However, its major advantage is in recognizing the goal of additional language learning as the *ability* to use an additional language in a variety of contexts, rather than the acquisition of native speaker competence. This goal is emphasized in many learning contexts, for example in federally and provincially funded language programs for refugees and immigrants in Canada (Centre for Canadian Language Benchmarks (CCLB) 2012). There is plenty of evidence (both theoretical and practical) to suggest that the goal of many language programs and many learners around the world is the acquisition of communicative competence, rather than native speaker competence (CCLB 2013: 15–19). This particular goal makes the authors' critique of *native-speakerism* presented in Chapter 9, outdated. Moreover, it does not reflect the local, bottom-up practices, whose inclusion in the field is advocated by the authors.

When creating a map of the terrain which is as broad and diverse as the terrain of applied linguistics itself, it is challenging to decide which landmarks should be present on the map, and to remain neutral and objective. Notwithstanding the wrinkle discussed above, the map that the authors create in this book constitutes an excellent guide to the exciting field of applied linguistics.

References

Centre for Canadian Language Benchmarks (CCLB). 2012. *Canadian Language Benchmarks: English as a second language for adults*. Citizenship and Immigration Canada.

Center for Canadian Language Benchmarks (CCLB). 2013. *Canadian Language Benchmarks / Niveaux de compétence linguistique canadiens*. Citizenship and Immigration Canada.

Hall, Christopher J. 2005. *An introduction to language and linguistics: Breaking the language spell*. London: Continuum.

Pennycook, Alistair. 2007. *Global Englishes and transcultural flows*. New York: Routledge

Friederici, Angela D. 2017. *Language in our brain. The origins of a uniquely human capacity*. Cambridge, MA: The MIT Press. Pp. 304. US $45 (hardcover).

Reviewed by Leah Gosselin, *University of Ottawa*

Language in our brain presents an in-depth exploration of the neural substrates linked to the language network, according to the current literature. The development, evolution and ontology of the language circuit are also considered, with a particular focus on the syntactic underpinnings of language.

In Part I, the author explores the neurological substrates associated with the numerous stages of language processing, which are necessary for any given communication event.

In Chapter 1, "Language Functions in the Brain: From Auditory Input to Sentence Comprehension", the author proposes a model for language comprehension at the auditory level. The model is supported by a review of crucial literature with

https://doi.org/10.1017/cnj.2020.33 Published online by Cambridge University Press

respect to each of its levels: lexical, syntactic, semantic and prosodic. Friederici particularly emphasizes the temporal and spatial neural underpinnings of each of these processing levels. All the while, the cascading nature of language processing is considered.

In Chapter 2, "Excursions', the author demonstrates that language comprehension and language production use a shared knowledge base (as proposed in early models; see Friederici and Levelt 1988). These models are supported throughout the chapter by seminal work on disordered language, early work using speech error analyses, and finally other empirical findings based on studies of online processing. Friederici then explores why certain communicative aspects, such as pragmatic abilities and hand gestures, are not believed to be part of the core language system.

In Part II, the author examines the manner in which the level-specific neural regions from Part I are interconnected, and how they cooperate to form a human language network.

In Chapter 3, "The Structural Language Network", the linguistic role of the primary white fiber tracts is discussed. Friederici examines the ventral and dorsal neuroanatomic pathways while discussing the evolution of their structural and functional interpretation, with particular emphasis on evidence from syntactic processes. The author concludes that the dorsal tract is primarily related to the comprehension of syntactically complex processes, while the ventral tract is responsible for the combinatorial processing of syntactically simple sentences.

In Chapter 4, "The Functional Language Network", Friederici reviews the neural connections between white matter involved in the language network and how these connections can be investigated by utilizing resting-state or task-related approaches. The author discusses the manner in which linguistic information is encoded and transmitted (e.g., neurotransmitters, mirror neuronal ensembles, etc.), and finally, a 'dynamic temporo-frontal' (p. 141) model for the language circuit is proposed and supported.

In Part III, Friederici turns to a discussion of the human language faculty prior to maturation and situates Lenneberg's 1967 seminal critical period hypothesis in the neurolinguistic literature.

In Chapter 5, "The Brain's Critical Period for Language Acquisition", the author discusses the debates about the length and the nature of the critical period, in relation to both first and second language (L2) acquisition. She suggests that different levels of processing may possess different age-thresholds and rigidities for their respective critical periods. It is shown that the critical period, characteristic of human language, is largely contingent on neural maturation, and is thus independent of input modality.

In Chapter 6, "Ontogeny of the Neural Language Network", the various levels of linguistic processing are separated and the timeline of their development during language acquisition is examined. Broadly, very young infants' processing is prosody-dependant, while older children may call upon higher-level processing. The author suggests that initial language development thus occurs on a bottom-up basis, and top-down processes are only employed with age. Thus, the ventral and dorsal white fiber tracts associated with each of these processes possess different maturation timelines; the ventral tract develops earlier than the dorsal pathway.

https://doi.org/10.1017/cnj.2020.33 Published online by Cambridge University Press

In Part IV, the evolution of the human language faculty is examined; Friederici maintains that language, as a uniquely human capability, is the consequence of our neural composition.

