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SPECIAL FEATURE: DARWINIAN CORE AND POST-DARWINIAN EXTENSIONS

Neutral illusions, selective nightmares and autopoietic madness

Ilusiones neutrales, pesadillas selectivas y locura autopoietica

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ABSTRACT

Until now, there are three evolutionary models: I) The Synthetic Theory of Evolution (STE) also named as the Neo-Darwinian model; II) The Neutral Theory of Evolution (NTE) with its daughter the Nearly-Neutral Theory of Evolution (NNTE); III) The Theory of Evolution by means of Natural Drift (NDTE) (Valenzuela 2007, 2009). All these theories accept that variation of genomes of living beings emerges by mutation. They disagree in relation of the causes of the acquisition and maintenance of the living being organization. STE proposes that the main factor for the acquisition and maintenance of fixated organization is selection and a marginal role of genetic drift. NTE proposed that the acquisition and maintenance of fixated organization is drift with a marginal role of selection, its daughter the NNTE includes besides selection with coefficients similar to the mutation rates. NDTE is derived from the conception of living beings as autopoietic processes, thus the acquisition and maintenance of organization occur by natural drift and living beings are always adapted. The extreme importance given to the factors of evolution, within each theory, has lead to absurd exaggerations that seems now illusions, nightmares or simply madness.

Key words: Synthetic Theory of Evolution, Neutral Theory of Evolution, Natural Drift.

RESUMEN

Hasta el presente existen tres modelos evolutivos: I) la Teoría Sintética de la Evolución, (STE) también conocida como modelo Neodarwiniano; II) La Teoría Neutral de la Evolución (NTE) con su hija la Teoría Casi-Neutral de la Evolución (NNTE); III) La Teoría de la Evolución por Deriva Natural (NDTE). Todas las teorías aceptan que la variación genómica ocurre por mutación, pero discrepan en la importancia de los factores que llevan a la adquisición y mantención de la organización del ser vivo. La STE establece que el factor principal de la adquisición y mantención de los caracteres es la selección natural y concede un rol marginal a la deriva genética. La NTE establece que el factor principal de adquisición y mantención de la organización es la deriva concediendo un rol marginal a la selección; la NNTE agrega efectos selectivos con coeficientes similares a la tasa de mutación. La NDTE, consecuencia de concebir a los seres vivos como procesos autopoieticos, propone que la adquisición y mantención de la organización ha sido por deriva natural y los seres vivos están siempre adaptados. La importancia extrema que se ha dado a los factores de la evolución en cada teoría ha llevado a exageraciones que aparecen como ilusiones, pesadillas o simple locura.

Palabras clave: Teoría sintética de la evolución, Teoría neutral de la evolución, Deriva natural.

Any situation in evolution can be described as two processes: 1) the variation of the genome size or DNA (RNA) quantity; 2) the state of alleles in gene loci or bases in nucleotide sites. The genome size is not the subject of this article. The state of an allele or a base in a gene locus or in a nucleotide site, respectively, may be: fixation, elimination or loss and remaining in a polymorphic state (Valenzuela 2000, 2002a, 2007, 2009). The mechanisms that maintain these three possibilities divide evolutionists in neutralists or nearly-neutralist and neo-Darwinists who propose the Neutral Theory of Evolution (NTE) and its daughter

the Nearly-Neutral Theory of Evolution (NNTE) and the Synthetic Theory of Evolution (STE) or neo-Darwinian evolution, respectively. Both groups of evolutionists accept that mutations (point mutation, chromosome mutation, polyploidy, etc.) are the source of evolution. They disagree in the mechanisms that lead to fixation, loss or polymorphic maintenance of a new mutant allele, base or chromosome rearrangement. For neutralists the main factor that produces fixations, losses or polymorphisms is genetic drift; natural selection plays a marginal role as purifying selection (lethality, sub-lethality,

infertility), but it occurs rarely; the NNTS adds selective processes with selection coefficients similar to mutation rates. For neo-Darwinists the main factor for fixations, losses or polymorphisms is natural selection; drift plays rarely some role (extinctions, founder effect, etc.). However, several conceptual errors did and do not allow to decide which of both models is the correct one; besides that, nobody has dared to propose a value for “rarely” (Valenzuela 2000, 2007, 2009, Valenzuela et al. 2010).

