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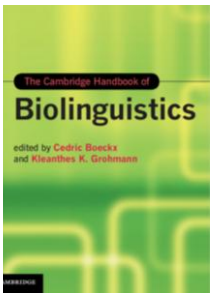
BOOK REVIEW: THE CAMBRIDGE HANDBOOK OF BIOLINGUISTICS



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Abstract
This review discusses the implementation of biolinguistics in children's language acquisition. The focus lies on the importance of biolinguistics in studying children's language acquisition. Children's language is considered important because, within the scientific concept of biolinguistics, will have an influence on the development of children's language until the child is an adult. This review is based on *The Cambridge Handbook of Biolinguistics,* which consists of three parts. The first section discusses the history of biolinguistics; the second chapter discusses the mind, brain and behavior in relation to language; and the third section discusses the evolution of language. This book aims to open our horizons about biolinguistics as a science that harmonizes language and knowledge, language development in children and the evolution of language in various species. In addition, the most profound meaning of this book lies in its emphasis on the function the human brain, where each part has its own specific role. Through this book we are asked to be grateful for God's gift to humans for giving the brain with a very extraordinary function. In line with its purpose, this book not only examines the integration between language and the human brain, but also inspires readers to appreciate the complexity of human cognition.

Keywords: biolinguistics, language acquisition, language learning

We all know that biolinguistics, as the study of the biology of language, contains many of the same things as other areas of biology such as form function, ontogeny, and phylogeny (Chomsky, 1976; Chomsky & Lasnik, 1993). The emergence of biolinguistics is based on questions regarding what is meant by language knowledge, how language develops in children, and how language evolves in a species. The discussion of language development in relation to biolinguistics begins in Chapter 1 of *The Cambridge Handbook of Biolinguistics*.

The emergence of biolinguistics as a science of language began with the draft of Logical Structure of Linguistic Theory by Noam Chomsky in 1955. At the same time, Lenneberg (1967) studied areas that needed to be explored in biolinguistics, including language acquisition and several language disorders, such as dyslexia, the language of deaf children, aphasia, and language evolution. This work culminated in Lenneberg's *Biological Foundations of Language*. At that time, Chomsky contributed a chapter titled "The Special Character of Human Language," which discussed some important points about human language being unique compared to other communication systems, such as those found in animals.

The pioneering period of biolinguistic studies began with several conferences that introduced biolinguistics to the public. These conferences, such as the interdisciplinary meeting held in Dedham, Massachusetts, in 1974, organized by the Royaumont Center for Human Sciences, became key to the development of biolinguistics, bringing together researchers from the fields of linguistics and biology to discuss language and the brain. Following the conference on ontogenetic and phylogenetic models of cognitive development organized by Piattelli-Palmarini at Biarritz Royaumont in 1975, this conference discussed an integrative approach that examined individual development and phylogenetics, referring to the evolution of human cognition.

In 1976, in relation to the study of language evolution, the New York Academy of Sciences held a conference featuring Chomsky as the main speaker to discuss the processes underlying language evolution. This event inspired a wide range of research on the brain and language, including the influential work of Geschwind and Galaburda (1987) on brain dominance and cerebral asymmetry. In another study on split-brain patients, Gazzaniga (2005) found that the left hemisphere is dominant in language processing, including word production and comprehension. These patients demonstrated that only the left hemisphere was capable of speaking or describing experiences, while the right hemisphere was responsible for functions such as face recognition, spatial perception, and emotional processing. Some of these conferences and studies on biolinguistics serve as evidence of the field's ongoing development. According to Chomsky (1994), biolinguistics is a fascinating area of inquiry, although its application still faces many challenges in understanding the biological basis of language.

From the history of the struggle of biolinguistics as a language discipline that connects language with the human brain, we can know that the journey of biolinguistics has taken a long and extraordinary time. Many conferences and studies have been conducted in this field. The development of biolinguistics began in the mid-1970s, when the regulatory mechanisms that controlled gene activation and inactivation began to be studied by the field of biology. In the 1960s, the pioneering work of Jacques Monod and Francois Jacob shocked the field by revealing that one gene could regulate the expression of other genes.

It was in the middle of biolinguistics that linguistic theory consolidated and found a comprehensive framework. The notion of parametric variation had been refined and had found some applicability. A number of syntactic modules have been identified and their fine-grained interdigitation explains the nature of the different levels of representation, and the licensed operations on those modules. From 2000 to the present, linguistic studies have developed rapidly. However, research on the interaction between genes and the environment, coupled with the issue of "missing heritability," remains unresolved. This situation means that the classical view, which considers that a single gene determines a particular trait, no longer serves to explain human language ability.

In line with this, technological advances in the current era, closely related to brain imaging technologies such as fMRI and EEG, have opened up new perspectives for understanding language from a neuroscience perspective. Several studies have successfully mapped the areas of the brain that function in language processing, particularly Broca's and Wernicke's areas, showing that language function is highly localized in the human brain.

