AJLLSE GLOBAL RESEARCH NETWORK

**AMERICAN Journal of Language, Literacy and Learning in STEM Education**
*Volume 01, Issue 06, 2023 ISSN (E): 2993-2769*

# From the History of the Formation of Neurolinguistics

**Sokhiba Zokirova**
Ferghana State University, Uzbekistan

## Abstract

Linguistics is a huge science that studies not only language per se, but also language and its relationship with society, with a person, with literature, etc. Neurolinguistics was born in the 1960s. The questions that neurolinguistics wants to answer were already formulated 200 years ago and several scientists developed this topic, but thanks to Chomsky's Generative Linguistics, neurolinguistics has become a separate science. This article will focus on neurolinguistics, its history, its questions, its theories and models.

**Keywords**: linguistics, neurolinguistics, history of neurolinguistics.

The first evidence that language (the gift of speech) resides in the brain was found in papyri dating back to 3500 BC. They found observations about how damage to the skull can affect other parts of the body, and therefore believed that different parts of the body depend on different parts of the brain. About the loss of speech, they said that it was caused by a god who sent his soul, his breath into the victim's brain and turned it into a being "silent in its sadness". Such a disease was treated by trepanation, i.e. by opening a hole in the brain to allow the soul of the god to come out.

Around 400 B.C. the Greek Hippocrates described the story of a man who forgot the letters. Interestingly, Hippocrates observed a relationship between speech impairment and hemiplegia, i.e., paralysis of the muscles of one half of the body due to injury in the opposite part of the brain. In 300, Herophilus showed that intelligence resides in the ventricles of the brain, and this vision was accepted even until the 18th century.

In the same era, Plato wanted to localize the "skills of the soul" in different parts of the brain, which for Plato was the center of all feelings. Thus the idea was born that the functions of the body could be directly related to one particular area of human society.

Still other philosophers and scientists of the Greek era (Democritus, Aristotle, Galen) gave their ideas to the science that had just appeared. Unfortunately, during the Middle Ages, the development of neurolinguistics, like other sciences, stopped. Until the 17th century, only a few descriptions of cases related to speech disorders were shown, and especially the discussion of Herophilus's theory about the localization of the intelligentsia in the ventricles of the brain continued. In the 16th century, Herophilus's theory was criticized by Constans Barolius and Andrew Vesalius, but their work was not widely accepted.

In the 17th century, Unitarianism, led by René Descartes, said that the pineal gland, or pineal gland, was the center of the "undivided soul." Physicist - Thomas Willis located the imagination in the corpus callosum, and this theory was supported by Francois de la Peyronie. Despite the fallacy of the ideas of Unitarianism, the church supported them and accepted them as a dogma.

Only by 1770, thanks to the monograph “amnesia of language” by the physicist Johann Gesner, a new view of speech disorders appeared; such disturbances were understood as memory

disturbances caused by inertia in the connections between different parts of the brain. The disturbances presumably caused difficulties in associating images and abstract ideas with linguistic signs. These were the first expressions of connectivism.

In addition, at the same time, the theory of localism was developing, which speaks of "high functions" located in different centers of the brain, especially in its cortex. Throughout the 19th century, both theories coexisted, and knowledge of speech disorders increased; most of the variants currently known were described in this century.

The anatomist Franz Joseph Gall was the first to locate the mental faculties in the cerebral cortex. Such a concept was proven by Paul Broca when he found the center of speech in the brain in 1861. In addition, Gall was the first to recognize gray matter as active tissue (nerves) and white matter as connective tissue. Using the Methods of Empirical Research, Gall linked different brain functions to specific areas of the cerebral cortex. For example, he located speech in two areas of the frontal lobe, one of them is the articulation of speech, the other is the memorization of words.

In the history of neurolinguistics, as an antagonist to Gall's ideas, the physiologist Pierre Flourens appeared, who defended the idea that the cerebral cortex worked as a whole, that is, brain functions remain intact even if part of the cortex is removed.

Gall's ideas were continued by his student Jean-Baptiste Boulet, who presented various cases of injuries in the frontal lobe associated with speech disorders and cases of injuries in other lobular areas not associated with these disorders. In addition, Boulet described two types of disorders associated with brain injury:

- Violations in the articulation of speech.
- Violations of lexical memory.

