse. In his words: "the brute in man is brought out largely by the theory that makes man believe he is blood relative to the brute" (p.43). That is, thinking you are like

an animal is the first step towards acting like one. And the greatest proof of this, for Bryan and other anti-evolutionists, was the First World War.

Interestingly, it was a scientist's publication, not a religious leader's, that Bryan cited when linking evolution to global conflict. It was the book *Headquarter nights* (1917), written by the American Darwinian zoologist Vernon Kellogg (1867-1937). In 1915-1916, Kellogg had volunteered in Belgium, providing clothing and food to civilians affected by the war. During this period, he had the opportunity to participate in dinners with high-level Germany military leaders, through which he learned, according to his understanding, of the centrality of the theory of evolution in German militarist ideology. In the words of Kellogg (1917, p.28), "The creed of the *Allmacht* of a natural selection based on violent and fatal competitive struggle is the gospel of the German intellectuals; all else is illusion and anathema." The *Allmacht* [omnipotence] of natural selection was the main assertion of "neo-Darwinism," a theoretical position promoted by German zoologist August Weismann (1834-1914), who claimed that the mechanism of natural selection was sufficient to explain evolution. According to Kellogg (1917, p.29), inspired by Weismann's complete emphasis on the deleterious dimension of the phenomenon (elimination of the least fit) as the engine of progress of species, the German officials believed that the war "not only must go on, for that is the natural law, but it should go on, so that this natural law may work out in its cruel, inevitable way the salvation of the human species."

Another controversy regarding the immediate application of the new conclusions of evolutionary biology to other fields of knowledge – less present in fundamentalist discourse, but frequent as academic criticism, especially among anthropologists – was related to "recapitulation theory," especially that proposed by Ernst Haeckel (1834-1919).[9] According to the German naturalist, the development of individuals of "superior" species would go through a series of stages in which the adult form of "inferior" ancestral species would be represented (Gould, 1991, p.111). For example, in human embryonic development, characteristics of the adult form of fish (gills) or reptiles (tails) could be identified. This phylogenetic interpretation of embryological evidence would be explored by Haeckel as an important argument in favor of the common ancestry of species and, more specifically, to support his reconstruction of evolutionary trees (Bouquet, 1996, p.55-59).

Evoking the idea of recapitulation, several authors, especially English, French and German nationalists, would claim that their own race – Caucasians or Aryans – represented the adult phase of humanity, while Negroids and Mongoloids (using the racial categories of the time) represented the childhood of the species (Gould, 1991; Regal, 2004). Within a broad understanding of evolution, the same type of hierarchy could apply to the respective cultures and social organizations of different peoples. As is well known, this reasoning served as an important scientific basis for the racialist justifications of imperialist domination in the nineteenth and twentieth centuries (Bowler, 2003, p.297).

In the context of the publication of the magazine *Evolution*, after the First World War, this alleged identification of biological principles and conclusions with political and military actions seemed particularly dangerous. Therefore, to defend biological evolution in front of a public still haunted by the horrors of that event, such as the American public of the 1920s, it had to be "saved" from the old, tarnished all-encompassing conception of the

theory, including criticizing it, differing oneself from its former defenders (Largent, 2009). In other words, the moment favored a defensive withdrawal of the concept of evolution through the suppression of certain connections between the natural sciences and other fields of knowledge.

Given that, it is not surprising that, in an article about Haeckel in *Evolution*, Alexander Goldenweiser refers to the theory of recapitulation – according to Stephen J. Gould (1991, p.112), one of the "most influential ideas in science in the late nineteenth century" – as "a very silly notion" and laments that the social sciences had fallen "under the spell of evolutionary ideas," causing "much obfuscation and error" (Goldenweiser, Apr. 1928, p.2). According to the author, the distinction between evolution in nature and in human societies was absolutely clear: "An organic law of growth cannot be expected to apply to historic series which are based on the transfer and cumulation of tradition" (p.2). Having established this distinction – that is, rejecting the totalizing approach to evolution – the author seems to say that there is no reason to fear the theory.

