BOOK REVIEW

Flegr J., 2008: Frozen evolution. Or, that's not the way it is, Mr. Darwin.
Charles University in Prague, Faculty of Science. 224 pp., ISBN: 978-80-86561-73-8.

This book was translated from Czech original published by the Academia Publishing House in 2006. The English version of the book is really welcome because its contents address wide audience of biologists interested in evolution. The concept of evolution proposed by Jaroslav Flegr is both original and unorthodox, and the book presents rather provocative ideas. The basis of the Flegr's explanation of evolutionary phenomena is that vast majority of species does not evolve because it is not evolutionarily plastic enough and not willing to respond to selective pressures of the environment. The species are mostly not able to do so, and they are called evolutionarily frozen in this book. This heretical thinking is inspired by the theories of punctuated equilibria by S.J. Gould and evolutionarily stable strategies by J. Maynard Smith, however, its conclusions go considerably behind this ideological background.

Classical darwinism and neodarwinism are based on competition of individuals within a species for the greatest biological fitness. In accordance with Richard Dawkins, Flegr argues that the genotype is not simply heritable in sexually reproducing organisms, but it is created anew in each generation by mixing the alleles of the parents. If biological fitness is thus not inherited amongst sexually reproducing organisms, then the basic mechanism and main driving force for Drawinian evolution, natural selection, can also not function. Therefore, concepts of darwinism or neodarwinism have become substituted by the theory of selfish gene assuming that the driving force for evolution is competition between various variants of a single gene. However, J. Flegr is convinced that even Darwinian evolution of adaptive traits based on competition of alleles within a single locus cannot work in sexually reproducing organisms. Similarly as the genotype, also the effects of the individual alleles in the phenotype of their bearer and on his biological fitness change from one generation to the next because of various effects of gene interaction. Most traits are affected by interactions amongst a large number of genes and thus even the selfish gene theory of inter-allele selection cannot explain the evolution of adaptive traits in sexually reproducing organisms. The overall chance of certain alleles in evolution cannot be expressed in terms of selection coefficients or fitness. The progress of competition of various alleles cannot be described by the laws of selection but the mathematical apparatus of game theory must be used for this purpose. Therefore, in sexually reproducing organisms, neither Darwinian individual selection nor Dawkins – Hamiltonian competition of alleles can function. The contemporary, still neodarwinistic understanding of evolutionary biology is most probably erroneous from its very foundations and requires fundamental re-examination. Long experience with the low fitness of improved races of domestic animals and their spontaneous gradual return to the phenotype of their wild ancestors shows that the mechanism proposed by Darwin for biological evolution could hardly function in sexually reproducing species.

The new theory assumes that the vast majority of species are not capable to evolve even when exposed to extremely strong selection and thus only passively wait until changes in their environment cause their extinction. The inability of most sexually reproducing species to respond evolutionary to selection pressure can be harmonized with our experience that the evolution of sexually reproducing species obviously occurs. If a new species is formed from a small and isolated population, then it will take with it from the parent population only a small part of the genetically determined variability and, as a consequence of the resultant genetic similarity or identity of the individuals of the population, can be subject to Darwinian evolution. After a period of time, the gene pool of the new species accumulates new variability and the species again evolutionarily freezes. This is the theory of frozen plasticity.

The punctuated character of evolution of sexually reproducing organisms is manifested as the almost instantaneous formation of a fully developed species and its invariability over the remainder of its existence is fully in accord with the conclusions of the theory of frozen plasticity. Asexual species have greater evolutionary plasticity and this allows them to occupy more extreme environments and utilize unusual natural resources. On the other hand, their capacity to coexist with other species is limited.

The theory presented in the book aims to postulate new paradigms of current evolutionary biology. It is quite probable that many arguments of J. Flegr will be discussed and criticized, and his predictions are available for detailed testing. However, such discussion and testing of the proposed hypotheses may be extremely fruitful and may open new and fascinating horizons of future research.

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