In 1861, Ernest Oburtin showed in Paris a case of a failed suicide whose brain remained open near the area of the frontal lobes. When the doctor touches the frontal lobe with a spatula, the patient cannot speak; For Oburtin, such a case was evidence that proved that the gift of speech was in this area. Paul Broca, surgeon and anthropologist, showed a similar case a little later.

It is traditionally said that in 1861 the science of neurolinguistics was born when Paul Broca presented his theory based on the study of a patient known as "tan", since this syllable was a single syllable that he could pronounce. On autopsy of a patient, Broca discovered that the brain damage had affected a specific area of the brain (known today as Broca's Center) located in the left hemisphere of the brain. Broca presented two hypotheses: firstly, that psychological functions are located in the nuclei of the brain, and secondly, that speech disorders were caused by injuries in the left hemisphere of the brain, and therefore speech is not zonal-centralized, but, on the contrary, lateral.

Brock is replaced by Meinert, an anatomy specialist who significantly influenced connectionist theory. Meinert tested white matter nerve fibers in animals and found two species:

- Fibers between the cerebral cortex and the spine.
- Accompanying fibers between different crossing points in each hemisphere or between two hemispheres.

Thus, Meinert confirms that consciousness, intellect and memory are located in the cerebral cortex, but do not have a specific place in it. Inductive thinking is thus the result between associations and perceptions.

Neurologist Carl Wernicke continued Brock's research, developing the idea that psychological functions reside in the brain. Wernicke's research led him to the discovery of a new area in the brain, now known as "Wernicke's area", which is associated with speech comprehension problems. Wernicke identified a "specific area" in the brain associated with speech that ran from

Wernicke's area (the area responsible for speech perception) to Broca's area (the area responsible for speech production).

Damage to any of these areas can lead to aphasia.

The German physicist Ludwig Lichtstein extended Wernicke's theory, which links two areas of the brain to speech, with a third area, which he called the "judgment center". For Lichtstein, the path that a word could take after being perceived by the brain was repetition (via Broca's area) or movement to a "judgment center" where the word's meaning was interpreted and acquired meaning.

Thus, two schools, localism and connectionism, were formed, which had a great influence until 1920, when the school of cognitivism was formed. Armand Trousseau criticized and refuted some of Broca's concepts from a clinical point of view, and in addition, outlined the concept of aphasia in neurolinguistics.

John Haglins Jackson is considered the founder of the cognitive school. He was the first to choose to study stimuli, reflexes and their complexities instead of anatomical location. So Jackson identified two levels of speech: automatic and propositional. It is on the propositional level that aphasia is located, which Jackson considers the inability to generate sentences, that is, the inability to use speech through thoughts.

Jackson set aside the idea of localization, and thought of the nervous system as hierarchical, consisting of basic reflexes, automatic actions, and deliberate actions. But unlike the localists, for Jackson, the symptoms could not be related to the location of the function, that is, the loss of any function due to injury in a particular place was not evidence that this function was located in that place.

Already in the 20th century, the cognitive school progressed thanks to the research of various scientists, among whom were Konstantin von Monakov and Kurt Goldstein. Localism was rejected, but some researchers (Henschen, Brodmann, Nelson) supported this school. Connectivism was revived in 1965 by Norman Geschwind and is now very influential, especially through Sidney Lamb's Connected Network Theory.

In the middle of the 20th century, a new school arose in Russia that spoke of "Dynamic Localization of Functions". Ivan Pavlov confirmed that complex functions (including speech) cannot be connected, isolated, or attached to cerebral structures. On the contrary, they are dynamic systems.

Lev Vygotsky saw the need to find a suitable definition of "function" before being puzzled by its location. For Vygotsky, a function is a complex action, when the whole organism adapts to some task. This action can be completed in different ways due to the interaction of various organs. This dynamism is controlled by cerebral structures that control different organs and are located in different places.

Also a significant influence on neurolinguistics was the psychologist Alexander Luria, who studied aphasia according to the “dynamic localization” model and applied it in clinical work.

Linguistic approaches to neuroscience began with Jacobson, who was the first to apply structural theory to the study of speech defects or aphasia. Jacobson applied Ferdinand de Saussere's theory of pragmatic and synmatic relationships in speech, as a result of which he distinguished two types of aphasia:

- (Pragmatic) Problems that arise when choosing the right item.
- (Synmatic) Problems that arise when combining elements.