Interestingly, this yearning for a theoretically restricted and exclusively biological concept of evolution, which was critical to ensuring a good public image for post-War evolutionists, coexisted in an ambivalent way, in the magazine *Evolution* – and in the public and academic debates in the United States during the period – with significant adaptation of the concept in other directions, applied and transformed in contact with a wide variety of pressing political, ethical and religious discussions during the period.

Alexander Goldenweiser himself, who in the article on Haeckel lamented that the social sciences had been influenced by the perspectives and conclusions of biological evolution, does not, however, reject this same dynamic – he even seems to approve of it – in his article on the naturalist, anarchist and former Russian prince Peter Kropotkin (1842-1921). In his work *Mutualism* (1902), Kropotkin had taken a stand against the then-popular idea that selfish, violent behavior was the most advantageous type of conduct for biological success, proposing instead the primacy of cooperative relationships, or mutualism. The main intention of the anarchist thinker, of course, was not only to condemn the myth of the "law of the fittest" in nature, but also to question its social, political and economic expressions (Ferretti, 2018).

In the United States, the relativization of morals based on the belief that the path to progress was "anything goes" biological competition had become quite common in the public expression of the theory.[10] As Goldenweiser admitted (Mar. 1928, p.3), "the biologically inspired doctrine of struggle, in which the weak perished and power conquered, exercised a sinister influence on sociological and political thought." However, according to him, "Darwin never intended to emphasize" an individualist and warmongering interpretation of evolution, it was "less scrupulous popularizers" (p.3) who did this. In contrast, the author highlights the work of Kropotkin, who, based on the natural history of horses, donkeys and goats, had affirmed the importance of intra- and interspecies cooperation as a factor of progress:

> Not satisfied with having demonstrated the importance of mutual aid in the animal kingdom, Kropotkin carried his research further into the field of primitive society and

> thence to the cities of medieval Europe and modern worker's co-operatives. Kropotkin's well documented and brilliant book serves as a necessary counterpoise to the one-sided distortions of the original Darwinian theory (Goldenweiser, Mar. 1928, p.3).

Curiously, Kropotkin's suggestion of an equally totalizing character, namely that mutualism is the most important relationship in zoological, anthropological, and sociological dynamics, seems to pass Goldenweiser's scrutiny without criticism. In fact, this connection between evolution and elements of the socialist tradition was not something new in the context of the publication of *Evolution*. Since the times of Lamarck and Darwin, left-wing intellectuals have sought, in different ways, to link evolutionary thinking to their revolutionary projects. The issue of materialism and the emphasis on transformation and progress were at the center of these reflections (Pittenger, 1987; Stack, 2000). The Socialist Party of the United States, of which Goldenweiser was a member from 1915 to 1929 (McGee, Warms, 2013, p.349), had been formed in the context of the Second International, in line with its strong emphasis on science in general and in evolutionary thinking in particular (Blackledge, Kirkpatrick, 2002). In socialist periodicals of the era, it was understood, in this spirit, that "scientific discoveries are weapons in the working class' arsenal" and "there is no work that will yield such rich returns in valuable information for the socialist worker as the study of natural science" (Cotkin, 1984, p.205).

Thus, if, on the one hand, the authors of the magazine *Evolution* suppressed certain connections between evolution and political positions; on the other hand, these same authors did not shy away from adapting evolutionary thinking to their own values, understandings and social expectations. This is what we find throughout the whole publication.

