biolinguistics

FORUM

Biolinguistics 15: 1–11, 2021
www.biolinguistics.eu

Hypotheses and Definitions in Language Evolution Research: Reply to Mendívil-Giró (2020)

Stefan Hartmann[1,*], Michael Pleyer[2,3], Sławomir Wacewicz[2], Antonio Benítez-Burraco[4], & Przemysław Żywiczyński[2]

[1] Faculty of Arts and Humanities, University of Düsseldorf, Germany
[2] Center for Language Evolution Studies, Nicolaus Copernicus University, Toruń, Poland
[3] University Center of Excellence IMSErt – Interacting Minds, Societies, Environments, Nicolaus Copernicus University, Toruń, Poland
[4] Faculty of Philology, University of Seville, Spain

[*] Corresponding author: hartmast@hhu.de

SH: https://orcid.org/0000-0002-1186-7182
MP: https://orcid.org/0000-0001-6685-391X
SW: https://orcid.org/0000-0003-1488-6220
ABB: https://orcid.org/0000-0003-4574-5666
PŻ: https://orcid.org/0000-0002-0267-3845

1. Introduction

In his reply to our paper "*Language* in language evolution research" (Wacewicz et al. 2020), José-Luis Mendívil-Giró (2020) argues against one of the central points of our paper, namely that the definitions of the term *Faculty of Language in the Narrow Sense* (FLN) in Hauser, Chomsky, & Fitch (2002; HCF) and Fitch, Hauser, & Chomsky (2005; FHC) are incompatible. In addition, he argues that the terminology proposed by HCF could be fruitfully applied to the theoretical avenues surveyed in the remainder of our paper, and that the idea of the language-ready brain, which is discussed at length in our paper, shares many theoretical assumptions with HCF's approach to language.

Although we do not agree with the main points of Mendívil-Giró's critique, we want to start by emphasising that there are many good and valuable specific observations in his reply. Firstly, the "faculty of language" is, obviously, not the same as "language." We agree with Mendívil-Giró that "HCF is not about lang-

Editor: Kleanthes K. Grohmann, University of Cyprus, Cyprus

Received: 6 February 2021
Accepted: 8 February 2021
Published: 30 March 2021

ISSN 1450–3417

uage in general, but about the human faculty of language (FLB), a property or state of the human brain that allows us to learn and use languages." The original authors were careful to explicitly note this difference (HCF 2002: 1570), as were we, by repeatedly using the formulation "(the faculty of) language." This should not however be used to question the centrality of the term "faculty of language" for language evolution and the fact that very frequently researchers (especially from the biolinguistic tradition) take it as a shorthand for "language" in this context. Consider, for example, the following quote from Fitch (2010: 22): "[R]esearchers (including ourselves) had been using the same word, 'language', to talk about two different things (FLB and FLN) for many years." Mendívil-Giró agrees on both of those points: "In fact, the object of study from the biolinguistic point of view adopted by Chomsky, Fitch an Hauser cannot be other than FLB (that is, FL)." Secondly, we seem to be in full agreement with Mendívil-Giró when he declares that:

> It would certainly be naive to think that we can have a "correct" definition of language. The same is true in any field of science: you do not need a universally accepted definition of life to study the origin of life, nor a universally accepted definition of natural species to study the origin of species (not to mention matter or energy). Yet shared assumptions about these objects are clearly needed if the sciences that study them are to be viable. (2020: 146)

In our target paper, we do emphasise this former point (no single "correct" definition of language). But we also agree with the latter point (shared assumptions are needed), while noting that the shared assumptions will form a family-resemblance pattern without however reaching a full overlap. In sum, here Mendívil-Giró's position seems to be fully compatible with ours, as we extensively elaborate it in the Discussion section of our paper. For example:

> We distinguish between definitions on two different and clearly separable levels. One is the level of more specific technical terms that function as building blocks of theories and especially of hypotheses, which require unambiguous formulations so as to meet the fundamental standards of non-triviality and falsifiability. This level is thus essential for science to make progress by conclusively resolving arguments with recourse to empirical data rather than getting stuck on conceptual differences. The other level, however, is the global level of macroscopic notions, which cannot (without further specification) function as building blocks of specific theories or hypotheses but have a different role, related instead to integrative and classificatory goals.
>
> (Wacewicz et al., 2020: 87–88)

In our paper, we have already pointed out that any theory-specific use of the term "language" will inevitably remain meronymous, in the sense of always relating only to parts of the complex phenomenon. We have therefore proposed to push definitions one level down: Our proposal was to leave language as an

unanalysable prime and instead provide rigorous definitions of particular components or aspects of language.

