COMMENTARY TO G. FOLADORI

IS IT WORTH TO FIT THE SOCIAL SCIENCES IN THE SAME TRACK AS THE STUDY OF BIOLOGICAL EVOLUTION?

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In the late Soviet Union, the official policy was to reduce religious expressions to their minimum, since according to a dictum attributed to Karl Marx, "religion is the opium of the people". Nevertheless, Lenin was embalmed after his untimely death, so that he may lay forever in state, as depositary of the concealed prayers of commoners and *aparatchiks*, which used to queue outside Lenin's shrine at Moscow's Red Square. In the same vein, it was claimed that Darwin's theory of evolution by means of natural selection was the final onslaught of science that finally banished religion to the attic. However, the "ecological niches" left empty by deities and saints expelled from the worldview of those now supposedly enlightened men were rather quickly occupied, on the one hand, by embalmed comrades and sacred pictures of the Holy Party Secretary and, on the other, by the holy orders of "Darwinians", "neo-Darwinians", "ultra-Darwinians", and most recently, "universal-Darwinians or Dawkins' buffs". As a quasi-secular religion, Marxism-Leninism is almost dead. Yet, many Darwinian sects thrive in academic corridors and the popular scientific press. Nowadays, it is rather difficult to distinguish the serious Darwinian biologist from the fundamentalist, although the serious ones usually produce rather restrained evolutionary schemes, derived from their observations or experiments, and remain open to criticism, being conscious of the serious gaps in current evolutionary theory. In contrast, the fundamentalists are keen on devising great, all-inclusive, evolutionary frames,

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presented in the form of amazing "just-so" stories, that connect the anguish of Pre-Cambrian blue-green algae with the current behavior of the stock-exchange and the international markets. Also, they are quick to cast into the creationist hell whoever dares to express any doubt about the story that a yeast cell became and elephant by mere trial and error.

It is against this background that I want to contrast what in my opinion is the core of Guillermo Foladori's paper "*El comportamiento humano con su ambiente a la luz de las teorías biológicas de la evolución*." As I understand, Foladori is worried by the current gene-centered reductionism that permeates contemporary neo-Darwinism. Thus, for him, such a worldview is unable to provide an explanatory framework linking biological evolution to cultural evolution. Therefore, he suggests that a 'phenogenetic' outlook, one that attributes an active role to the phenotype in shaping the evolutionary process, provides the right basis in order to understand the transit from biological to cultural evolution. This is epitomized, according to Foladori, by the "qualitative, punctuated, jump", represented by human labor as the ability to make tools in order to make further tools (*el salto cualitativo que significa el trabajo humano –como fabricación de instrumentos para fabricar instrumentos...perfectamente concebible en el marco de una teoría del papel del fenotipo en la evolución*). For Foladori, the qualitative jump from the culture of "all the other animals" to human culture, results from the phenotype acting upon a dynamic environment that might be modified according to the needs of the very same phenotype. Further on, Foladori hints that a phenotype-based theory of evolution may lead to explain such human phenomena as the social division of labor and the existence of social classes.

One may agree with Foladori in the sense that standard neo-Darwinism, a blend of Darwin's theory with population genetics, is entrenched in a scientific blunder: to attribute the coefficients of selection to the genes instead of the phenotypic traits. In standard neo-Darwinian theory the selective pressures are considered in terms of the impact they might have upon populations and on the evolution of individuals carrying particular genetic mutations within such populations. Moreover, neo-Darwinism is still haunted by the rather primitive notion that "one gene equals one trait;" without considering that genes do not perform as isolated entities and, except for simple biological systems such as viruses and bacteria, the phenotype is to a great extent the result of the concerted but differential expression of the genome at tissue and organ level. Yet, neo-Darwinians agree that selective pressure acts upon the whole organism phenotype constituted by the whole set of traits, though each trait is considered to be associated to a specific gene susceptible to undergo mutation. A single trait is not an isolated entity since it belongs to an organism whose structure and behavior define a system of constraints that determine the

possibilities to withstand and integrate a modification. As it was previously mentioned, the genome is not a collection of genes independent from each other, but a system integrated at the structural and regulatory levels. Thus, the actual impact of any discrete or large mutation in a given gene is the result of its effect upon the integral function of the genome (Aranda-Anzaldo, 1990; Brandon, 1999). The more often than not paradoxical results, obtained in mammalian gene-knockout experiments, in which the phenotype resulting after the specific gene-knockout is quite beyond any rational expectation, constitute the experimental evidence that in complex organisms the effect of single mutations is usually assimilated at the whole genome level and, so, it is completely unjustified to support the naive notion that one gene equals one trait (Routtenberg, 1995). Within a complex systems perspective, biological evolution implies three hierarchical levels: the genome, considered as a hierarchical and interacting ensemble of genes; the phenotype, considered as the non-linear manifestation of the genotype at the organism's level, and the population, considered as a function of reproductive rates and environmental constraints (Weisbuch, 1989).

The example, proposed by Waddington, that natural selection will select for survival and propagation those horses which run faster, thus escaping from predatory wolves, independently of whether such horses run faster because they have some genes that code for a "racing" function or because they were trained by an expert to do so, clearly illustrates the point that selection acts upon the phenotype and not upon the genes (Waddington, 1969). Natural selection is able to "see" phenotypes, but the fixative or discarding effect of selection is possible only upon those traits of the phenotype that are stablile coded in the genotype. This situation leads to the false impression that selection might be acting directly upon the genes, but we must bear in mind that any nucleotide sequence that is not expressed and eventually translated into protein, or that it has no regulatory role upon the expression of other potentially expressed sequences, will never be "seen" by natural selection and thus is liable to "drift" for as long as it has no phenotypic effect associated with it. The genotype is a coding device but its meaning is the phenotype; natural selection is only concerned with meaning, not with the actual coding or enciphering of such meaning (Aranda-Anzaldo, 1997).