Movement: the moral expansion of evolutionary thinking

One of the most expressive examples of the evaluative expansion of the theory of evolution in the magazine is the article "The Ethics of Evolution", by Maynard Shipley (June 1931), founder of the antifundamentalist organization Science League of America. Shipley begins his article by stating: "It is impossible to emphasize too highly the ethical value of the evolutionary concept" (p.14). According to the author, the accusation of the fundamentalists that "the evolutionary philosophy is brutalizing and essentially immoral" (p.14) is absolutely unfounded and results from ignorance of the "grand and ennobling principle of mutual aid, as taught by Darwin and strongly emphasized by Kropotkin." The history of evolution, in Shipley's interpretation, shows that "Man 'especially' cannot live for himself alone. He could never have evolved to his present high state on the basis of strict selfishness or individualism" (p.14; emphasis in the original).

In addition to defending altruism and community life based on a progressive reading of the natural history of the species, Shipley similarly condemns human social vices as primitive characteristics, "vestiges" of evolutionary development, comparable to the appendix and third molars – an idea that is also defended in "Mind and morals," by Hugh F. Munro (Oct. 1928, p.3). The quote is long, but important:

> Despite the ups and downs of human history, on the whole the human race has been growing better and better. When boys and girls learn that they ... are the survivors of a very old race which has been, on the whole, forging onward and upward in proportion as its members have learned that virtue is its own reward, that kindness, decency and fair play alone can gain for them a high and secure place in society – when they learn that meanness, selfishness and brutality are evidences of reversion to a more primitive brute stage in the evolution of man, they will value the beauty of the ideal in conduct and do their best to make this our world a more satisfying and more delightful place in which to live (Shipley, June 1931, p.14).

When deriving ethics lessons from the history of evolution, Maynard Shipley did not act, so to speak, as a lone prophet, but rather as a priest in an already well-established religion. Beginning in the mid-nineteenth century, US scientists, engaged in their professionalization, sought to legitimize their craft in the eyes of the public by presenting science as a moralizing instrument.[11] As already mentioned, the organization of biology as a discipline in the United States was explicitly linked to social reform proposals. It was a science, in the words of Philip Pauly (1991, p.171), "at the same time ostentatiously objective and loaded with values;" that is, while postulating the positive reality of the natural world, biology expressed a series of values, legitimized as "data from nature," which were, in turn, related to a certain ideal of society – modern, industrial, cosmopolitan and secular.

This is the context in which affirmations like those by Shipley are situated (June 1931, p.14), such as "[t]o learn the laws of the universe is to learn also that we must obey those laws or perish. Morality consists, in the last analysis, in obedience to nature's laws." or "evolution not only gives a unity and direction to the study of human culture as a whole, and that modern science is unintelligible without it, but also that this discipline has great value as an educational agency" (p.14).

Clearly, Maynard Shipley did not follow the lead of his colleague, Henshaw Ward, mentioned above, regarding the restrictive conceptual perspective that evolution is "purely biological." In another article, entitled "What evolution means to you," the author clearly says that "[n]ot only is the evolution concept necessary to a real understanding of the natural sciences, but it is essential in every branch of human welfare," such as in the "plant and animal industry, in medicine, surgery, geology, zoology, psychology, human origins, child study, criminology and penology – in short, in every department of human knowledge" (Shipley, Mar. 1928, p.9; emphasis added).

As already mentioned, Maynard Shipley is not the only author in the magazine *Evolution* to attribute such an explanatory and instructional meaning to evolution. On the contrary, this displacement of evolutionary science towards a wide variety of debates predominates in all issues of the publication. Another example is the article "Evolution and the new perspectives of life purposes," by Harry Elmer Barnes (Mar. 1928, p.7), a history professor at Columbia University. The article began with the assertion that "evolutionary conception and the new cosmology are as disruptive of the accepted views of man as they are of the older theological attitude towards God" (p.7). In the opinion of the author, "biblical theory" – according to which man is a "theological entity," sometimes exalted as a "little lower than the angels," sometimes demoted to "a worm of the dust" – could no longer

be sustained, "The scientific facts," says Barnes, "reveal man as neither a worm nor an angel with pruned wings. He is the leading member of the simian group and therefore the dominant element for the time being in the animal kingdom (p.7).

