Bridget D. SAMUELS. *Phonological Architecture: A Biolinguistic Perspective*. Oxford: Oxford University Press. 2011. 252 pp. ISBN: 978-0-19-969436-5

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As its title suggests, this is a biolinguistics book. Given the vast scope of this journal and the methodological and theoretical departures that the work under analysis might represent, I will start by making some very brief considerations, at the cost of not being able to provide an in-depth review of the book itself due to space restrictions, but with the advantage of providing readers with the right mindset: a fundamentally biolinguistic one, which hopefully enables a better understanding of Samuels' endeavor and its implications for those who are interested.

As Lenneberg (1964: 76) notes:

> "Nothing is gained by labeling the propensity for language as *biological* unless we can use this insight for new research directions – unless more specific correlates can be uncovered."

I chose this quote for two reasons: first, because, in retrospect, it sums up what the term "biolinguistics" means – or, better said, what adopting a biolinguistic perspective means: looking into the biological properties of human language, whatever they might turn out to be and their nature – in a very concise way; second, because, already then, it's a warning about how meaningless or even harmful it is to refer to the idea that language is biological without actually pursuing it.

It is not at all uncommon for many a preamble to include a reference to the

biological nature of the language faculty and for the author to convey to the reader the intention of approaching it as such, only to ignore or even contradict it as the chapters that follow unfold. Thus, "biolinguistics" has become a term whose allusion to in books, articles, conferences and elsewhere, mainly in the context of Generative Grammar, does not always live up to everyone's expectations, warranting constant definition or clarification when contrasted with the remaining literature. The ideas behind Lenneberg's passage, present in other well-established publications from the same period, which went on to become some of the most quoted (to put it briefly and point out the most famous examples, most of Chomsky's work of the time, with emphasis on 1957, 1959 and 1965), and despite the ubiquitous rhetoric, have in practice been frequently ignored, misunderstood or subverted. While some of the apparent vagueness of both biolinguistics and its methodological repercussions, much like what happens with other approaches and ideas, can be explained by the ever-changing focus of research within and across linguistic traditions (see Boeckx & Hornstein 2003), not all of it can be so easily justified. Part of the problem stems from a certain – sometimes explicit – unwillingness to "let" language be studied by fields other than linguistics, leading to, among other things, a perpetuation of some ideas about language as metaphors, when in fact such ideas could attain a stronger ontological status if only dialog between different sciences, the ones that can bring their own useful tools and methodological concerns to the table, could take place. This is an example of how harmful it can be to dwell on the idea of a biological basis for language and not pursue it: it hinders further developments.

Nevertheless, it is important to recognize that a biolinguistic approach is not incompatible with, say, descriptive-style analysis, in the sense that the two kinds of investigation, in and of themselves, are not supposed to clash. In fact, certain purely descriptive analyses of languages and typological generalizations can sometimes be helpful in biolinguistic discussions. The problem only arises when linguists are not clear about what their object of study is, using the faculty of language as a starting point but leaving any further inquiry undone.

Fortunately, there's been a recent reemergence of what came to be called the *biolinguistic approach*, which encompasses both a return to the seminal works that first proposed that language could be studied as part

of the physical universe and as biological entity and a new look at the "old" questions these works raised. The result is an interdisciplinary and mutually-informed program of research whose ultimate goal is to unveil the properties of human language by trying to reach a commensurable level of understanding, taking advantage of the best each discipline has to offer.

This book, a good example of the aforementioned reemergence of the field, is the second volume of a recently founded collection, *Oxford Studies in Biolinguistics*, the first volume of which (Di Sciullo & Boeckx 2011), very general in character, serves as a good companion or entry point to some of the topics Samuels focuses on and biolinguistics in general. After a diverse list of abbreviations and symbols, seven chapters follow, tied up with a useful glossary.

Chapter 1 ("Introduction") lays out the main tenets that will guide the book, highlighting the great deal of work there is to be done if one wants to look at language from a biological perspective "in the strong sense" (trying to answer certain questions explicitly through the aid of (or aiding) other fields, such as biology and psychology, as opposed to having such concerns but not addressing them directly, "the weak sense" (see Boeckx & Grohmann 2007 for the distinction), and committing to give a contribution by addressing a wide audience – much wider than less generalist works can reach –, in order to bridge the gap that usually keeps such an approach from materializing successfully. Samuels then proceeds to summarize each chapter.

