

Psycholinguistics and the Search for Extraterrestrial Intelligence

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The author of the article reveals the possibilities of psycholinguistics in the identification and interpretation of languages and texts of Alien Civilizations. The author combines modern interdisciplinary research in psycholinguistics with the theory “Evolving Matter” proposed by Oleg Bazaluk and concludes that the identification of languages and texts of Alien Civilizations, as well as the communication of terrestrial civilization with Extraterrestrial Intelligence, is in principle possible. To that end, it is necessary to achieve the required level of the modeling of neurophilosophy and to include these achievements of modern psycholinguistics studies: a) language acquisition; b) language comprehension; c) language production; d) second language acquisition. On the one hand, the possibilities of neurophilosophy to accumulate and model advanced neuroscience research; on the other hand, highly specialized psycholinguistic studies in language evolution are able to provide the communication of terrestrial civilization with Extraterrestrial Intelligence.

Keywords: psycholinguistics, neurolinguistics, neuroscience, neurophilosophy, neuroevolution, text, language, evolution of language, SETI, Alien Civilizations, extraterrestrial intelligence.

Introduction

In this article, we combine the current achievements of psycholinguistics and neurophilosophy and answer the question: how psycholinguistics is able to help us in our search for Extraterrestrial Intelligence (SETI).

The author draws attention to, first of all, the relationship between psycholinguistics and neuroscience, cognitive science, linguistics, and studies it with a focus on neurolinguistics. The author is more interested in the achievements of psycholinguistics and neurolinguistics, by studying the brain processes language, as well as the evolution of language features at the scale of the Earth. The following research areas are important for us in psycholinguistics: a) language acquisition; b) language comprehension; c) language production; d) second language acquisition. The book “The Oxford Handbook of Psycholinguistics” brings together the views of the seventy-five leading researchers to provide a review of the current state of the art in psycholinguistics [The Oxford Handbook, 2007].

Currently, there are several understandings of neurophilosophy. The first understanding concentrates on the traditional research of the philosophy of mind, studying the causal relationship between brain and mind. The modern achievements in this field are collected and analyzed in the book “LOT 2: The Language of Thought Revisited” by Jerry A. Fodor [Fodor, 2008]. In the book, Fodor provides an update on his thoughts concerning a range of topics, including The Representational Theory of Mind (RTM).

The second understanding of neurophilosophy is based on the analysis and synthesis of neuroscience achievements. It is more the philosophy of neuroscience than the philosophy of mind. Patricia S. Churchland's works are considered significant in this area. For example, the book "Brain-Wise: Studies in Neurophilosophy" gives an up-to-date perspective on the state of neurophilosophy. According to Churchland, neurophilosophy should be drawing on the results of the research at the neuronal, neurochemical, system, and whole-brain levels [Churchland, 2002].

In this article, we present the achievements of neurophilosophy in the traditions that were laid by Francis Crick [Crick & Koch, 1990; Crick & Koch, 2003], Patricia S. Churchland [Churchland, 2002], Christof Koch [Crick & Koch, 2003; Quiroga et al, 2005] and others, i.e., with a focus on the study results in neuroscience. At the same time, taking into account the particularities of the journal and the declared topic, we will base our reasoning on Oleg Bazaluk's research [Bazaluk, 2014; Bazaluk, 2015; Bazaluk, 2016]. Bazaluk projects the modern achievements in the philosophy of neuroscience on space exploration. Furthermore, he considers neurophilosophy as a key discipline that summarizes the achievements of neuroscience on the planetary and cosmic processes. [Bazaluk, 2016].

The Search for Extraterrestrial Intelligence (SETI) and Language

The modern achievements in the search for Extraterrestrial Intelligence are presented, for example, in the works of Lev Gindilis [Gindilis, 2004], Alexander Panov [Panov, 2008], Paul Shuch [Shuch, 2011], etc. One of the main problems of SETI is the identification and interpretation of languages and texts of Alien Civilizations. The basis for communication between terrestrial and extraterrestrial civilizations is to find a common, understandable language. However, we have already established that the identification and interpretation of languages and texts are the major area of research in psycholinguistics. Psycholinguistics possibilities of identifying and interpreting texts in the anthropocentric paradigm have been reviewed in a number of works [Krotenko, 2012; Krotenko, 2012a; Krotenko, 2016]. The author believes that the experience and achievements of psycholinguistics in the identification and interpretation of languages and texts of early terrestrial civilizations should be used for the identification and interpretation of languages and texts of Alien Civilizations, to establish a language of communication with them.

We need to make a connection between psycholinguistics and SETI. At first view, they are completely different areas of research. We need to determine the initial research space, recognized by scientists from both the field of the Search for Extraterrestrial Intelligence and the field of psycholinguistics.

The author suggests considering such a space as *the field of neuroevolution*.