The opposition established by the author is intriguing. When comparing the two approaches – the biblical and evolutionary – Barnes appears to treat them as equivalent to some extent in their nature and gnoseological function. Namely, he seems to compare them as different results of identical knowledge dynamics, or different responses to identical questions, or even as moves made in the same "language game."[12] When one pays attention to the fact that the biblical comparison of man with angels (Psalms 8:4) or with worms (Psalms 22:6) appears as an eminently poetic expression in the context of the composition of psalms, that is, of Jewish musical praises, it seems rather imprecise to classify it as a "biblical theory" and place it in direct opposition with observations and theorizations regarding the description of the world in its material form. Similarly, what the "scientific facts reveal" seems to have little relevance to the validity of these expressions. However, by establishing this direct comparison between the Bible and biology, Barnes seems to present them as occupying the same space of knowledge, so that one must choose between one or the other. In this movement, it is as if religion was being dragged into the territory of science, to perish there when judged by scientific criteria.

As Harry Elmer Barnes (Mar. 1928, p.7) argues:

> If it were known to be true that we are slightly mitigated angels, this would afford no clue to the study of mankind, because no one has seen an angel and we possess no knowledge of the 'personal traits and behavior patterns' of the angelic host. On the other hand, once we come to recognize the fact that man is an animal we immediately have the rich field of comparative anatomy, physiology and psychology to draw upon and from which to build a solid approach to the study of human nature and behavior (emphasis added).

Here, the idea of replacing the biblical worldview with the biological one really appears to be a true change in scientific paradigm, leading to new research possibilities, bringing new data to light and promising superior conclusions about the same object of study. In this same spirit, Barnes (Mar. 1928, p.7) goes so far as to place folklore, theology and primate psychology along the same line of scientific development in order to conclude that "the study of simian psychology … affords more in the way of a key to human behavior than all the books on theology ever compiled from the days of primitive folklore to the most abstruse apologetic manual of a contemporary professor of systematic theology." And he continues:

> Even a humorous and avowedly trivial little book like Clarence Day's *This Simian World* will tell one more relevant and cogent things about human nature than all the ponderous tomes of a [Thomas] Aquinas or the collected sermons of a dozen [Dwight L.] Moodys or [Charles H.] Spurgeons [US and UK evangelists, respectively] (Barnes, Mar. 1928, p.7).

Interestingly, this comparison of science and religion ends up also leading science to significant transformations. If the understanding of man as almost an angel or almost

a worm resulted from existential considerations regarding his place in the world, the understanding of man as "the leading member of the simian group" (Barnes, Mar. 1928, p.7), proposed as a replacement for the former, must also meet the same demands for meaning that the earlier "definition" met. In the movement to replace religious understanding of mankind with a scientific one, the latter ends up having to assume the roles traditionally played by religion, such as moral education, guidance and social cohesion, and even clarification of the meaning of life.

In this sense, Barnes (Mar. 1928, p.7) would say, the "implications of the above [definition] for sociology and ethics are very great and far-reaching indeed." According to the author, the "type of behavior and institutions which are best suited to advance human happiness and efficiency must be sought and constructed in conformity with the need of a species of super-simians inhabiting diverse types of geographic environment" (p.7). This means that modern political and social orientation should be based on the scientific study of humans which, in turn, should be based fundamentally on primatology, approached in a comparative manner. But that was not all. According to Barnes (Mar. 1928, p.7), the recent contributions of science as a whole, from astrophysics discoveries to anthropological ones, "have necessitated a complete revolution in the accepted views of the purpose of life." Thus, in a movement complementary to the one analyzed above, science moves towards a territory traditionally occupied by religion – that of the meaning of life – and, in the author's opinion, achieves a new victory there. After all, given modern scientific knowledge,

> This earth can no longer be regarded as a temporary training-camp, preparatory for life in the New Jerusalem. Rather, it can be rationally regarded at present in no other way than as a place in which a man should make himself as happy as possible during his temporary existence here upon earth. Not only 'must the objectives of human life be reduced to a secular plane,' but we must now definitely enunciate and defend 'the right to be happy' (Barnes, Mar. 1928, p.7; emphasis added).