2. On the Definitions of FLN

One of our main points of contention with Mendívil-Giró's response is located in Section 2, as many of his claims are falsified by the quotes from HCF and FHC already provided in our target paper. He claims that our summary of the definetion of FLN in HCF is incorrect. In particular, while we show that in HCF "uniqueness to humans" is a *hypothesis* about FLN, Mendívil-Giró argues that it is part of the *definition* of FLN. Although the reading proposed by Mendívil-Giró is a good interpretation of the terminological distinction between FLN and FLB in the light of the 2005 paper by FHC, the actual published text of the 2002 paper (HCF) clearly contains the inconsistencies that we have pointed out and documented with quotations.[1]

In science, it is crucial to keep definitions and hypotheses apart. A major source of the inconsistencies that we have pointed out—and, by extension, the confusion that leads to the discussion we are engaging in here—lies in a conflation of hypotheses and definitions. In the remainder of this section, we will therefore aim at teasing these two aspects apart. Mendívil-Giró's stance that the FLN definition in HCF is extensional while the FHC one is intensional is, in our view, not convincing, although it can prove very useful in understanding how exactly the different conceptualisations of FLN conflate definitions and hypotheses. As we have already pointed out in our original paper, both HCF and FHC repeatedly make it clear that their definition is, first and foremost, intensional (to use Mendívil-Giró's term) and that its extension, i.e. what belongs to FLN, has to be empirically determined. Thus, any extensional claims that go beyond the provided definition are hypotheses, not definitions. The feature of being uniquely human is not part of the definition of FLN in HCF—instead, the assumption that FLN is uniquely human is explicitly framed as a hypothesis that could be wrong. In FHC, on the other hand, it becomes a major defining criterion for FLN, culminating in the possibility that FLN could be an empty set if no features that are uniquely human can be found.

To illustrate our point in more detail, let us tease apart the definitions and hypotheses that can be found in the original papers.

Definition.

Mendívil-Giró maintains that

> [HCF] propose that the FLN label should be reserved, by convention, for those components of the FL that (supposedly) are neither shared with other species (are specifically human) nor are part of other human cognitive domains (are language-specific); hence the use of the word narrow. (2020:147)

[1] A more extensive treatment of the inconsistencies was offered in Wacewicz (2012), which was the basis for our discussion in section 3 of our target paper.

However, he does not point us to a quote with the exact phrasing of this proposal. The likely reason for this is that there is no such quote in the entire published text of HCF (of course, we challenge the critical reader to find the relevant fragment of the HCF paper). Instead, HCF explicitly argue that FLN *may be* unique to humans, adding that "*this represents a tentative,* testable *hypothesis* in need of further empirical investigation" (HCF: 1576 [emphasis added]). In FHC, by contrast, species-specificity is part of the definition of FLN:

> The contents of FLN are to be empirically determined, and could possibly be empty, if empirical findings showed that none of the mechanisms involved are uniquely human or unique to language, and that only the way they are integrated is specific to human language. The distinction itself is intended as a terminological aid to interdisciplinary discussion and rapprochement, and *obviously does not constitute a testable hypothesis*. (2005: 180–181 [emphasis added])

At the beginning of Section 3 of our original paper, we list three quotes from HCF, where HCF define FLN as an abstract linguistic computational system, in particular when they first introduce that notion (p. 1571): "*Faculty of language–narrow sense* (FLN). FLN is the abstract linguistic computational system alone, independent of the other systems with which it interacts and interfaces" (HCF: 1571, italics in the original). Further, one of the HCF authors writes: "FLN … was defined by Hauser et al. (2002) as a computational process that is responsible for the generative and hierarchical properties of narrow syntax" (Tincoff & Hauser 2006; again, a quote already cited in our paper).

The fact that all these quotes were ignored by Mendívil-Giró indicates that his proposed interpretation seems to be only very loosely based on the actual content of HCF.