Neuroevolution and the Evolution of Language

In the article "The Faculty of Language: What Is It, Who Has It, and How Did It Evolve?" the authors submit "that a distinction should be made between the faculty of language in the broad sense (FLB) and in the narrow sense (FLN). FLB includes a sensory-motor system, a conceptual-intentional system, and the computational mechanisms for recursion, providing the capacity to generate an infinite range of expressions from a finite set of elements. We hypothesize that FLN only includes recursion and is the only uniquely human component of the faculty of language. We further argue that FLN may have evolved for reasons other than

language, hence comparative studies might look for evidence of such computations outside of the domain of communication (for example, number, navigation, and social relations)” [Hauser et al, 2002].

At present, the Evolution of language is a widely studied subject field. For example, in the book “Approaches to the Evolution of Language: Social and Cognitive Bases,” one of the first systematic attempts to bring language within the neo-Darwinian framework of modern evolutionary theory was made. It presents the studies by linguists, phoneticians, anthropologists, psychologists and cognitive scientists explore the origins of the complex structure of human language, emphasizing its social (as opposed to purely practical) bases, and showing the mechanisms by which this structure emerges, is maintained, and develops [Approaches, 1998]. “The Oxford Handbook of Language Evolution,” published in 2012, presents critical accounts of every aspect of the field. The book’s five parts are devoted to insights from comparative animal behaviour; the biology of language evolution (anatomy, genetics, and neurology); the prehistory of language (when and why did language evolve?); the development of a linguistic species; and language creation, transmission, and change [The Oxford Handbook, 2012].

Studies in this area prove that the evolution of language is, in essence, a particular case of neuroevolution. This is especially evident in the theory “Evolving Matter” by Oleg Bazaluk, who studies this issue from the point of view of the theory of evolution. Bazaluk considers neuroevolution not only as a logical stage of continuous and nonlinear complication of the Earth’s biosphere but also as a natural stage of the complication in the Universe. From the theory “Evolving Matter” it follows that [Bazaluk, 2016]:

1. Neuroevolution at the scales of Earth is a continuous and nonlinear complication of neurons in neuronal populations, systems and ensembles. At the scales of the Earth, this complication covers a period of hundreds of millions of years.
2. It is through neuroevolution that the mammalian brain was formed, and then the transition from the brain of mammals to hominids occurred.
3. The human brain was formed through neuroevolution: at first, a neural ensemble of the subconscious, and several hundred million years later - a neural ensemble of consciousness.
4. Neuroevolution is a complication of the key Wernicke’s and Broca’s speech areas in the evolution of the language, as well as the prefrontal cortex.
5. Neuroevolution is a process, which naturally occurs at any point of the Universe, in which certain physical and chemical conditions are met.

The identification and interpretation of languages and texts of Alien Civilizations

The understanding of neuroevolution, which follows from Bazaluk’s evolving theory, and in which the evolution of language is presented as a special case, allows us to draw the following conclusions:

1. Marc Hauser, Noam Chomsky, and W. Tecumseh Fitch have noted that in the evolution of language there are actually many “uniquely human components of the faculty of language,” which can hardly be transferred to the forecast, study, and interpretation of the cognitive, affective, and behavioral aspects of extraterrestrial organisms [Hauser et al, 2002]. About the features of understanding extraterrestrial intelligence (ETI), Albert A. Harrison wrote in his early articles [Harrison & Elms, 1990]. We agree with the conclusions of these authoritative scholars; however,

- we believe that the problem of language evolution should be considered from a more general viewpoint, studying it as the evolution of language of the Intelligent Matter, as it follows from Bazaluk's theory "Evolving Matter" [Bazaluk, 2016].
2. Bazaluk's theory of "Evolving Matter" indicates the universal nature of processes that occur at the scales of the Earth and the admissibility of their transfer at the scales of the Universe. Bazaluk's evolving theory asserts that we can use the main features of the evolution of language at the scales of the Earth for the identification and interpretation of languages and texts of Alien Civilizations. As a special case, this provision is confirmed, for example, by the promising model for extrapolation from terrestrial to extraterrestrial life [Harrison, 2002]. We can assume with a high degree of probability that neuroevolution and the evolution of language of all cosmic civilizations can in principle have common identification markers. This allows us to use the research results in psycholinguistics and neurolinguistics for understanding neuroevolution of Alien Civilizations.
 3. Bazaluk argues that the main space for self-realization of the human brain is the logosphere. He writes: "Starting from quipus and finishing with modern multi-billion book editions, IT technologies, the internet and others, the virtual material method of transmission of the artificial products of human activity denotes with the help of symbols, gives meaning, stores and transmits different semantic structures, namely, memes" [Bazaluk, 2016: 116]. The term logosphere is synonymous with the term semiosphere, which was coined by Yuri Lotman in 1982 [Lotman, 2001]. Bazaluk uses the term logosphere, arguing that: a) the concept of the logosphere contains more history of language, which starts with the ancient Greeks; b) the logosphere is a product of noogenesis; therefore, it unites much more meanings than a highly specialized concept of the semiosphere. The achievements in neuroevolution, sociocultural evolution and evolution of technology, i.e. from all areas of human activity are presented in the logosphere. In the logosphere, the products of neuroevolution, socio-cultural evolution and the evolution of technologies generate, accumulate, systematize and transmit by inheritance the meanings of ideas, values, and ideals. In the logosphere, also, evolution of language products accumulate, which reveal the history of civilization development, its modern level of development, and also allow making certain forecasts for the future.
 4. The current state of the logosphere of Earth allowed John Elliott to implement inter-language analysis by incorporating languages from all the major languages families and on its basis to propose the design of the language, which ultimately will be made available to SETI [Elliott, 2011]. Elliot has done a great deal of work and his results worth studying.

