

## Section 9

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### FUNDAMENTAL UNITS AND REDUCTIONISM IN EVOLUTIONARY BIOLOGY

The hierarchical structure of natural phenomena has caused much confusions in most, if not all, scientific disciplines, including evolutionary biology. The traditionally 'uni-level' thinking of the majority of scientists has been in variance with the hierarchical structure of natural phenomena and prevented those scientists from the sophisticated insight into the nature of the multilevel phenomena. This discrepancy has been repeatedly causing certain methodological mistakes, which again and again appeared in the history of scientific disciplines and often caused deceleration of their development, or even led the scientists astray. In the present paper, some of these methodological mistakes will be briefly discussed. They will be illustrated with examples from the field of evolutionary biology, particularly in respect to the theories of heredity, taxonomy and evolution proper.

The set of mistakes to be discussed below is initiated by the subjective, non-scientific, and usually unconscious evaluation of the hierarchical levels pertinent to the particular phenomenon the scientist is studying. A decision is usually reached that not all of these levels are equivalent. In consequence, usually one level is then chosen which begins to be considered as central. If that level is considered lowermost at the same time, it is usually called 'fundamental'. At this stage of development the unconscious phase ends and the problem is 'transferred' to the conscious, scientific world. Since science, as such, has its roots in a more or less unconscious pre-scientific knowledge, it is understandable that a belief became widespread in the science, that a certain level is central in any case. The latter belief is clearly incorrect, although it holds that one or more levels may be more significant than others from certain viewpoints, or in certain respects, or it/they may be more easily studied, or understood. Each of these arguments may substantiate the selection of a certain level as 'central' from the point of view of our cognition, but neither of them substantiates the 'recognition' of that level as ontologically central, or even fundamental. However, this shortcoming occurs very frequently in current science.

We can now discuss directly the situation, when a certain level is already established as fundamental. It is possible to skip here

the more general situation, when the level is considered central, because what applies to it will follow from the discussion below.

The first methodological problem is immanent in the notion of the fundamental level, namely the level is considered fundamental. It means that units /entities/ organised at such a level are considered indivisible. Such atomistic approaches are widespread in science. In the field of evolutionary biology they appeared most importantly in the theory of genes, which were considered indivisible, fundamental units of heredity for long time, a concept which has been surpassed only in the late 1950s/early 1960s [see 6]. Similarly, species are usually considered indivisible, fundamental units of evolution.

Another methodological mistake frequently associated with the notion of fundamental levels is that these levels are considered universal. This may be best illustrated by the species notion. Although species are units organised at the population level, which is not reached — primarily or secondarily — by all organisms [cf. 4], they are repeatedly considered universal. This has led to creation of such theoretical artifacts, as the concept of agamospecies [see 5]. Moreover, the logic of this assumption is sometimes reversed and those concepts which do not obey it are rejected as incorrect. On the other hand, it is useful to detect in studying a phenomenon such levels which obey the assumption of universality. If there are more such levels in some particular case, it is useful to detect the one which is the lowest of them. On the basis of this criterion I believe, for example, that the generic and not the species level is the lowermost universal, natural level in taxonomy and, consequently, in biological nomenclature.

Still another methodological pitfall is here the reality of units organised at the fundamental level. I do not wish to enter here into the aged disputations between realists and nominalists. However, I will stress here that these disputations are frequently 'won' by realists when the units under question are the fundamental units, while it is often 'won' by nominalists when the units under question are organised at some higher level. This may be best illustrated by taxonomy. Here, species are considered fundamental and really occurring in nature, while higher taxa /genera, tribes, families, etc./ are usually considered unreal. Despite this, it seems now that some of the higher taxa are also real [see 1, 2, 3].

The last methodological pitfall associated with the notion of fundamental units, which will be discussed here, is reducibility. After a certain level is established as fundamental, the frequent opinion is that all phenomena which occur at higher levels are reducible to those occurring at the fundamental level. This is often assoc-

iated with the conjecture that the units organised at the fundamental level are real, while those organised at higher levels are not /see above/. This methodological mistake appeared in a very distinct form in the history of the heredity notion, where heredity has been reduced to the genetic level. This mistake is being overcome only in 1980s [see 7]. Another example is the attempt to reduce the evolution phenomenon to the population level, which has been most distinct in classical neo-Darwinism and, again, is being overcome only in 1980s.

It may be concluded that no fundamental levels exist, but that all levels are fundamental in a certain sense. This does not mean, however, that certain levels cannot be considered fundamental for practical purposes at certain stage /or stages/ in the development of science. Due to space limitations, only some of the most significant methodological pitfalls associated with the notions of fundamental level and fundamental units could be discussed. However, it is hoped that even this short note will help in the understanding of certain errors which have occurred in the history of particular scientific fields and to overcome certain erroneous conjectures which still prevail in various fields of scientific activities, including evolutionary biology.

#### R e f e r e n c e s

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