A much extended error is the confusion of gene or base substitution by gene or base fixation. Neutralists developed this idea by making synonymous substitution and fixation. This error is widespread now (Valenzuela 2002a, 2007, 2009, Valenzuela et al. 2010). They showed that the rate of neutral substitution was equal to the rate of neutral mutation and it was independent of the population size (N). However, the mutation rate is a rate of turnover, thus the substitution rate should be (because it should be dimensionally equivalent) also a turnover rate, independent of N . Fixations are substitutions which occurred some time ago and remained at frequency 1.0, for a long period of time or until we study them. Then, the fixation rate is “by definition” a non-turnover rate. Fixations are antithetical to substitutions. A fixation is destroyed by a substitution (Valenzuela 2000, 2002a, 2007, 2009, Valenzuela et al. 2010). The Neutral or nearly-Neutral Theories of evolution are founded in the idea that neutral fixation for paleontological eras is possible. This is a big error.

Fixation is physically (thermodynamically) impossible, due to environment Brownian motion, turbulences and mutations (Valenzuela 2007). Even, our genome in the short time of our lives is unstable and mutations lead us to diseases (such as cancer and metabolic insufficiencies), aging and death (Valenzuela 2009). We see rarely (during some years) our genome mutations, because of repair mechanisms or other mechanisms that get rid off abnormal cells, but when these mechanisms fail due to inherited mutations, individuals having these inherited diseases suffer very often of cancer, immune diseases, or other insufficiencies that kill them in uterus, childhood or youngness. Thus, we see in our lives that natural selection

is strongly operating along with the cell cycle of all our cells. If neutral fixation is impossible, the Neutral and Nearly-Neutral Theories of evolution are also impossible; they were simple an illusions of the error of confusing substitution with fixation. Besides that, as neutralists demonstrated that the rate of neutral substitutions was independent of N , and drift is dependent of N , they, by logical transitivity, also demonstrated that the rate of neutral evolution (substitution) is independent of drift (Valenzuela 2007, 2009). Drift cannot drive evolution, it is a non-directional evolutionary factor, it may change gene frequencies up or down, but its evolutionary contribution is “by its definition and its constitution” zero (Valenzuela 2007, 2009). In modeling neutralists confounded the absorption states (or barriers) of stochastic matrices with the biotic states of fixation and loss. With forward and backward mutation rates, fixations and losses are impossible as stated and demonstrated by Wright and Feller more than 50 years ago (Valenzuela 2007, 2009). Even though, neutralists read these articles, they did never understand them properly. They thought and said that Wright changed his idea of drift, instead (Gould 2002).

In fighting with neutralists, neo-Darwinists hardened their positions and thought evolution as a pan-selective process: every allele or base that is (not) present in a locus or site, either fixated, lost or at a polymorphic state, is in this situation because it is so adapted (the pan-adaptationism program). When selectionists proposed that polymorphisms maintained by heterozygous advantage were the proof of neo-Darwinian evolution, they did not have the proportion of polymorphic loci that existed in natural population (they did not realize that this is not valid for haploid organisms). When the proportion of polymorphic loci was estimated and it was found that near 10 % of loci were maintained polymorphic, the model of maintenance of polymorphisms by means of heterozygous advantage fell down, because the impossibility to maintain any population due to homozygous disadvantage (any individual should be negatively selected by one or more loci at the homozygous state). Neutralists believed they had won the battle, because for them, polymorphisms were transient states in the way to fixation or loss, thus any proportion