Hypothesis.

We show that HCF hypothesise that FLN is uniquely human (and uniquely linguistic), and provide the specific relevant wordings in three quotes in Section 3.1.2 of our original paper. Although Mendívil-Giró describes this as our "interpretation," this is the literal published text of HCF, for example "*Hypothesis 3: Only FLN is uniquely human*" (HCF: 1573, italics in the original). Note that species-specificity is explicitly framed as a hypothesis here, and nothing in the text indicates that it should be understood as a definition or a terminological proposal.[2] Quite to the contrary, HCF specifically assert that human uniqueness is not predicated definitionally of FLN, but as a hypothesis about it: "[A]lthough we have argued that most if not all of FLB is shared with other species, *whereas FLN may be*

[2] Mendívil-Giró does use one quote to illustrate his position here: "Their hypothesis in HCF is that the FLN label should be reserved only for the computational component: 'We propose in this hypothesis that FLN comprises only the core computational mechanisms of recursion as they appear in narrow syntax and the mapping to the interfaces'" (HCF 2002: 1573). This is a misinterpretation. As we show above, HCF first define FLN as "the abstract linguistic computational system" and then hypothesise in this quote that this abstract system "comprises only the core computational mechanisms of recursion".

unique to humans, *this represents a tentative, testable hypothesis* in need of further empirical investigation" (HCF: 1578, italics ours).

All in all, the definitions provided in HCF and FHC are only compatible if we conflate hypotheses and definitions (again, a point clearly demonstrated and documented with specific quotes in our target paper). This does not exclude the possibility that FLN is widely understood in the way proposed by Mendívil-Giró. But note that this fact, in turn, lends even more support to the point we made in Section 3, where we argued that "the specific wording of the top-down definitions of *language* was inconsequential to the research practice of the field."

3. The Language-Ready Brain

In Section 3 of his reply, Mendívil-Giró addresses the remaining theoretical frameworks discussed in our original paper:

(i) Language as a Multimodal Phenomenon (Kendon; McNeill; Zlatev)
(ii) Language as a Complex Adaptive System (Steels; Kirby)
(iii) Language as a Form of Social Interaction (Tomasello; Levinson)
(iv) Language in the Language-Ready Brain (Arbib; Bouchard; Boeckx & Benítez-Burraco)

Mendívil-Giró argues that the terminological distinction between FLN and FLB is compatible with each of these approaches, focusing on the fourth type of models. The first three lines of research are discussed surprisingly briefly in his reply. He devotes only one line to the view of language as a multimodal phenomenon (Section 4.1 of our paper) and writes that it identifies "language with speech and gesture, and would therefore be a central part of the study of the evolution of the sensorimotor component (SM) of FL." Thus, his analysis arguably oversimplifies both the multimodal conception of language and the FLN/FLB approach. The main tenet of the latter is that there is a set of formal properties of language that can be abstracted away from instances of linguistic usage. The views discussed by us in Section 4.1 of our paper vehemently oppose such a conceptualisation. As Kendon argues, language is only feasible in the context of other semiotic systems, most importantly gesture, together with which it is used—abstracted away from this rich semiotic context, language itself fades away (Kendon 2004, 2014). Further, it is difficult to agree with Mendívil-Giró that the multimodal approaches describe the evolution of the sensorimotor component of FL. This statement disregards the essentially cognitive nature of these proposals, for example, of McNeill's Growth Point (McNeill 1992, 2005), foundational to his conception of language and its evolution (McNeill 2012), or of mimesis, on which Zlatev (2008) builds the semiotic hierarchy to account for the emergence of language (Zlatev et al. 2020). On a more general level, Mendívil-Giró misses the point that for Kendon, McNeill, and Zlatev multimodality (or polysemioticity) does not represent an accidental property of language but its design property (cf. Vigliocco et al. 2014).

The language-as-a-Complex-Adaptive-System (CAS) view is dealt with equally briefly. Mendívil-Giró states that this view "is not particularly interested in FL as a biological object, nor, therefore, in the evolution of its components."