However, in our view, Elliott's results have an inherent error about which Marc Hauser, Noam Chomsky, and W. Tecumseh Fitch warned [Hauser et al, 2002]. The results obtained by Elliott depend too much on the features of human development at the scales of Earth and are not as abstracted as Bazaluk's evolving theory requires. Our research shows that there is no sense to use words and phrases, by establishing contact with alien civilizations. One can assume with a particularly high degree of probability that extraterrestrial intelligence will perceive words and phrases as a set of sounds, as the baby's brain does, or a man who does not speak a foreign language. It is through the connection of neuroevolution with the history of culture, or according to Bazaluk's terminology — noogenesis, a man is able to identify

and interpret the meanings of his language and texts. Neuroevolution of Alien Civilizations is connected with its cultural history, so the meanings that it includes in its language and texts will be completely incomprehensible to a man. In general, we support the conclusions of John Elliott and agree that “Using a combination of knowledge gained from devising methods for detecting and decoding language, communicating with lost tribes, and Corpus linguistics, it is believed a comprehensive framework for natural language can be designed for communicating with an extraterrestrial civilisation and thereby be an integral part of any interstellar message” [Elliott, 2011: 423]. However, in our view, the research results obtained by Elliott cannot be used for the initial contact. They are, for the most part, applicable to closer and more continuous attempts to establish communication with extraterrestrial civilizations. Our study showed that at the initial contact with alien civilizations “a corpus of at least 20,000 words,” proposed by Elliott [Elliott, 2011: 423], will be perceived by extraterrestrial intelligence as a set of sounds, but not as a set of meanings that are important to establish a favorable interpersonal relationship.

Conclusions

Our study of the possibilities of psycholinguistics in the identification and interpretation of languages and texts of Alien Civilizations allows us to draw the following conclusions:

1. The initial contact with alien civilizations is possible at the level of drawings, graphics, sounds, facial expressions, gestures, etc. That all depends on what senses are involved in communication with extraterrestrial intelligence, a distance and the number of participants in communication. The primary contact with alien civilizations least of all needs words and phrases.

2. The identification and interpretation of languages and texts of Alien Civilizations is possible in the second stage of communication, by establishing the main markers for the identification of extraterrestrial intelligence: a) the level of neuroevolution and, accordingly, the perfection of the brain; b) the features of noogenesis and, accordingly, the level of achievement in sociocultural evolution and the technology evolution of extraterrestrial civilizations.

3. From Bazaluk’s evolving theory, it follows that the Alien Civilizations, which come into contact with our earthly civilization, already have certain communication skills. For their part, this is a conscious action that obliges representatives of an extraterrestrial civilization to prepare carefully. There is no doubt that an extraterrestrial civilization will be prepared for a dialogue with the earthly civilization, and after knowing neuroevolution features of the Earth, they will propose various ways of establishing contact. It would be wrong, in our view, to broadcast signals of our existence, having no experience in communication with extraterrestrial intelligence, but most importantly the necessary level of perfection of the logosphere and the technosphere to understand extraterrestrial intelligence and for interstellar message construction. We should be prepared to contact with alien civilizations.

4. The establishment of communication with extraterrestrial intelligence, or vice versa, extraterrestrial civilizations with earthly civilizations, is intended to be indicative and massive. The establishment of contacts between civilizations cannot be connected with single cases, about which the mass media writing. A contact between civilizations is an indicative action that takes place in several stages:

- a) Cognition of the features of noogenesis of civilization: a combination of factors of neuroevolution, sociocultural evolution and the evolution of technology.

- b) The evaluation of communication capabilities of the civilization, establishing the degree of aggressiveness.
- c) The choice of communication space, and the ways and means of its provision.
- d) Clear formulations of communication goal and confidence in their correct identification and interpretation.

5. Contacts between civilizations are carried out without intermediaries, with the involvement of a sufficiently large number of participants. The civilization that initiates communication must show its openness, benevolence and convey the reason for its desire to establish contact. From Bazaluk's evolving theory, it follows that between space civilizations there is competition for resources and favorable space for the evolution of the Universe. Therefore, any civilization initiating contact with another civilization must accurately and convincingly convey its unselfish initiative and prove the mutual benefit of the Commonwealth. Establishing contact for the sake of contact will unambiguously cause misunderstanding of highly developed civilizations and rejection. This is not a logical step, from which ambiguous consequences following.

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