This completes Barnes' defense of the absolute superiority of science (especially biology) in all respects – descriptive and prescriptive, objective and evaluative, biological, sociological and metaphysical – over religion (especially fundamentalist Christianity). Thus, it is understandable why the magazine *Evolution* chose to promote science, represented mainly by the concept of evolution, against fundamentalists and, more broadly, against anything seen as a "repressive force" from the perspective of the "conflict thesis." According to the understanding of several authors of the magazine, evolution expressed a set of values for science and for society, which should be largely secularized, removed from the traditional religious foundation and placed back on an "objective" foundation, in which nature itself, uncontaminated by human error, would express the definitive values for social progress and human improvement.

Final considerations

The aim of *Evolution: a Journal of Nature* was to promote evolutionary thinking in a specific context: the controversy over teaching evolution in schools in the United States in the early twentieth century. Like any environment – such as a laboratory, a field research

camp or an academic conference – the public arena in which this controversy took place had its peculiarities: its own questions, concerns, symbolic references and sensitivities. In order to survive in this environment, the theory of evolution could not be indifferent to these pressures. It had to adapt.

What we sought to illustrate throughout this article was precisely the mutability of the concept of evolution, as it was presented during the years in which *Evolution* was published. From article to article, from editorial to editorial, the concept was transformed, adapting to the specific context in which it was being evoked, answering the questions that were more urgent at that time and ignoring elements considered of little use or unfavorable in public dispute. Sometimes, entrenching itself against dangerous associations and extrapolations, damned in the public imagination, the concept retreated back to the security of objectivity and value neutrality. At other times, offering itself as a guide for solving ethical, political or social challenges, the concept expanded in scope and meaning, moving to completely different arenas for debate. Thus, instead of simply presenting the rudiments of the theory of evolution, omitting details and translating jargon, *Evolution* creatively adapted – with significant ambivalence – the scientific knowledge it endeavored to popularize.

Understanding this dynamic is essential so that we do not lose sight of the lively and necessary interaction between science and society, both in the past and in the present. Even today, the subject of evolution continues to incite debates that go far beyond disagreements on facts or methods.[13] If we want to encourage more fruitful discussions, we cannot ignore the fact that, on all sides of current controversies, as in those of the past, values, society's ideals and even conceptions about the purpose of our existence on Earth are vividly present – they can in no way be disregarded.

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NOTES

[1] The period of national reconstruction after the Civil War was marked by intense industrial development and expansion of urban centers, resulting in new demands, relationships and professional specializations. Society's ability to keep pace with the country's structural changes was a pressing issue during the period. The diversity of proposals for ordering the apparent chaos set the tone for what Hofstadter (1955) called the age of reforms (1890-1940), in which the educational reform mentioned above is situated.

[2] Despite contemporary discussions about the appropriateness of the term "popularization," we chose to maintain the label that the magazine applied to itself.

[3] Katterfeld had emigrated from the German Empire to the United States as a child. He completed his primary and secondary education there and studied sociology at a university in Topeka, Kansas, where he joined the Socialist party. He ran for government office in the state of Washington and, later, was secretary of the party in Moscow. After returning to the United States, he was arrested and, little by little, he distanced himself from the party to dedicate his time to another front: science communication. For a more complete study of the editor's career and life, see Caldeira (2018).