However, if this is meant to imply that proponents of a CAS view are not particularly interested in the biological and cognitive dimension of our ability to acquire and process language, this statement is misleading. In fact, the proposal that "language is shaped by the brain" (Christiansen & Chater 2008) highlights that the properties that shape language structure in order to make it learnable by humans are of fundamental importance to understanding language and its evolution. This importantly includes the complex interplay of biological properties as well as cultural and interactional processes (Beckner et al. 2009; Christiansen & Chater 2016). Importantly, these biological and neurological properties are seen as being domain-general in nature (Beckner et al. 2009; Pleyer & Hartmann 2019).

It is also somewhat misleading to state that the following view is increasingly popular (Mendívil-Giró): "[L]anguages somehow externally developed this complexity and motivated the adaptations that would lead to the language-ready brain." In fact, it is not the position of the complex adaptive system approach that languages "somehow" developed complexity. In fact, it is one of the main research avenues of this approach to investigate the factors that influence the emergence of structure and complexity in languages, with researchers having found a wealth of social, ecological, and other factors that influence the shape of languages in interaction with biological biases (e.g., Bentz 2018; Lupyan & Dale 2010, 2016; Raviv et al. 2020).

Mendívil-Giró is similarly laconic in his evaluation of the social-interactive perspective (Section 4.3 of our target paper). In this respect, he notes: "[Tomasello and Levinson] simply ignore the computational dimension of language (FLN)." In fact, the idea that there is some computational core of language is incompatible with their views. As we stress in in Section 4.3 of our paper, language for them is a form of social cognition and action, i.e. it is the implementation of socio-cognitive mechanisms, such as shared intentionality (Tomasello & Carpenter 2007) or the "interaction engine" (Levinson 2006), in the process of communication (Tomasello 2008; Levinson & Holler 2014). Beyond this characterisation, there is no language, which Mendívil-Giró apparently finds difficult to accept and proposes that their work "constitute[s] a part of the investigation of the evolution of the relation between the CI and SM components of FLB."

Tomasello and Levinson are committed to a deeply functionalist view, whereby language serves to achieve social goals—direct attention (Tomasello 2008), aid collaboration (Levinson 2006), or reasoning about each other's intentions (Tomasello 2008). There are of course properties, for example, codifycation (Tomasello), which distinguish language from other semiotic systems (e.g., gesture), which serve similar goals. However, the design of language to a large extent depends on the same general-purpose mechanisms as these other systems do (and accordingly, it entails a different sort of computations at the brain level), while its unique characteristics are the result of the interplay of these mechanisms with cultural-historical processes (Tomasello & Carpenter 2007; Tomasello 2008; Evans & Levinson 2009). In addition, it should be noted that Tomasello has written extensively on his usage-based, construction grammar approach to language acquisition (e.g., Tomasello 2003, 2011). This approach investigates how children use their abilities of intention-reading and pattern-recognition to build up networks of constructions of different degrees of abstractness and schematicity (e.g., Tomasello 2003; Diessel 2013). This also means that the cognitive dimension

of language acquisition and processing, which is extensively researched in constructionist approaches (e.g., Hoffmann & Trousdale 2013), is highly relevant for the social-interactive perspective. It is therefore misleading to say that the computational dimension of language is simply ignored in these approaches. Instead, it is reframed and viewed from a different perspective.

In his more extensive discussion of the language-ready brain hypothesis, Mendívil-Giró raises an interesting question when he points out that this term can be understood in two ways: "Either the brain first developed, through evolution […], or languages developed as complex cultural objects and then they served as an adaptive environment for the evolution of the language-ready brain from a 'language-unready' brain." This is a very relevant point as there are indeed multiple interpretations of the concept of language-readiness. From a gradualist point of view that is taken by most of the current approaches that we have reviewed in our paper, it would make sense to assume a co-evolutionary scenario. Accordingly, some brain innovations increasing language complexity might certainly result from biological changes (e.g., mutations in specific genes controlling brain development or neuron interconnection patterns).

Nonetheless, increasing evidence supports the view that specific language features can have a differential impact on selected cognitive abilities, such as working memory (Amici et al. 2019). This means that increasing language complexity resulting from cultural processes can eventually remodel our cognitive architecture, particularly if "cognitive gadgets" aimed to process language features more quickly and efficiently are implemented (Heyes 2018). Eventually, these changes can be fixed (and transmitted) via, for example, epigenetic marking. On this view, the statement that the language-ready brain precedes language is as problematic as the statement that language precedes the language-ready brain, and the answer to this particular chicken-and-egg question crucially depends on what we mean by "language."

