Chapter 8

The Evolution of the Genetic Code from the Viewpoint of the Genetic 8-Dimensional Yin–Yang–Algebra

ABSTRACT

The set of known dialects of the genetic code is analyzed from the viewpoint of the genetic 8-dimensional Yin-Yang-algebra. This algebra was described in Chapter 7. The octet Yin-Yang-algebra is considered as the model of the genetic code. From the viewpoint of this algebraic model, for example, the sets of 20 amino acids and of 64 triplets consist of sub-sets of “male,” “female,” and “androgynous” molecules, and so forth. This algebra allows one to reveal hidden peculiarities of the structure and evolution of the genetic code and to propose the conception of “sexual” relationships among genetic molecules. The first results of the analysis of the genetic code systems from such an algebraic viewpoint speak about the close connection between evolution of the genetic code and this algebra. They include 7 phenomenological rules of evolution of the dialects of the genetic code. The evolution of the genetic code appears as the struggle between male and female beginnings. The hypothesis about new biophysical factor of “sexual” interactions among genetic molecules is proposed. The matrix forms of presentation of elements of the genetic octet Yin-Yang-algebra are connected with Hadamard matrices by means of the simple U-algorithm. Hadamard matrices play a significant role in the theory of quantum computers, in particular. It leads to new opportunities for the possible understanding of genetic code systems as quantum computer systems. Revealed algebraic properties of the genetic code allow one to put forward the problem of algebraization of bioinformatics on the basis of the algebras of the genetic code. The described investigations are connected with the question: what is life from the viewpoint of algebra?

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INTRODUCTION AND BACKGROUND

This chapter is devoted to the first results of investigations of the evolution of the genetic code from the viewpoint of the genetic octet Yin-Yang-algebra, which was described in the previous Chapter 7. Owing to discovery of the connection of this algebra with the genetic code, new opportunities arise for algebraic systematizing and classification of binary-oppositional structures in molecular-genetic ensembles. Notions and formalisms of this algebra are used here to analyze ensembles of genetic molecules in connection with a traditional theme of male and female beginnings in living substance on various levels. This algebraic way leads to revealing a set of phenomenological rules of evolution of the genetic code and to new possibilities of understanding some interrelations between elements of molecular-genetic ensembles. New notions of “sexual” types of the triplets and amino acids can be proposed on a well-reasoned mathematical basis. The results of these investigations and of applications of such new notions are described and discussed.

The theme of male and female beginnings and biological reproduction, which is connected with them, is one of the main themes in human civilization. This binary opposition – man and woman - exists in different forms in many theories in the fields of psychology, biology and culture, etc. Existence of male and female types in psychology, of male and female chromosomes, of male and female gametal cells, etc. is known widely. This primeval theme presented in religions and myths of all times and people. For example, in Ancient China female and male beginnings (Yin and Yang) were considered as the main operating forces in the world, and the world has been created by them. The spiritual philosophical doctrines of the East, which are presented in many ancient books, asserted, that the soul at initial stage of its creation united both male and female beginnings and, in that way, the soul reflected the dual nature of the Creator.

Initial representations about bisexual nature of human being have been formulated in folklore and mythology of many nations of the world. In particular, these representations were developed by an ancient philosophy. For example, Plato’s narration is known concerning androgynous beings from which modern people have been brought into the world. According to Plato, love is the instinctive aspiration of individuals, who love each other, to uniting them with their return to the initial state, which was before its division into two. Modern psychology considers bisexuality as the fundamental characteristic of constitutional nature of human being. And the notion of androgynous being is considered as a fixation of this duality which includes always the male and female beginnings but in the different proportions, which can be changed during a life. Many famous philosophers have presented to people a wide set of valuable thoughts about male and female beginnings of being and about nature of sexual relations of men and women. People have gotten accustomed to seeing mutual relations between men and women. A vast set of works in various fields of culture is devoted to these relations. It is considered ordinary that male and female beginnings in nature are necessary to continue life and its development (Bull, 1983; Geodakian, 1999; Karlin, & Lessard, 1986; Maynard Smith, 1978; Mooney, 1992; Williams, 1975).

The tendency of thinkers to reflect the natural fact of male and female beginnings on a formal language is known from the ancient time. For example, thoughts about fundamental meanings of male and female beginnings are reflected by thinkers of Ancient China and of the Pythagorean School into the thematic division of the series of natural numbers, where even numbers embody the female beginning (Yin) and odd numbers embody the male beginning (Yang).

Alternation of even and odd numbers in a series of natural numbers was considered as the form of an interpenetrating in the union of male and female beginnings. Especial value was given to the basic
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