SOLAB

On the structural analogies between phonemes and nucleotides

Suren Zolyan[1]

1. Institute of Scientific Information on Social Sciences, the Russian Academy of Sciences, Moscow, Russia

Abstract

The only prominent molecular biologist who likened nucleotides to phonemes was Fr. Jacob, probably influenced by his interlocutor, Roman Jakobson. Phoneme, unlike sound, is an element of the language system and is defined as a minimal set of distinctive features. Extrapolation of this methodology to the genetic code (GC) leads to a distinction between a nucleotide as a biochemical element and a nucleotide as an intra-system abstract unit. The differences between nucleotides can be represented as two pairs of binary oppositions based on two distinctive features: the number of carbon ring bases (two vs. one); the number of hydrogen bonds: three (G; C) or two (A, T/U). These are the differential features that can be considered the minimal units of the GC. Their ontology is determined by intra-system encoding and decoding operations.

The GC may be represented as a superposition of two coding systems: (a) quasi-triplet (32 codons can be represented as “doublet + comma” when the third position separates triplets from each other); and (b)semi-triplet - 30 codons are coded according to the principle: “doublet+ purine” or “doublet + pyrimidine”. The proper triplet coding is observed only in two codons encoding tryptophan and methionine when all three positions are relevant. One can find the gradation of coding complexity: quasi-triplet; semi-triplet; proper triplet, and context-dependent triplet (methionine/start-codon).

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Email: Surenzolyan@gmail.com

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