However, this is also an area where a monolithic definition of *language* would not prove very useful—at best, it would allow for positing an arbitrary cut-off point in the sense that we speak of "language" as soon as a specific feature or set of features is available, but it would not help us understand the processes involved. Furthermore, this also implies that, as noted, even "language-readiness" can be seen as a gradual concept. A co-evolutionary scenario in fact allows for the possibility that there were further subtle biological changes since the first emergence of forms of language (Schoenemann 2009; Hurford 2012; Benítez-Burraco 2017), particularly, because our brain has been changing since our inception, reaching its present-day variation between about 100 and 35 kya (Neubauer et al. 2018).

4. Conclusion

While we do not agree with some of Mendívil-Giró's main points, we do agree with his general assessment that "the field of language evolution research is in good health," given fruitful debates about key concepts that are constitutive of our object of study—language. Just as Mendívil-Giró, we do not share Lewontin's (1998: 109) extremely negative attitude towards language evolution research, but

equally, we might agree with him that affirmations of "remarkable progress" are difficult to demonstrate—simply because a notion such as "remarkable progress" cannot be objectively measured and is very subjective. However, we also hold that the claim that we "know essentially nothing about the evolution of our cognitive capabilities" (Lewontin 1998: 111) is just as subjective and impossible to quantify and measure. Here we find that landmark publications such as Hurford (2007, 2012), Fitch (2010), Tallerman & Gibson (2012), or the launch of the CHIELD database (Roberts et al. 2020) are testament to the wealth of evidence, results, and knowledge that has been accumulated in language evolution research, which can hardly be said to amount to "essentially nothing."

As a case in point, this evidence can serve as useful constraints on hypotheses about the evolution of language (Johansson 2005). In addition, recent years have also seen a trend towards generating testable, falsifiable hypotheses about language evolution, as exemplified, for example, in Progovac's (2015) research programme (see also Progovac 2019). These developments can be seen as convincing indicators of scientific progress and we agree with Tamariz (2021: 513) that answers to "questions about language origins and evolution will come from the integration of knowledge from a variety of disciplines."

We started our original paper with several quotes—by Wescott (1991), Botha (2000), and others—to the effect that language evolution research must agree on a single definition of language as a *sine qua non* for progress. Such claims are very intuitive and *prima facie* very reasonable, but the essence of our original paper was to show that they are mistaken. This task was achieved by the lengthy section 4 of that paper, in which we demonstrated that several highly influential approaches to language evolution research—all of them undeniably central examples of latest research in this field—would not be able to agree on a single definition of language. In short, we again underscore that it is good to have explicit, clear and consistently applied definitions of your central terms—including language—*within* a paradigm or approach. This is as true in the field of language evolution as anywhere in science. However, at least at present, it does not appear to be possible to have a single top-down definition of language *across* all approaches and paradigms of language evolution. In particular, we would argue that our understanding of language should be based on the available scientific evidence, rather than accommodating the facts to one particular *a-priori* view of what language is and how it may have evolved.

This is why, if we ask the question of "what evolved"—which can be seen as the main question of language evolution research in its totality—the answer must simply be: language. This is despite the fact that such an answer would, in our view, be both undercomplex and overcomplex. It would be undercomplex because it would underestimate the complex set of cognitive prerequisites on which language builds, and it would be overcomplex for the same reason—unless we limit the scope of the term to specific aspects of language (such as FLN).

As for the definition(s) of FLN and FLB, we have defended our argument that the 2002 and 2005 definitions of FLN are incompatible. We have demonstrated that the 2005 definition includes elements that were stated as hypotheses before, and that the definitions are therefore only congruent if we conflate hypotheses and definitions. As our conceptualizations of language—both in

everyday discourse and in science—tend to include certain assumptions, it can be hard to keep hypotheses and definitions apart, but doing so is vital for enabling a fruitful exchange both between and within individual frameworks.

Author contributions

SH, MP, SW, ABB, and PZ jointly wrote the paper.