In Chapter 2 ("A Minimalist Program for Phonology"), after a brief history of the field of biolinguistics, Samuels presents the three main pillars that will form her phonological theory: Minimalism (Chomsky 1993, 1995 and virtually all subsequent work), Substance-free Phonology (Hale & Reiss 2000 and subsequent; Blaho 2008, for the most recent and radical version and a general review of previous work of the same persuasion), and Evolutionary Phonology (Blevins 2004). The minimalist concern is quite apparent throughout the whole book. Basically, Samuels wants to ask about phonology what Minimalism asks in general: "how little can be attributed to UG while still accounting for the variety of I-Languages attained[…]?" (Chomsky 2007: 3). With this in mind, Samuels' task becomes twofold: 1) to determine what is part of a desirably highly simple phonological component, with help from Substance-free phonology, and 2) to relegate the rest to something else, mostly phenomena that find their way under the phonetics

label, based on Evolutionary Phonology. It quickly becomes apparent to the reader that these are two sides of the same coin. Everything considered part of performance is automatically left out of phonology. Most notably, markedness falls within this group. Despite it being one of the most recruited concepts in modern linguistics, Samuels, drawing heavily from Hume's (2004) and Haspelmath's (2006) work and also with the interesting example of epenthetic consonants, effectively shows why markedness has no place in theories of synchronic phonological competence. The take-home message of this chapter is that whatever falls within the realm of diachrony, while computationally possible, is not intrinsic to the computations themselves, and thus not part of a theory that explains such computations.

Chapter 3 ("Phonology in Evolutionary Perspective") decomposes phonology into underlying abilities, found in species other than *Homo Sapiens* in various forms and to varying degrees, and used in domains other than phonology or even language. Following closely the organization of this chapter, the abilities taken into account can be put under the labels "categorical perception", "grouping" and "[extraction of] patterns". Samuels goes into much greater detail, pointing out many instances of such abilities and referring to solid behavioral studies on a number of different species, including non-primates. This discussion resonates with the work of Hauser, Chomsky and Fitch (2002), in that it follows the recent softening of the homo-centric position regarding the uniqueness of language, attributing much of what was once thought to be strictly human to more general abilities present throughout the animal kingdom, opening way to the investigation of what they name FLB (part of the "FLN (*Faculty of Language in the Narrow Sense*)/ FLB (*Faculty of Language in the broad sense*)" dichotomy[1]), that is, what is part of language but not exclusive to it *or* to humans. Since the focus here is phonology, Samuels is in position to reject the claim by Pinker & Jackendoff (2005) that some aspects of phonology are exclusive to language and perhaps music, which would lead them to present an exception to the ideas put forward by Hauser, Chomsky & Fitch.

Chapter 4 ("The Syntax-Phonology Interface"), perhaps the most technical,

[1] The FLN/FLB distinction, very much taken for granted after Hauser, Chomsky & Fitch (2002), should be met with some reservations. While FLB undoubtedly exists by default, it is not clear why FLN (what is exclusive to humans and language) should exist as such. The same authors, in a later reply to Pinker & Jackendoff (2005), itself a reply to their 2002 paper, even go as far as to say that FLN could turn out to be an empty set (Fitch, Houser & Chomsky 2005), rendering the initial distinction weak from the start.

and which I will refrain from dissecting here, concerns the integration of phonology with the other components of language. Samuels proposes what she calls "Phonological Derivation by Phase" (PDbP) a theory of phonological cyclicity, seen as a direct consequence of syntactic phasality. In the authors words, it combines the "best parts" of Lexical Phonology (Kiparsky 1982), Distributed Morphology (Halle & Marantz 1993) and Derivation by Phase (Chomsky 2001). Rooting aspects of computation in the various interfaces (in this case, mainly the phonology-syntax interface) is important as a way of relieving and guaranteeing the simplicity of the different components themselves.

