

CONSTANTIN VON ECONOMO'S LAST PUBLICATION: A COMMENTARY ON CHARLES FRAIPONT'S "ÉVOLUTION CÉRÉBRALE"

POSljednja PUBLIKACIJA CONSTANTINA VON ECONOMA: KOMENTAR NA „ÉVOLUTION CÉRÉBRALE” CHARLESA FRAIPONTA

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SUMMARY

This paper highlights a commentary written by the neurologist Constantin von Economo on a book published by the Belgian paleontologist Charles Fraipont in 1931. The commentary appears to be Economo's last opus, published posthumously in early 1933. The reviewed work deals with the evolution of the brain in primates, hominids and humans, presenting some interesting ideas about the phylogeny of the human cerebral hemispheres in conjunction with the living conditions of the genera in consideration.

Key words: Cerebral phylogeny; primate brain; Evolutionary Neuroscience; History of Medicine.

INTRODUCTION

The neurologist Constantin von Economo (1876–1931) made major discoveries in nerve cell biology, cerebral cortical cytoarchitectonics, and human neuropathology. His surname has been carved into the eponym “von

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Economio encephalitis” or encephalitis lethargica. One of the keenest interests of Economo in science was brain evolution. In the last four years of his life, Economo became increasingly involved in paleontology and evolutionary neuroanatomy and their relationship to the substrate of the intellectual faculties and human culture. His neurological thought culminated with bold propositions about the anatomy of talent and the future evolution of the human nervous system. He published some twenty studies in these domains [15]. Economo postulated a general principle, “progressive cerebration,” to connote the constant evolution of the mind through successive generations, the increase of brain mass as an upward trend of a species, and the future acquisition of new cerebral “organs of thought” (in the sense that Theodor Meynert had applied the term “organ” to the cerebral cortex) through the progressive differentiation of cytoarchitectonically specific cortical structures [1–4].

The present paper documents what is probably his last published work (Figure 1). A book critique, authored by Economo, appeared in print posthumously in early 1933 in a Viennese ethnological and linguistic review [5]. It dealt with a monograph on cerebral evolution [6] that had been published by the Belgian paleontologist, Charles Fraipont (1883–1946).

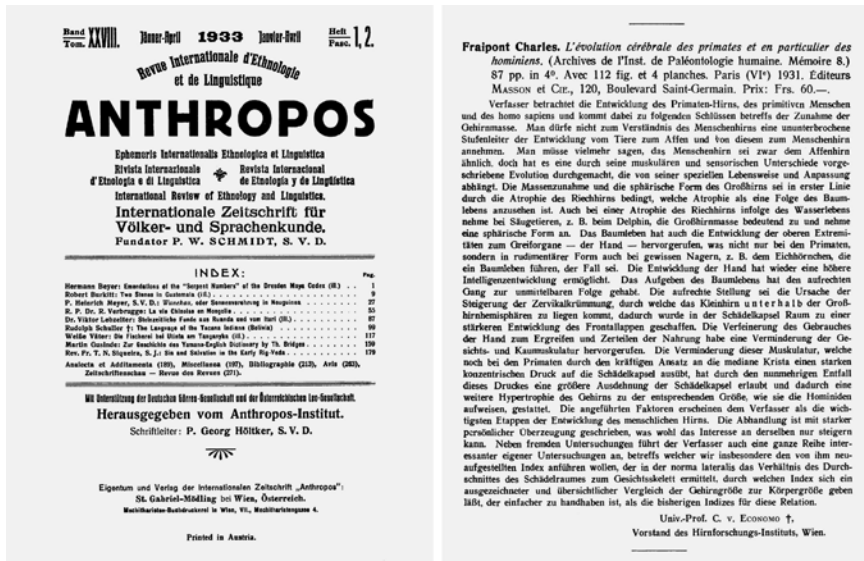


Figure 1. Title page of the Viennese journal *Anthropos* and Economo’s article published in 1933 [5].

CHARLES FRAIPONT

Fraipont obtained a degree in civil mining engineering in 1908 and went on to occupy the Chair of Paleontology in the Faculty of Sciences at Liège between 1923 and 1945. He was the son of Julien Fraipont (1857–1910), a natural scientist who became Rector of the University of Liège in 1909, months before his death. Charles Fraipont served a three-year term as Senator of the Arrondissement of Liège in 1936, affiliated with the *Parti Rexiste*, a far-right Catholic-nationalist political party active in Belgium between 1935 and 1945.

Through comparative anatomy and the study of skull and limb fossils, Fraipont [6,7,9] attempted to shed light on the problem of human origins and human phylogeny (Figure 2). He built on the previous ideas of P. Broca, J. Fraipont, G. Hervé, M. Boule, R. Anthony, F. Coupin, S. Leclerq and F. Tilney, among others, and attributed to humans an arboreal ancestry passing gradually to the semi-upright and subsequently to the completely vertical position [14]. That trend effectively released the forelimbs, which next took over numerous functions previously executed by the jaws; with

the latter working less, the face diminished in volume and became less prominent; the crotaphic muscles atrophied, ceased to compress the lateral face and even the top of the skull, something that permitted a greater development of the brain. On the other hand, arboreal life reduced the importance of olfaction, the rhinencephalon became atrophied and as a consequence the brain's frontal lobes grew considerably; thus intelligence assumed a direct relationship to the importance of the frontal lobes.