Acknowledgements

This research was supported by the Polish National Science Centre under grant agreement UMO-2019/34/E/HS2/00248. MP was supported by a postdoctoral fellowship from the University Center of Excellence IMSErt – Interacting Minds, Societies, Environments, Nicolaus Copernicus University in Toruń.

References

Amici, Federica, Álex Sánchez-Amaro, Carla Sebastián-Enesco, Trix Cacchione, Mattias Allritz, Juan Salazar-Bonet, & Federico Rossano. 2019. The word order of languages predicts native speakers' working memory. *Science Reports* 9(1), 1124.

Beckner, Clay, Richard Blythe, Joan Bybee, Morten H. Christiansen, William Croft, Nick C. Ellis, John Holland, Jinyun Ke, Diane Larsen-Freeman, & Tom Schoenemann. 2009. Language Is a Complex Adaptive System. *Language Learning* 59(s1), 1–26.

Benítez-Burraco, Antonio. 2017. Grammaticalization and language evolution: Focusing the debate. *Language Sciences* 63, 60–68.

Bentz, Christian (2018). *Adaptive Languages: An Information-Theoretic Account of Linguistic Diversity*. Berlin: de Gruyter .

Botha, Rudolf P. 2000. Discussing the evolution of the assorted beasts called language. *Language & Communication* 20(2), 149–160.

Christiansen, Morten H. & Nick Chater. 2016. *Creating Language: Integrating Evolution, Acquisition, and Processing*. Camrbidge, MA: MIT Press.

Christiansen, Morten H. & Nick Chater. 2008. Language as shaped by the brain. *Behavioral and Brain Sciences* 31(5). 489–558.

Diessel, Holger. 2013. Construction grammar and first language acquisition. In Thomas Hoffmann & Graeme Trousdale (eds.), *The Oxford Handbook of Construction Grammar*, 347–364. Oxford: Oxford University Press.

Evans, Nicholas & Stephen C. Levinson. 2009. The myth of language universals: Language diversity and its importance for cognitive science. *Behavioral and Brain Sciences* 32(5), 429–448.

Fitch, W. Tecumseh. 2010. *The Evolution of Language*. Cambridge: Cambridge University Press.

Fitch, W. Tecumseh, Marc D. Hauser, & Noam Chomsky. 2005. The evolution of the language faculty: Clarifications and implications. *Cognition* 97, 179–210.

Hauser, Marc D., Noam Chomsky, & W. Tecumseh Fitch. 2002. The faculty of language: What is it, who has it, and how did it evolve? *Science* 298, 1569–1579.

Heyes, Cecilia M. 2018. *Cognitive Gadgets: The Cultural Evolution of Thinking*. Cambridge, MA: The Belknap Press of Harvard University Press.

Hoffmann, Thomas & Graeme Trousdale (eds.). 2013. *The Oxford Handbook of Construction Grammar*. Oxford: Oxford University Press.

Hurford, James R. 2007. *The Origins of Meaning: Language in the Light of Evolution I*. Oxford: Oxford University Press.

Hurford, James R. 2012. *The Origins of Grammar: Language in the Light of Evolution II*. Oxford: Oxford University Press.

Johansson, Sverker. 2005. *Origins of Language: Constraints on Hypotheses.* Amsterdam: John Benjamins.

Kendon, Adam. 2004. *Gesture: Visible Action as Utterance*. Cambridge: Cambridge University Press.

Kendon, Adam. 2014. Semiotic diversity in utterance production and the concept of 'language'. *Philosophical Transactions of the Royal Society B: Biological Sciences* 369(1651).

Levinson, Stephen C. 2006. On the human "interaction engine". In Nick J. Enfield & Stephen C. Levinson (eds.), *Roots of Human Sociality*, 39–69. Oxford: Berg.

Levinson, Stephen C. & Judith Holler. 2014. The origin of human multi-modal communication. *Philosophical Transactions of the Royal Society B: Biological Sciences* 369(1651), 20130302.

Lewontin, Richard. 1998. The evolution of cognition: Questions we will never answer. In Don Scarborough & Saul Sternberg (eds.), *Methods, Models, and Conceptual Issues: An Invitation to Cognitive Science*, 108–132. Cambridge, MA: MIT Press.

Lupyan, Gary & Rick Dale. 2016. Why are there different languages? The role of adaptation in linguistic diversity. *Trends in Cognitive Sciences* 20(9), 649–660.

