Neurobiological Ontogenetic Development and Human Language Evolution
A Reappraisal and Perspectives

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Introduction and Objective

Although many authors examine the similarities between human and non-human genes or even behaviors regarding language evolution (Arbib, 2005; Hauser et al, 2002), the key question about the evolution of a self-conscious mind (Eccles, 1977) and its association with human language is far from a deep understanding. As noticed by Culotta (2005) and Holden (2004) few researchers devote that proposal to their work.

Developmental Neurobiology

On the context of the phylogeny evolution we will find great contributions from neurobiology on the research of Rakic (1988; 2004). Supported essentially by his own studies on molecular and cellular developmental neurobiology of the cerebral cortex of primates, Rakic proposed two important theories about the theme. The first one is the *Protomap Hypothesis*, which suggests that the basic pattern of cytoarchitectonic areas emerges through synergistic, interdependent interactions between developmental programs intrinsic to cortical neurons and extrinsic signals supplied by specific inputs from sub cortical structures, and the second one is the *Radial Unit Hypothesis*, which postulates that the embryonic cortical plate forms from vertically oriented cohorts of neurons generated at the same site in the proliferative ventricular zone of the cerebral vesicle. Accordingly, each radial unit consists of several clones that migrate to the cortex following glia fascicles spanning the cerebral wall. Besides, Rakic has also important insights on ontogeny evolution when showing how the brain is malleable during its development where neuroplasticity usually occurs after damaging or even after gene mutations (2004).

Genetics

Regarding genetics we will find important contributions recently joined through the study of gene mutations and language disorders by Bishop et al. (1995) and Fisher et al (1998). The studies on expression of genes like FOXP2 were the first step for the consolidation of a genetically based contribution for the human language evolution as sustained by Zhang (2003). Besides, accordingly Zhang (2003), the understanding of behavior and evolution of genes like ASPM human gene have also added many insights regarding the mechanisms underlying the acquisition of a greater brain size by humans.

Conclusion

The recent advances on Neurodynamics of complex systems together with the study of human genetic expression mechanisms raise a very difficult challenge: it is not possible to dissociate gene expression, developmental neurobiology, life history, cognition and consciousness. This way, the key question of brain dynamics both, during ontogenetic development and maturity, has to be analyzed in many distinct fields. And the following question remains open: what would be the brain computations needed for the expression of the behavior?

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