Fraipont [6] also suggested an “Index” for comparing brain-to-body size, in that sense, antedating Harry Jerison [12,13] and his “encephalization quotient.”

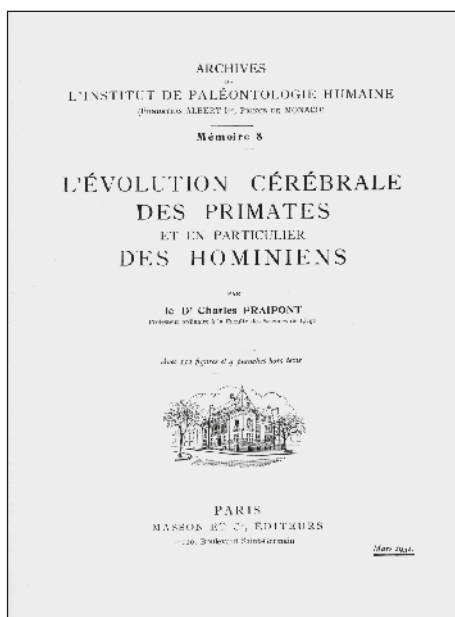


Figure 2. Fraipont’s 1931 monograph on cerebral evolution [6].

Later on, Fraipont re-examined the second skull from Engis, which had been discovered in 1829 by Philippe-Charles Schmerling, and concluded that it belonged to a Neanderthal [8,11]. The same fossil is among those used to analyze over one million base pairs of hominoid nuclear DNA sequences and to initiate a Neanderthal genome-sequencing effort [10].

ECONOMO'S REVIEW

The following is an English translation of Economo's book review [5]:

“The author considers the development of the primate brain, of primitive man, and of Homo sapiens, and arrives at the following conclusions regarding the increase in brain mass. One should not accept, as far as the understanding of the human brain is concerned, an uninterrupted ladder of evolution from animals to apes, and from those to the human brain. Rather, one should claim that the human brain is indeed similar to the ape brain, but further, owing to its motor and sensory differences, it has undergone a predestinate evolution that stems from its specific way of life and adaptation. The increase in mass and the spherical form of the cerebrum can be attributed primarily to the atrophy of the rhinencephalon, an atrophy that should be viewed as a consequence of arboreal life. Even in the case of mammals such as the dolphin, the significant increase of the cerebral mass and the acquisition of a spherical form could be attributed to an atrophy of the rhinencephalon. Arboreal life has also led to the evolution of the upper extremities — the hand — into grip organs; this may be the case not only with primates, but in a rudimentary form even with certain rodents, e.g. the squirrel, which lives in trees. The development of the hand has further made possible a higher development of intelligence. The abandonment of arboreal life led to the upright gait as a direct consequence. The upright posture is conceivably the cause of the increase of the cervical curvature, through which the cerebellum ended up lying below the cerebral hemispheres, thus creating room in the cranium for a larger growth of the frontal lobes. The refinement of the use of the hand for grasping and cutting foods may have led to a reduction of the facial and mastication musculature. The reduction of such musculature, which in the case of primates already exerts a strong concentric pressure on the capsule of the cranium via the forceful fitting onto the median crista, has allowed a greater expansion of the cranial vault through the substantial attenuation of this pressure and thereby permitted a further hypertrophy of the brain to the respective size, as witnessed in hominids. The aforementioned factors

appear to the author as the most important stages of the evolution of the human brain. The treatise is written with strong personal conviction, which can only lead to an increased interest in it. Besides the studies of others, the author presents an entire array of interesting investigations of his own; with regard to the latter, I wish to especially emphasize his newly established Index, which in the norma lateralis presents the ratio of the cross section of the cranial vault to the facial skeleton; through this Index an excellent and clear-cut comparison of brain-size to body-size is obtained, which is handier than the currently used indices for that relationship.

University Professor C. v. Economo, Director of the Brain Research Institute, Vienna."

CONCLUSION

The present study documents a historical record of Constantin von Economo published posthumously in German, in what appears to be his last opus. For Economo to have engaged in writing a review of Charles Fraipont's book, the latter work must have had originality and value when it appeared in 1931. Fraipont's style and argumentation are straightforward and logical. His monograph on the cerebral lobes of primates, hominids and humans appears to be a good source for tracing previous important publications by other researchers, besides presenting some ideas potentially useful for current scholars in evolutionary neuroscience.

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SAŽETAK

Ovaj rad ističe komentar koji je o knjizi belgijskoga paleontologa Charlesa Fraiponta objavljenoj 1931. godine napisao neurolog Constantin von Economo. Komentar je, kako se čini, Economovo posljednje djelo, objavljeno posthumno početkom 1933. godine. Spomenuto djelo bavi se evolucijom mozga u primata, hominida i ljudi, te predstavlja neke zanimljive ideje o razvoju ljudskih moždanih hemisfera u ovisnosti o životnim uvjetima.

Ključne riječi: *cerebralna filogenija; mozak primata; evolucijska neuroznanost; povijest medicine.*