A few years later, having become acquainted with the studies of the Russian school, Jacobson speaks of three possible types of dichotomy in aphasia:

- Codification - Decodification (pronunciation)
- Constraint - Break (morpho-syntax)
- Word order - Expression (syntax)

After the advent of the generative school of Noam Chomsky, neurolinguistics experienced resurgence, and many applied studies on the origins of grammar in neurolinguistics arose during this period. It is worth paying attention to the work of Eric Lenneberg, which still has a strong influence. Briefly, we can formulate the following conclusions of Lenneberg:

- Language is determined by innate characteristics, traits of each species, and biological characteristics (cerebral functions of each species).
- Some features of human language are universal (there is a basic foundation for all languages).
- Ontological development occurs through physical maturation until adolescence (Position of the language and its progressive differentiation).
- Contact with other people only acts as a trigger that triggers an innate mechanism.

This large volume of scientific works, theories, discussions and influences left behind two large systems in linguistics: On the one hand, the so-called "Neoclassical model", sung by Geschwind, on the other hand, the other direction - "Dynamic localization", which had a great influence of the writings of Alexander Luria.

Summing up, we can say the following: neurolinguistics is not a single, methodologically related science, but rather several weakly interacting approaches, each of which develops in its own direction. From our point of view, the activity approach to the development of the methodology of neurolinguistics is the most relevant at the present time, since it allows conducting research that meets the challenges of modern society.

At the same time, neurolinguistics is an old and new science. It has a long history, and it has been shown that scientists from all fields were interested in the study of neurolinguistics, created new theories, worked on various hypotheses, helped create neurolinguistics. However, much has not yet been done and remains to be done.

Currently, various branches of neurolinguistics are being explored to understand how the brain works when we speak, listen, think sentences, start learning foreign languages, etc. On the one hand, connectivism, on the other, cognitive theory, and on the third, the theory of dynamic localization of functions, all try to solve questions about how language is born, develops, functions, transforms, etc., in the human brain.

**List of literature used**


1. Alimdjanovna, X. M. (2022). CLIMATE CONTROL AND LIGHT CONTROL IN A SMART HOME. *European Journal of Interdisciplinary Research and Development*, *8*, 149-155.
2. Jo'rayev Vohid Tojimamatovich, A. M. (2022). Working With Geospatial and Descriptive Data in A Geoinformation System. *Periodica Journal of Modern Philosophy, Social Sciences and Humanities*, *11*, 113-116.
3. Jo'rayev, V. T. (2020). The Role and Advantages of Distance Courses in the Innovative Educational System. *The American Journal of Social Science and Education Innovations*, *2*(10), 434-439.
4. Muxtoraliyevna, Z. S., & Madinabonu, E. (2023). BOSHLANG'ICH SINF O'QUVCHILARIDA INGLIZ TILINI O'QITISHNING O'ZIGA XOSLIGI. *IJTIMOIY FANLARDA INNOVASIYA ONLAYN ILMIY JURNALI*, *3*(5), 190-197.

