

COMMENTARY TO G. FOLADORI

A PYRRHIC VICTORY
FOR PHENOGENETICS:
A WORLD-ENCOMPASSING
ARTIFICIAL SELECTION

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Foladori's paper is divided in two parts. The first part deals with the general aspect of the creative interaction between organism and environment. The second relates to the specific position of humans, considering the evolutionary continuity together with a qualitative jump as detected by the author; this last part also debates with the ultradarwinist position, especially to its social consequences. The criticism to ultradarwinism should start with the basic biological aspects (see Rose, 1997). To repudiate Dawkins in the sociological field is superfluous, since his biological basis is disputable.

Being a zoologist, my comments will relate mostly to the first part of Foladori's paper.

Lewontin's phenogenetics is in fact part of a much broader current of ideas than those presented by Foladori and will result, when time and maturation comes, in a real "New Synthesis" between the environmentally passive genotype and the environmentally active phenotype. This can be seen also as an eventual final reconciliation between Neo-Darwinism on one side, which has lately left some of the classical Darwinian positions, and a Lamarckism, on the other, which can be seen in a much broader and less crude terms than the original ones. To quote Waddington (1963), the Lamarckian Act of Will should be seen as a situation in which "existing modes of behavior (themselves controlled, with greater and lesser latitude, by heredity) combine with external circumstances to determine the nature of the effective environment." For decades Neo-Dar-

winism had to cope, without a convincing success, with such pheno-induced or facilitated hereditary pathways like the Baldwin effect, Phenocopies and "Genetic Assimilation". Transversal or horizontal genetic exchanges are also more and more admitted, and not only in the behavioral-cultural sense used for this term by Foladori, but as transpositions from an alien genotype. It matters little if the transferred introns result from bacterial, parasitic or perhaps from digested prey organisms, since all these belong to the live environment in which organisms act and reproduce.

Most impressive are the examples provided by parasitology. Environment and natural selection for obligate parasites has an entirely different meaning than the environment and natural selection for free-living organisms. The niche of a parasite is its host, the body and often the homeostatic internal environment of such host, and this is an almost exclusively biotic or "biogenetic" environment. Here we have extreme cases of genome-environment interaction, since the parasites operates a "phenotypic manipulation" in order to improve the selective success of the parasite. According to Poulin (in press), "(The) altered phenotype of the parasitised host can have consequences for host evolution... it can possibly slow down *natural selection*..."

Science magazine, a rather conservative science-establishment journal, has recently discovered that out there are "ecosystem engineers", i.e., species that shape habitats for other species. They even rediscovered the venerable case of the beavers. According to Alper (1998), "The concept (!) of ecosystem engineers may be ready to join an elite set of theories, such as *natural selection* and predator-prey theory, that help explain how species arise and interact." This supposed novelty is strange if one thinks of such classics as the insect societies, where artificial environments are maintained within the colonies, as well as the hundreds of alien species that are clients of these colonial environments. This has been common knowledge since Fabre's times!

Eldredge (1998), considers two parallel hierarchical organization systems in life: on one side, the genealogical hierarchy, on the other, the ecological hierarchy. He emphasizes, more than anyone in the Neo-Darwinian school, that economic success is a precondition to reproductive success and, consequently, the real mechanism of natural selection. Economic-energetic aspects are beginning to be seen as extremely important in evolution. Vermeij (1987), for instance, sustains a "stepwise economic expansion" of animals. The "escalation" in time of predator pressure, as documented by him, is a typical example of how animals "engineered" the whole biosphere.

For Barbieri (1987), selection promotes properties that contribute to the well functioning of the ecosystems. Even old concepts that envisage the

biosphere as a single mega-organism that manages and regulates its own environment has gained some respectability with the “Gaia hypothesis” of Lovelock and Margulis. Accordingly, the biosphere has been capable to engineer the macroclimatic global environment and to keep it within life-sustaining limits, despite the increasing solar impact.

In conclusion to this part, many open-minded evolutionist seem today to dissociate themselves from the exclusive Weissmanian dichotomy of genotype-phenotype and the consequent Neo-Darwinist unidirectional dichotomy organism-environment.

Speaking of the human phase, I would emphasize more than Foladori that there is a gradual accumulation of extra-genetic means of transmission already within the hot-blooded vertebrates, be it immunological information transmitted to the progeny or outright learning and experience exchange. The gradual improvement of the tools of existence has also its roots in evolutionary time, be it the gradual improvement of the beaver dam technology or the gradual, generation-to-generation, amelioration of nest building in birds. It seems to me that Foladori unnecessarily disregards this gradual process in order to emphasize the qualitative jump of humanization.

Foladori rightly mentions Darwin’s artificial selection as a model for his theory of natural selection. He does not mentions however the increased real-time importance of artificial selection. The major symptom of the human-dominate biosphere is the fact that natural selection is being gradually replaced by artificial selection. Gradually, all the rest of the biotic world is coming to live in a global environment modified and engineered by humans (Por, 1996). In a sense, more and more sectors of the world ecosystem are transformed into domesticated and ancillary ones, and even our natural reserves resemble increasingly our gardens. Very soon, humans will be surrounded only by organisms which are either artificial cultigens, tamed animals, culled and managed forests or, at the other extreme, unwanted parasitic and synanthropic species for which the human environment is their “natural” environment. In this process, as it has been already repeatedly said, humans have domesticated themselves too. They can live only in the global-sized beaver lake they built for themselves. Loren Eiseley (1969) put it in a poetical way: “It is as though, instead of many adaptive organisms, a single gigantic animal embodied the only organic future of the world.”

Foladori resumes that in the phenogenetic view “the phenotype adapts (within its genetic limitations) the environment to conform to its own requirements and, by doing this, it modifies the future of evolution”. If this can be said with all certitude already of a stone coral that builds a reef for its own needs, inadvertently creating a new environment for untold

numbers of other species, this can be said many times over of humans. They have modified, deviated and probably limited evolution by means of natural selection to a minimum in the wide world. Instead, inadvertently and intuitively at first, and then increasingly scientifically and morally driven, they replaced it by artificial selection. Bearing in mind the caution of Eiseley, that "the word should be uttered softly, for man's history is not yet done," we have to ask ourselves if we shall reach our own genetic or, rather, our deep structural limitations, if such exist, even if only mentioned in a parenthesis.

In conclusion, I see Foladori's paper as a valuable contribution towards the new synthesis which envisages a feedback relation of genome-phenome, heredity-environment.

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