of polymorphic sites could be possible. However, genome studies came, and now in haploid organisms (viruses and bacteria). These genome studies have revealed that the polymorphic state is exceptionally found. Now working with nucleotide sites, genome studies show that most sites has the same nucleotide base (monomorphism), that is maintained, not only in a given population, but in species, genera and higher taxa. For each polymorphic site found in a population, there are hundreds or thousands of "fixated" bases (monomorphic sites) in the genome. Thus, the main feature of evolution is not variation, but maintenance, or better, it is, quantitatively, small islands of variations in an ocean of invariant genome forms. The most important feature of the Galapagos' finches is not the Darwin's proposition of adaptation of their beak to the fruit they ate, but that they remain as finches (this may be controversial for a more precise taxonomy), birds, vertebrates, chordates, eukaryotes and living beings, for millions, hundreds of millions or thousands of millions of years. How could this invariance be acquired and can it be maintained? This seems a recursive nightmare that sends back us to be tempted to give only one answer: an ocean of pan-selective invariant sites that leave a small proportion of them that could vary in a less selective form and even giving some place for non-selective sites (that could vary by drift). The neutralist or nearly-neutralist answer that this ocean of monomorphic forms were acquired by neutral substitutions and are maintained as neutral fixations or by very weak selection, in spite of they are not so maintained within individuals, is simply irremediable madness.

In parallel with the development of evolutionary theories, there was a development of life theories or theories of living beings. One of these theories proposes that living beings are autopoietic processes. In short, an autopoietic process is a net of processes that produces or generates this net of processes; a self-organizing organization. Autopoiesis was proposed by Maturana and Varela as an invariant condition of living beings (their characteristic or specifying trait). Natural selection is impossible within the autopoietic approach. Living beings are all adapted because they are alive and they are

autopoietic. Autopoiesis is the invariance of invariant conditions for being a living being. Then, how could and can the living diversity (variants) be produced, if living beings are invariant (in their core) beings? The answer came from R. Berrios, who proposed phenotype drift to generate diversity (Maturana & Varela 1984). Maturana asked Berrios if natural drift could be better than phenotype drift, and this term was accepted (R Berrios, personal communication, 1997). Natural drift is the morphological change that is produced by any mechanism (genetic, epigenetic, environmental, etc.); it is conceived to occur by simple or random variation (Maturana-Romecín & Mpodosis 2000). At this point, the reader should know that I write this section by following what I think I understand on this mysterious theory and because I share my office with R. Berrios. Morphological natural drift is morphogenetic random walk. A fly wing may increase or decrease its dimensions, size or shape by random variation of its axis or veins. How much of evolution (if something) has occurred by natural drift? We named friendly "autopoions" those colleagues and professors working in autopoiesis. Neutralists based their theories in neutral maintenance of polymorphisms and fixation, autopoions base evolution in natural drift and the invariance of adaptation and autopoiesis. Unfortunately natural drift and autopoiesis are completely insufficient to produce ontogeny and phylogeny. A caterpillar is as autopoietic and adapted as the butterfly it produces, thus the metamorphosis cannot be produced by autopoiesis, because an invariant cannot yield a variant. How could *Homo erectus* (or some ancestor) become *Homo sapiens* if both are equally autopoietic? Another very important restriction of natural drift (as well as neutral evolution) is its condition of reversibility (Valenzuela 2007, 2009). The phylogenetic transformation of the species (taxon) A to species (taxon) B (prokaryotes to eukaryotes), should be equally probable as the transformation of B into A (eukaryotes to prokaryotes). This has never been found in evolutionary studies. We see convergence but not reversibility (Valenzuela 2007, 2009). On the other hand, any part of a morphological context, as for example the nose in the face between the eyes, should be found at any

region of this context. Cyclops with a proboscis over the unique eye are seldom seen (as human monsters), but they are almost always non-viable individuals (natural selection). Living beings are not autopoietic beings, they do not produce an organization that organizes them, and they receive their organization from their ancestors (Valenzuela 2007). Living beings are not adapted, they are adapting at any moment of their lives; at any moment they can become ill or die. The challenges of inner changes (mutations) or outer changes (environmental changes, accidents) can or cannot be overcome. To think that organs, tissues or systems evolve by Brownian motion within bodies is also madness.

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