[4] Although older works, such as those by Ludwik Fleck (2010), originally published in 1935, already contributed elements to the discussion, it was the article by Cooter and Pumfrey (1994) that sparked a prolific debate among specialists in the field, intensified by the article by Secord (2004) and highlighted in the Focus section of v.100, n.2, of the journal *Isis* (see Bensaude-Vincent, 2009; Daum, 2009; O'Connor, 2009; Pandora, 2009; and Topham, 2009). An excellent introduction to this debate is the text by Oliveira (2012).

[5] Historian Joe Cain (2003) of University College London made the complete digitized series of *Evolution* public in 2003, accompanied by a three-page general note. Since then, very few works, among them some by Constance A. Clark (2008, 2009), have referred to these documents. A thesis by Caldeira (2018) has been, until now, the only publication that focused on the magazine as the main object of study. The publication is freely accessible through the Biodiversity Heritage Library (BHL) website: https://www.biodiversitylibrary.org/bibliography/7766. Access on: 10 Jan. 2020.

[6] The seminal works related to this thesis are *History of the conflict between religion and science* (1874), by John William Draper, and *A history of the warfare of science with theology in Christendom* (1896), by Andrew Dixon White. For a direct and current counterpoint to this "thesis," see Harrison (2006). For a historiographic assessment of the development and appropriations of the "thesis of conflict," see Hardin, Numbers and Binzley (2018)

[7] We wish to emphasize that the expression "social evolution," in Goldenweiser's phrase, refers to the subject discussed by him in the previous paragraph, the "theory of social evolution as formulated by Herbert Spencer." Therefore, it should not necessarily be understood as a term used and approved by the author.

[8] A disciple of the cultural relativist Franz Boaz (1858-1942), Goldenweiser could not accept the progressive theory of the "steps" of civilizational development, defended by Auguste Comte and also suggested by Spencer.

[9] Although this principle has been strongly associated with Haeckel, variants of this idea were proposed, before and after, by numerous other authors (Mayr, 1994). In Brazil, for example, Fritz Müller, a traveling naturalist from the National Museum in Rio de Janeiro, had already stated in 1864, based on observation of a tuberous annelid, that embryonic development manifested distinct morphological phases, which gradually recalled the structures of "inferior" species. In Müller's interpretation, "primitive historical forms" appeared to be preserved in embryogenesis (Papavero, 2003).

[10] Defending *laissez-faire* economics and morally exempting himself from its monopolistic practices, oil magnate John D. Rockefeller, for example, had asserted that "great business growth is simply the survival of the fittest [and] the operation of a law of nature" (cited in Hofstadter, 1955, p.4).

[11] Francis Bowen (1811-1890), a philosopher from Harvard, had argued, for example in 1849, that the objective study of nature would reveal a system of moral laws in stark contrast to the "taint of egoism" seen in industrial society. In his mind, the modern study of nature should include the "general science of human nature," consisting of the "special sciences of ethics, psychology, aesthetics, politics and political economy" (Jewett, 2012, p.37). Bowen gave this set of topics the name "science of duty." In the same way that the laws of physics and chemistry governed the behavior of the stars and the elements, the laws of the "science of duty" should serve to govern human behavior. Discovering and communicating them was the hope and mission of scientists wishing to restore the desirable, "natural" order of society.

[12] In his *Philosophical Investigations*, Ludwig Wittgenstein (2009) develops the concept of "language games" [*Sprachspiels*], which compares each "language and the activities intertwined with it" (§7) with games, that is, with dynamics governed by their own rules, in which the meaning of the words spoken is not given by the words themselves, but rather by the relationship between the speech (or "move") and the other pieces, moves, limitations and possibilities of the "game." That is, the same utterance, when removed from one game and inserted into another, will inevitably have its meaning altered or even eliminated.

[13] Since 2005, at least 70 anti-evolutionist bills have been proposed in the United States (Matzke, 2016). In Brazil, there are currently two bills under consideration demanding the inclusion of creationism in public and private education (PL 8090/2014, authored by Pastor Marco Feliciano, and PL 5336/2016, authored by Jefferson Campos).

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