Thus, Foladori may be right when suggesting that many basic tenets of neo-Darwinism are wrong. Yet, paradoxically, he fells victim to the very reductionist demon that he was trying to exorcise. The suggestion that there is a need to modify current Darwinism so that it might provide the basis for understanding the relationship between man and its environment, and from there, to bridge the gap between biological theory and the social sciences, is a prime example of classical reductionist thinking.

Foladori claims that one of the main tasks of interdisciplinary studies is to establish a relationship between natural and social sciences. He acknowledges that human culture represents a "qualitative change", yet, all along his paper there is a hint that we only need the right kind of biological theory, *et voilà*, we may explain human biology and human culture within the same theoretical framework. If there is truly a way to establish straightforward continuity between biological explanations and social explanations, then the social sciences shall be no more than higher-order derivatives from mainstream biology. These claims are not far from those of professor Wilson and his sociobiologist followers, and sadly, they include a distant echo from all that nonsense about universal-Darwinism telling us that cultural change is driven by natural selection acting upon "memes" (cultural patterns, behaviors or styles), endowed with the properties of replication, variation and selection (see Blackmore, 2000, for a recent extolling of this pseudo-scientific matter, and Plotkin, 2000, criticizing it).

THE PROBLEMS OF HARD AND SOFT REDUCTIONISMS

Since Aristotle, analogy has been all-important in stimulating scientific creativity. But there are good, bad and bogus analogies. During the last century, the brain has been either a telegraphic central, a telephonic net, and a digital computer. Simple models for complex things are helpful as heuristic devices for initial research on a given subject; therefore, someone may think that the study of insect societies sheds light on the workings of human societies. Still, infatuation with the model leads to unwarranted reductionism. Moreover, modern science is haunted by a metaphysical dogma that affirms the primacy of the simple part over the complex whole and thus, privileges explanations from the bottom up. This is a prejudice far from being scientifically proved. The rather obvious existence of the so-called emergent properties, provides many counter-facts to dogmatic reductionism. There is nothing in the H_2O molecule that may explain the behavior of water flowing through a sink. From the properties of nitrogen and hydrogen we cannot deduce the smell of ammonia.

A basic problem affecting most reductionist schemes is the lack of awareness about the existence of levels of explanation. Thus, when Darwin was writing down his theory or when T. S. Eliot was musing the blank verses of *The Waste Land*, there must have been quantum mechanical processes taking place inside the molecules of their cells. At the same time, relativistic effects were affecting the course of the Solar System through the space and, as such, the movement of both, Darwin and Eliot, through the universe. Anyhow, it would be rather silly to believe there is a set of Schrödinger equations that explain why Eliot decided to quote Edmund Spenser's *Prothalamion* in that line of "Sweet Thames, run softly, till I end

my song," or that Darwin thoughts resulted from the gravitational pull of a long-distant galaxy. Moreover, there is as yet no straight-path connecting quantum mechanics and general relativity, and no hint whatsoever that the principle of natural selection may be derived from any fundamental physical theory. On the other hand, natural selection acts upon systems that satisfy quantum mechanical principles, be it humans or bacteria. However, a given system may be consistent with many different principles that affect the manifold levels of organization, without implying that there must be a given principle from which all the others derive (Aranda-Anzaldo, 1998).

Foladori's phenogenetic outlook might be a more solid and ample-base for modern evolutionary theory, but it is doubtful that it might provide any serious insight with respect to the evolution of human culture. Bacteria may be passive subjects to evolution driven by chance and necessity, but humans have a will to act. Human culture is the evidence of such a will. Obviously, humans are biological entities and biology defines boundaries to human action. Yet, it is unwarranted speculation to suggest that the self-sacrifice of a Kamikaze pilot is in the last term a way of ensuring the survival and fitness of Japanese genes. When a human being drinks wine it is not due to a random encounter with such a liquid in a pond, or because he is driven to such a drink by an innate instinct. Wine is a very complex stuff and there are no rivers of it. There is plenty of water for quenching our animal thirst. Winemaking is the result of both human will and experience. Certainly, the effects of wine on human physiology are directly related to our biological make-up, and some of its components may even mimic the action of endogenous molecules. Further, it would be absurd to pretend that natural selection, acting either upon the human phenotype or genotype, has endowed us with the ability to produce and to enjoy wine, or to pretend that drinking wine is an adaptive feature. Social scientist do a disservice to themselves by pretending to ground their theories in those of the natural or exact sciences. The natural sciences and their theories apply to specific realms of knowledge and experience. Some great blunders of Marxism, such as Lysenkoism in the former Soviet Union, resulted from subduing natural science to political will. However, it would be the same kind of blunder to pretend that we may ground in quantum mechanics or Darwinism the understanding of human history. Foladori refers to a "ecological inheritance" somehow represented by all that stuff from which human culture is made. He is right when suggesting that such an inheritance is quite different from genetic inheritance. But I may add that it is rather superfluous to coin new terms that contribute nothing to further our understanding of human affairs. Among our primitive ancestors appeared some toolmakers, and that most primitive ability to make tools may have something to do with

the particulars of our biological evolution; but man is not only a tool maker. I dare to suggest that the real qualitative jump in human evolution was the acquisition of a conscious will to act and the knowledge about the certainty of our own death. Those attainments uplifted mankind to a very different level, as a truly historical and cultural being; a level about which Darwinism, in its many contemporary guises, has little, if anything, to say.

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