Lupyan, Gary & Rick Dale. 2010. Language structure is partly determined by social structure. *PLoS ONE* 5(1), e8559.

McNeill, David. 1992. *Hand and Mind: What Gestures Reveal about Thought*. Chicago, IL: University of Chicago Press.

McNeill, David. 2005. *Gesture and Thought*. Chicago, IL: University of Chicago Press.

McNeill, David. 2012. *How Language Began: Gesture and Speech in Human Evolution.* Cambridge: Cambridge University Press.

Mendívil-Giró, José-Luis. 2020. In defence of FLB/FLN: A reply to Wacewicz et al. (2020). *Biolinguistics* 14.SI, 145–153.

Neubauer Simon, Jean-Jacques Hublin, & Philipp Gunz. 2018. The evolution of modern human brain shape. *Science Advances* 4, eaao5961.

Pleyer, Michael & Stefan Hartmann. 2019. Constructing a consensus on language evolution? Convergences and differences between biolinguistic and usage-based approaches. *Frontiers in Psychology* 10, doi 10.3389/fpsyg.2019.02537.

Progovac, Ljiljana. 2015. *Evolutionary Syntax*. Oxford: Oxford University Press.

Progovac, Ljiljana. 2019. *A Critical Introduction to Language Evolution: Current Controversies and Future Prospects*. Cham: Springer.

Raviv, Limor, Antje Meyer, & Shiri Lev-Ari. 2020. The role of social network structure in the emergence of linguistic structure. *Cognitive Science* 44(8), e12876.

Roberts, Seán G. et al. 2020. CHIELD: The causal hypotheses in evolutionary linguistics database. *Journal of Language Evolution*, doi: 10.1093/jole/lzaa001

Schoenemann, P. Thomas. 2009. Evolution of brain and language. *Language Learning* 59, 162–186.

Tallerman, Maggie & Kathleen R. Gibson (eds.). 2012. *The Oxford Handbook of Language Evolution*. Oxford: Oxford University Press.

Tamariz, Mónica. 2021. A comparative evolutionary approach to the origins and evolution of cognition. In Richard D. Janda, Brian D. Joseph, & Barbara S. Vance (eds.), *The Handbook of Historical Linguistics*, vol. II, 500–522. Hoboken, NJ: Wiley-Blackwell.

Tincoff, Ruth & Marc D. Hauser. 2006. Cognitive basis for language evolution in nonhuman primates. In Keith Brown (ed.), *The Encyclopedia of Language & Linguistics*, 2nd edn., 533–530. Amsterdam: Elsevier.

Tomasello, Michael. 2003. *Constructing a Language: A Usage-Based Theory of Language Acquisition*. Cambridge, MA: Harvard University Press.

Tomasello, Michael. 2008. *Origins of Human Communication*. Cambridge, MA: MIT Press.

Tomasello, Michael. 2011. Language development. In Usha Goswami (ed.), *The Wiley-Blackwell Handbook of Childhood Cognitive Development*, 239–257. Malden, MA: Wiley-Blackwell.

Tomasello, Michael & Malinda Carpenter. 2007. Shared intentionality. *Developmental Science* 10(1), 121–125.

Wacewicz, Sławomir. 2012. The narrow faculty of language: What is it, who has it, and how is it defined? *Theoria et Historia Scientiarum* 9, 217–229.

Wacewicz, Sławomir, Przemyslaw Zywiczynski, Stefan Hartmann, Michael Pleyer & Antonio Benítez-Burraco. 2020. *Language* in language evolution research: Towards a pluralistic view. *Biolinguistics* 14.SI, 59–101.

Wescott, Roger W. 1991. Defining language. In Walburga von Raffler-Engel, Jan Wind, & Abraham Jonker (eds.), *Studies in Language Origins*, vol. 2, 77–84. Amsterdam: John Benjamins.

Zlatev, Jordan. 2008. From proto–mimesis to language: Evidence from primatology and social neuroscience. *Journal of Physiology–Paris* 102(1–3), 137–151.

Zlatev, Jordan, Przemysław Żywiczyński & Sławomir Wacewicz. 2020. Pantomime as the original human-specific communication system. *Journal of Language Evolution* 5(2), 156–174.