A question often asked by students or language scholars who study biolinguistics as a subdiscipline is what exactly is discussed in the field of biolinguistics. This question is answered in this book. Section 1 explains that the concept of biolinguistics was first popularized by Noam Chomsky and Eric Lennerberg in the 1960s. The history of the development of biolinguistics and how this field was developed is proof that this science is very important to study. Chomsky (1994) states that biolinguistics as a whole seeks to find the basis for the assumption that children bring language to explore their experiences. Language in children develops from birth and continues through various activities, reaching its final stage after the child becomes an adult. Language in children is greatly influenced by the brain, which responds to the child's experiences in language. This issue is closely related to the unification that connects the study of language with other natural sciences (Chomsky, 1994).

Chapter 2 of this book discusses the human mind, brain, and behavior as they relate to computational primitives in phonology, morphology, and syntax, as well as their connection to the human nervous system and brain. Primitive representations in phonology consist of basic units such as features, segments, and syllables. These features are considered the smallest components of phonological knowledge that can be used to explain sound patterns in language. Computational primitives in morphology refer to the basic units used to construct and process morphological structures in language. This includes the elements involved in processing morphological information, as well as how that information relates to cognitive processes in the brain. Primitive representations in syntax consist of basic units such as word categories (e.g., nouns and verbs), phrases, and hierarchical structures that govern the relationships among elements within a sentence. These units are considered the smallest components of syntactic knowledge that can be used to explain sentence structure patterns in language.

The essence of this book lies in Chapter 3, which explains that biolinguistics as a science that harmonizes language with natural sciences such as biology is also related to language evolution. Language evolution aims to understand how language emerges and develops in the context of human biological and genetic evolution. The study of language evolution therefore focuses on analyzing how

language emerges and develops based on biological perspectives and human evolutionary processes. This includes understanding the basic structure of language embedded in the human brain as well as explaining how the ability to speak is unique to the human species. The study combines various disciplines such as linguistics, psychology, biology and anthropology to understand how language is rooted in the biological basis of humans and evolves over time (Jackendoff, 2002).

The FOXP2 gene discusses genetics as part of biolinguistics. Genetics as part of biolinguistics is discussed in the FOXP2 gene. This gene plays a very important role in language formation. This gene is an element that links biology and language. This gene controls other genes that control the brain, speech control, and vocal cord movement. If there is a disturbance in this gene, it causes several things to happen, such as mispronunciation, errors in word order, and difficulty in using grammar. This gene has a very important role because it significantly affects the shape and structure of the brain, such as the basal ganglia and cerebellum, which play an important role in controlling voice movements.

Living creatures, such as chimpanzees, rats, and birds, have lower language abilities than humans. The human brain is more adept at handling complex problems, processing well-structured sentences, and supporting social interaction between humans. There are two areas of the brain that play an important role in language processing. These areas are Broca's and Wernicke's. The Broca's area, located in the left frontal lobe, functions to produce language. Broca's area also controls the muscles involved in the process of speaking, such as the lips, tongue, and even the vocal cords. It is very important to take care of this area, as damage to it can cause Broca's aphasia, which is difficulty speaking and writing. Even with difficulty speaking and writing, a person with aphasia can still understand well.

Next, the Wernicke's area, located in the left temporal lobe, functions to process language meaning, such as interpreting spoken words and connecting vocabulary with meaning. Damage to the Wernicke area can cause Wernicke's aphasia (difficulty understanding language). There are other areas in the brain structure that also support language processes, such as the Arcuate Fasciculus, which is a nerve fiber that connects Broca's area and Wernicke's area. This area functions to send information from speech to the language comprehension process. If this area is damaged, it can lead to Conduction Aphasia, where the patient has difficulty repeating heard sentences despite understanding the language and being able to speak on their own.

This book provides an important foundation regarding the relationship between language, the brain, and human behavior. The author has successfully integrated aspects of linguistic subdisciplines, such as phonology and morphology, with neuroscience as the underlying mechanism. This shows that linguistic subdisciplines have a very strong correlation with human cognitive processes. This integration will certainly give rise to several relevant studies based on this book.

This book is equipped with various images of the human brain that play a central role in linguistics. However, these images are still descriptive and need to be supplemented with in-depth empirical discussions, such as research results discussing neurolinguistics with the help of fMRI or EEG technology. With these

improvements, this work has the potential to become a very important reference for the development of modern biolinguistics studies in the world.

Overall, this book serves as a starting point for students who wish to study biolinguistics, which combines linguistics, biology, and neuroscience. The author successfully emphasizes that biological mechanisms produce human language abilities. Finally, the presence of this book deepens our gratitude to God, who has designed the human brain with its various parts and respective functions. Therefore, it is only fitting that we take good care of it.

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