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REVIEW

Angela D. Friederici, *Language in our Brain: The Origins of a Uniquely Human Capacity*. Cambridge, MA & London: The MIT Press, 2017. Pp. xiii + 284.
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This fascinating book compiles a vast number of neurolinguistics studies into a coherent picture of how the brain processes core parts of language with regard to both spatial and timing characteristics. It further relates neuroscientific data to clinical, anatomical, and genetic findings to discuss how the language faculty matures in the individual brain and how it might have developed in the human species. *Language in our Brain* is divided into four parts. Part I presents the time-course and brain structures involved in processing the basic components of the language system: phonetics, phonology, prosody, lexical semantics, syntax, morphosyntax, and argument structure. Morphology is mentioned in relation to syntax and morphosyntax, and pragmatics forms part of excursions 'beyond the core language system' (p. 95). Part II examines the major neural pathways relevant for language as well as the connectivity between areas, and shows how the language system is inserted into this network. Part III relates how maturation of the linguistic brain network is associated with language acquisition from before birth to around puberty. Part IV compares the human neural system shown to be involved in language processing with anatomical, behavioral, and functional data from other primates as well as paleoanthropological findings, drawing conclusions about the evolution of language.

The book gives a comprehensive, thoughtfully written view of how the language faculty is represented, has evolved, and develops ontogenetically in the human brain. Its main empirical base is the great number of studies that Angela Friederici has directed herself, but it also integrates results from other research groups. Although the author has written several state-of-the-art papers, the book format feels well needed in order to give the full picture of her neuroscientific model for language processing. The book focuses on speech processing but findings from sign language are also discussed. The text is well-organized and works towards a clear goal. The components of the system are first presented and then put together, and finally the ontogenetic and phylogenetic development of the resulting language network in the brain is discussed. It is never boring to read, since the writing is extremely succinct,

with virtually no superfluous digressions. Even the 'excursions' feel like necessary parts to get the complete picture of Friederici's model.

Friederici naturally inserts language processing into the proposed ventral and dorsal streams of auditory processing in the brain (Hickok & Poeppel 2004). Coinciding with many others, she attributes perhaps the largest portion of language processing to the ventral stream (Hickok & Poeppel 2004, Saur et al. 2008, DeWitt & Rauschecker 2012). Thus, phonetic-to-phonological processing proceeds in a frontal-going stream along the left superior temporal gyrus, to detection of lexical and morphosyntactic forms as well as shorter phrases in the most frontal part of the temporal lobe. Ventral connections from the anterior temporal lobe lead to the anterior to mid portion of the inferior frontal gyrus for semantic interpretation and processing of local dependencies. However, the main claim of the book is the empirically supported idea that sentence processing with full-blown syntax is possible only if the ventral stream is connected to a particular part of the DORSAL auditory processing stream.

The syntactic dorsal stream network encompasses the posterior portion of the left inferior frontal gyrus in the left hemisphere (posterior part of Broca's area) and its connection via arcuate fasciculus to the posterior temporal lobe (Catani, Jones & Ffytche 2005, Friederici et al. 2006). Friederici convincingly shows how this dorsal network ties together the other aspects of language processing, producing hierarchically structured sentence-level parsing with complete argument structure and word displacement possibilities. This network works in parallel with the dorsal sensorimotor-mapping network mediated by the superior longitudinal fasciculus, important for processes involving word repetition/language learning (Saur et al. 2008), effortful listening (Hickok & Poeppel 2004) and perhaps prediction (Roll et al. 2017). The author shows how the syntactic dorsal network seems to be absent in both other primates and newborn babies, rather maturing at the rate of the acquisition of complex syntactic capabilities in children (Skeide, Brauer & Friederici 2016). In consequence, she argues for this particular portion of the dorsal stream to be the main characteristic that has enabled humans to have the rich combinatorial language we have.

Although syntax is at the core of the book and the foreword is written by syntactic theoretician Noam Chomsky, it is rather neutral regarding specific theoretical frameworks. It attests the neural representation of fundamental syntactic properties that most grammatical theories try to account for in one way or another, such as phrase-structure building, morphosyntax, *wh*-movement, and grammatical voice. The work provides a plausible and sound picture of HOW language is represented in the brain. This opens up the possibility of asking WHY language is represented in this way. Interesting attempts have been made for the ventral language network, which seems to fit into the general primate system for auditory object recognition (Rauschecker & Scott 2009). The 'non-syntactic' part of the dorsal stream seems to be related to sensorimotor processing (Hickok & Poeppel 2004) and sound localization

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(Alain et al. 2001). A remaining question, also mentioned by Friederici, is how specific the 'syntactic' part of the dorsal network is to syntax and to what extent productive language, complex thought (Chomsky 2005), or other factors have driven the evolution of this network.

I would recommend this inspiring book to anyone interested in the neural representation of language, especially those with a particular interest in syntax. It is written so that it can be understood by both neuroscientists and linguists.

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