Chapter 5 ("Representational and Primitive Operations") starts with a discussion of features and different types of "classes" (phonetically natural class, featurally natural class and phonologically active class), arriving then at a notion of archiphonemic underspecification similar to that of Inkelas (1995). A case for a flat, linear hierarchy of phonology is made, according to which phonological objects take the following form, inspired by Raimy (2000): a string of elements X limited by #, a start marker and %, an end marker:

(1) $\# \rightarrow X_1 \rightarrow X_2 \rightarrow X_3 \rightarrow X_4 \rightarrow \%$

Some parallels between syllabic structure and syntactic phrases are reviewed and mostly rejected, providing good evidence that syllables, at least taking into account their known descriptions in the literature, need not have an innate basis. Instead, Samuels argues that the properties usually explained through syllable structure may be explained differently and more effectively, an argument which paves the way for the three phonological operations that arguably form the bulk of Samuels' generalized theory to be introduced. The aptly named operations are SEARCH, COPY and DELETE, and apply to representations of the form in (1). With a generous list of various known processes, such as vowel harmony and tone sandhi, Samuels shows how this simple computational apparatus may in fact be powerful enough to account for all attested data in the world's languages (and, presumably, unattested data as well), eliminating the need for more complex phonological representations and operations.

Chapter 6 ("Linguistic Variation") seeks to answer the variation question: why does it exist?; after all, phonology wouldn't have to yield such different results. Samuels starts by discussing the implications of the famous "Poverty

of the stimulus". While some authors, such as Blevins (2004), have denied that such an argument exists in phonology on the basis that, unlike what happens with syntax, there's *too* much data from which to choose, Samuels argues instead that the fact that children can still choose the right data among such a vast universe is proof that the "Poverty of the stimulus" argument holds, since what is actually important is that children have a lack of information about which data to choose. In fact, it could be said that the argument holds in all domains, and there's no controversy surrounding it in other fields (although the name of the argument might be different or the argument too obvious to even name). Berwick, Piestroski, Yankama & Chomsky (2011) provide an updated discussion on the issue.

To answer the main question itself, a hard one, Samuels hints at a combination of the properties of the acoustic signal, articulation and, as she describes it in the end of the book, "[...] the overwhelming human drive to find and figure out patterns and a society in which such patterns are learned and reinforced by other individuals (or to put in more biological terms, epigenetically transmitted)" (p.205-206). Samuels exposes some of what goes into all of these aspects that potentiate variation, again problematizing what's part of competence and what's part of performance, adding to the previous discussion of what should be factored out of phonology itself and what should be attributed to it and therefore to what about it is innate.

In Chapter 7 ("Conclusions"), Samuels summarizes the whole book and proposes further directions of research, ending with a note about how phonology need not *be*, but when all factors previously discussed enter into play all conditions for its development are met.

For those familiar with the biolinguistic literature, this book should come as a pleasant surprise. Usually, in works that share similar concerns, syntax gets the most attention, a situation one should expect, given its role both in the object that is language and in the theoretical apparatus behind the most salient generative and biolinguistic proposals. What Samuels shows is that it is not only possible, but extremely rewarding to bring along phonology to the forefront of biolinguistic research.

One thing I would like to highlight is the minimalist character of *Phonological Architecture*. Although it may seem that biolinguistics is sometimes used as a means to force minimalism onto to every theoretical

discussion, one must realize that it does not make much sense to posit a highly complex innate basis for language. While such a basis can – and indeed does – give way to intricate results (= *languages*), it is not explanatorily helpful to relegate all of what enters into it to an highly specified internal component, and doing so actually contradicts the idea of an abstract, computationally efficient, productive system for human language. With this in mind, looking at language through a minimalist lens might be a useful way of using linguistic theory to help uncover its biological foundations. It is likely – considering the young and ambitious character of this enterprise, it would be high-handed to argue against it – that some of the findings and conceptual arguments presented here turn out to be inaccurate or not the best path to follow. There is much more to be investigated and much more to be thought about. However, for the same reasons, *Phonological Architecture* is destined to become a stepping stone to the study of phonology and, most importantly, human language.

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