In Chapter 7, "Evolution of Language", the author discusses evolutionary theories, such as the idea that language is the modern relative of gestures. She states that this theory does not hold, as language involves a specific substrate not linked to gestures within Broca's area. Friederici notes that humans' neural composition is responsible for the fact that language is a uniquely human capability. That is, neural circuits implicated in the processing of the hierarchal properties of human language (e.g., a dentritically dense dorsal pathway) are present only in humans and no other species or primates.

In Chapter 8, "The Neural Basis of Language", evidence against FOXP2 as the language gene is reviewed; Friederici considers the role of the largely unexplored GPR6, a gene which plays a role in the maturation of Broca's area. In line with this, the author notes that the substrates responsible for human language should provide explanations for the differences between the human language faculty and the communicative capacity of other species. Since "syntax is at the core of human language" (p. 227), Friederici examines the differences between humans and primates with regard to areas related to syntax (i.e., the posterior region of Broca's area, and the dorsal pathway).

Altogether, the work *Language in our brain* provides a thorough examination of the current neurolinguistic literature, and an in-depth look into the substantial body of work produced by the author herself. Friederici imparts a novel neural model for language comprehension, supporting her model with a wealth of empirical evidence. This sets the stage for new 'language in our mind' studies, which in turn could allow researchers to improve upon past psycholinguistic models that have remained more or less stagnant. The author provides insight into how to disentangle levels of processing that are typically highly confounded, thereby facilitating avenues for future research.

Furthermore, this book consistently addresses controversies within the field (e.g., the critical period, the language gene, the language pathways, etc.). Friederici carefully considers the existing evidence supporting or opposing the theoretical positions, before advancing her own stance. As a result, the reader is provided with a non-biased view of disputed topics and is therefore encouraged to come to his or her own conclusions. The author also notes possible gaps in the literature (e.g., the GPR6 gene), once again paving the way for future studies which may lead to the eventual resolution of these controversial topics.

Friederici considers the importance of controlling for factors such as age of acquisition (AoA) and proficiency, which have often been collapsed in language experiments. It is noted that these characteristics may affect different levels of language processing (e.g., how AoA plays a role in syntactic analyses). This is crucial, as there exists a 'crisis' of sorts in the field of bilingualism and second language acquisition (including in brain studies): often, language background characteristics such as those described by Friederici are put aside or not well defined. Operating from a neurolinguistics' viewpoint, *Language in our brain* calls for a

https://doi.org/10.1017/cnj.2020.33 Published online by Cambridge University Press

more thorough examination of language characteristics. The implications of this consideration are numerous; importantly, it favours a more replicability-friendly interdisciplinary literature.

One topic that is particularly developed in this book is the author's discussion of the dorsal pathway. In the past, researchers (Rauschecker and Scott 2009) have noted that the dorsal stream in the human brain may be the fundamental underlying substrate for human language; other brain imaging studies (Perani et al. 2011) suggest that the dorsal pathway is composed of two distinct tracts, both possessing different functions in terms of processing. Friederici expands on these findings by proposing that one branch of the dorsal pathway (roughly, the tract that extends from the temporal cortex to the posterior region of Broca's area) is intimately linked to the language circuit, as it is primarily implicated in the processing of syntactically complex sentences in adults. The author states that "syntax is at the core of human language" (p. 227), thereby asserting that this dorsal tract may be central to language being a uniquely human capability. Given these advancements, important questions are highlighted for researchers in the field: Is this dorsal tract responsible for the sensitive period? Does it play a role in language or speech disorders? More research remains to be done in these respects.

Friederici makes important contributions in the field of neurolinguistics, particularly with regard to the neural underpinnings of syntax: its evolution in human language, its acquisition according to age, and its functional and structural substrates across all stages of language development. Thus, this book provides both a solid baseline of information for the novice learner as well as comprehensive theoretical analysis of 'language in our brain' for the more advanced neurolinguist. Importantly, Friederici's approach is all but speech-centric, and she considers other language modalities at every opportunity. For this reason, this book is valuable for those interested in sign language as well as for those interested in speech.

References

Friederici, Angela D., and Willem J. M. Levelt. 1988. Sprache. *In Psychobiologie. Grundlagen des Verhaltens*, ed. Klaus Immelmann, Klaus Scherer, Christian Vogel and Peter Schmoock, 648–671. Stuttgart: Gustav Fischer

Lenneberg, Eric H. 1967. *Biological Foundations of Language*. New York: Wiley.

Perani, Daniels, Maria C. Saccuman, Paola Scifo, Alfred Anwander, Danilo Spada, Cristina Baldoli, Antonella Poloniato, Gabriele Lohmann and Angela D. Friederici, 2011. Neural language networks at birth. *Proceedings of the National Academy of Sciences of the United States of America,* 108 (38), 16056–16061.

Rauschecker, Josef P., and Sophie K. Scott. 2009. Maps and streams in the auditory cortex: nonhuman primates illuminate human speech processing. *Nature Neuroscience*, 12(6), 718–724.

https://doi.org/10.1017/cnj.2020.33 Published online by Cambridge University Press