5. O‘rinova , N. M. (2023). TYUTORLIK FAOLIYATINING PEDAGOGIK-PSIXOLOGIK XUSUSIYATLARI. *INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE "THE TIME OF SCIENTIFIC PROGRESS "*, *2*(6), 17–22.
6. O‘rinova, N. M. (2023). TYUTORLIK FAOLIYATINI TASHKILIY METODIK JIHATDAN SHAKLLANTIRISHNING PEDAGOGIK SHART-SHAROITLARI. *INTERNATIONAL SCIENTIFIC CONFERENCE " INNOVATIVE TRENDS IN SCIENCE, PRACTICE AND EDUCATION"*, *2*(6), 5–10.
7. O‘rinova, N. M., & Muminova, N. J. (2022). BOSHLANG ‘ICH TA’LIMDA O ‘QUV-KVEST TEXNOLOGIYASIDAN FOYDALANISHNING NAZARIY JIHATLARI. *Academic research in educational sciences*, *3*(5), 460-472.
8. O‘Rinova, Nilufar Muhammadovna BO‘LAJAK O‘QITUVCHILARNI TYUTORLIK FAOLIYATIGA TAYYORLASH MEXANIZMLARI // ORIENSS. 2023. №4-2.
9. Rahmatjonovich, T. D., & Ruslanovna, M. B. (2022). Creative Activity of Students in the Lessons. *Spanish Journal of Innovation and Integrity*, *6*, 440-445.
10. S.M. Zokirova. (2023). INTERLANGUAGE HOMONYMS AS A TRANSLATION PROBLEM. *Horizon: Journal of Humanity and Artificial Intelligence*, *2*(5), 248–251.
11. Teshaboyev, D., & Usmonova, M. (2023). BOSHLANG ‘ICH SINF ONA TILI DARSLARIDA “UYUSHIQ BO ‘LAKLAR” MAVZUSINI O ‘RGATISHDA INTERFAOL METODLAR VA MUSTAQIL ISHLARDAN FOYDALANISHNING AHAMIYATI. *Евразийский журнал технологий и инноваций*, *1*(5 Part 2), 252-257.
12. Teshaboyev, D., & Xamdamova, M. (2022). UMUMIY O’RTA TA’LIM MAKTABINING BOSHLANG’ICH SINFLARIDA ONA TILI O’QITISH METODIKASI. *Eurasian Journal of Academic Research*, *2*(5), 823-827.
13. Teshaboyev, Dilmurod, Ne’Matova, Mahfuza Ma’Rufjon Qizi BOSHLANG’ICH SINF DARSLIKLARIDA QO’LLANGAN HARAKAT SEMALI FE’LLARNING SEMANTIKASI // ORIENSS. 2023. №3.
14. Tojimamatovich, J. V. (2023). CONCEPT AND ESSENCE OF INFORMATION SECURITY. *Web of Synergy: International Interdisciplinary Research Journal*, *2*(4), 643-647.
15. Tojimamatovich, J. V. . . (2023). Digital Transformation of Educational Management System. *Web of Semantic: Universal Journal on Innovative Education*, *2*(4), 202–206.
16. Valijonovna K. I. et al. About Humorous Literature For Children. – 2022.
17. Valijonovna, X. I. (2022). FORMING OF EDUCATIONAL MOTIVATION FOR PRIMARY SCHOOLCHILDREN. *Emergent: Journal of Educational Discoveries and Lifelong Learning (EJEDL)*, *3*(10), 83-91.
18. Valizhonovna, K. I. (2023). THE ROLE OF SPELLING IN IMPROVING STUDENTS'LITERACY. *Open Access Repository*, *4*(2), 768-774.
19. Valizhonovna, K. I., & Malikakhan, A. (2023). Develop the Speech of Primary Class Students Modern Issues. *Eurasian Journal of Humanities and Social Sciences*, *16*, 7-10.
20. XOLDAROVA, I., & ALIJONOVA, M. (2023). SINFDAN TASHQARI ISHLAR ORQALI O‘QUVCHILARNING AQLIY FAOLIYATI VA DUNYOQARASHINI SHAKLLANTIRISH. *Journal of Pedagogical and Psychological Studies*, *1*(5), 141–146.
21. Zokirova , S. M., & Tojialiyeva , D. R. qizi. (2023). O‘ZBEK BOLALAR SHE’RIYATIDA VATAN TASVIRI. *Educational Research in Universal Sciences*, *2*(3), 539–546.

22. Zokirova Sohiba Muhtoraliyevna, & Tojialiyeva Dilnoza Rasuljon qizi. (2023). VATANPARVARLIK RUHIDA TARBIYALASHDA AN'ANAVIYLIK VA ZAMONAVIYLIK. Educational research in universal sciences, 2(4), 805–810.

23. Zokirova Sohiba Mukhtoraliyevna, & Kholikova Mukhtasar Kurbonali qizi. (2023). The Problem of Defining a Riddle. *Texas Journal of Philology, Culture and History*, *18*, 22–26.

24. Тешабоев, Д. Р. (2022). ЭРГАШ ГАПЛИ ҚЎШПРЕДИКАТИВ БИРЛИКЛАР ФАЛСАФИЙ НАРСА КАТАГЕРИЯСИ СИФАТИДА. *IJTIMOIY FANLARDA INNOVASIYA ONLAYN ILMIY JURNALI*, *2*(11), 25-30.

25. Уринова, Н. М. & Таджибоева, Х. М. (2018). Педагогические основы развития социальной активности учащейся молодежи. In *international scientific review of the problems of philosophy, sociology, history and political science* (pp. 29-33).