Diana Archangeli & Douglas Pulleyblank (2022) *Emergent Phonology*. Language Science Press. Pp. vi+193.

Reviewed for *Phonology* by Shigeto Kawahara (Keio University)

THIS IS A DRAFT, COMMENTS WELCOME

As linguists, whether a generativist or not, we cannot ignore the influence of the generative grammar in contemporary linguistics. Thus, continuing to think about its core thesis—the claim that human species are equipped with Universal Grammar (UG) (Chomsky 1965)—is essential for any practicing linguist. In the current book, Archangeli and Pulleyblank do precisely this, from the perspective of phonological theory. These authors had published many influential articles and books using UG-based analyses (e.g. Archangeli & Pulleyblank 1994 among many others), but starting around 2006 (e.g. Pulleyblank 2006), they started addressing to what extent we can do phonology without recourse to UG. Based on the accumulation of their work since then, this book presents their (interim) conclusion—we can, and in fact should, analyze phonological patterns without UG.[1] Instead, they propose that phonological regularities emerge as a consequence of general cognitive capacities, hence the title of the book *Emergent Phonology*.

The claim about UG in my view can be decomposed into three sub-claims: (1) human beings are born with some sort of ability to acquire language (i.e. the innateness hypothesis), (2) that ability is specific to human species, and (3) that ability is specific to language, being to a large degree independent of other cognitive modules. In this book, the authors clearly reject the third claim, and they are skeptical about the second claim as well. Of course, the authors are not claiming that non-human animals (like cats and dogs) can potentially acquire human languages; they instead refer to studies which show that abilities that have been considered as prerequisite for language acquisition are not specific to human species (e.g. p.11 and p.55). My reading of the book is that they are still willing to accept the first claim that humans are born with an innate ability to acquire language. In short, their proposal is a concrete attempt to do phonology without a domain-specific language acquisition device.

The book is not very long, consisting of 148 pages without the references and the indexes. It comes with a rich list of references, which is 26 page long, along with useful indexes by name, language and subject (although readers can get a free, searchable PDF copy of the book). The book is overall clearly written, but readers should be aware, as is stated by the authors, that the

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[1]Although it is not mentioned in the book, their attempt appears to be in the same spirit as Minimalist Program in syntax (Chomsky 1995), which attempts to minimize the content of UG as much as possible. The conclusions are rather different, however. Archangeli and Pulleyblank, albeit tentatively, conclude that no UG is necessary; Minimalist Program still posits *merge* as an—and perhaps the only—operation made available by UG.

meanings of some technical terms are used to mean something different from their traditional uses. For example, the term "optimizing", which has a specific meaning in Optimality Theory (OT: Prince & Smolensky 1993/2004), is used to mean "relationships being characterizable in terms of phonological properties" (p.73). The book has many "boxes" that highlight important points, and lay out technical details and comparisons with previous theories such as OT.

The book is probably too advanced for undergraduate students, as it assumes basic familiarity with previous influential theories such as OT, Exemplar Theory (Pierrehumbert 2001), etc. However, graduate students who have completed their introductory phonology course would benefit hugely from reading this book, as it will give them an opportunity to rethink if—and more importantly, why—we need to posit the mechanisms that are introduced in such introductory courses. Grown-up researchers would likewise learn a lot from reading the book. It is unlikely that a reader will agree with every aspect of the book. But it is precisely this characteristic of the book that makes it readable: it forces us to pose for a moment and rethink whether and why theoretical postulates that we posit in phonological analyses are necessary. I would particularly like to invite practicing phonologists to take a look at Box 3.6 (p.40), which presents a comparison between the authors' proposal and OT, a point that I will come back to below.

I would now like to proceed to a brief summary of each chapter. Chapter 1 lays out their conceptual foundation, addressing the question of whether we need a language-specific acquisition device that is separate from other cognitive modules in order to learn phonological regularities, the question that the authors answer in the negative in this chapter. They argue that abilities to (1) attend to language (2) to remember (3) to identify similarities (4) to process sequences (5) to attend to frequency (6) to form categories (7) to generalize and (8) to generalize over generalizations suffice to acquire phonology. Chapter 2, using the data from Yangben, illustrates how learners equipped with these abilities are able to identify phonologically relevant "partitions" (roughly corresponding to "natural classes" in more traditional phonological analyses). The authors then present how learners may acquire the phonotactic restriction in terms of tongue root position observed in this language. Word-final devoicing of low-toned high vowels is also discussed in this chapter.

Chapter 3 turns to what we would call "morphophonological alternations" in more traditional frameworks, i.e., tongue root position harmony and rounding harmony patterns. In this chapter the authors define their critical notions like *morphs* (roughly corresponding to "morphemes"), *morph sets* (roughly corresponding to "morphologically related paradigms") and *morph compilation* (roughly corresponding to "morpheme concatenation"). The authors are very careful not to use the traditional terms to highlight the fact that they are not relying on the traditional analytical tools. This chapter also introduce *well-formedness conditions*, which are similar to markedness constraints used in the OT literature, and *assessment tables*, which resemble OT tableaux—a

visual illustration of how conflicting, violable and ranked well-formedness conditions work to select actual, observed forms. Two additional principles—Morph Set Relations (MSR) and Morph Set Conditions (MSC)—are introduced in this chapter.

In Chapter 4, Archangeli and Pulleyblank challenge one of the fundamental concepts that has been shared by most modern phonological theories, namely, the postulation of *underlying representations* (or inputs in OT), a principle that states that whenever possible, analysts (linguists and language learners) should posit a single form per morpheme.[2] In this traditional view, when there are two realizations of a single morpheme, [X] and [Y], the relationship between [X] and [Y] is captured indirectly by virtue of these two representations sharing the same underlying representation /Z/. The authors instead argue that systematic relationships between [X] and [Y] should be more directly captured at the surface level by MSR. A simple but compelling argument is that in traditional analyses, it is natural and straightforward to posit /-d/ as the underlying representation of the past tense morpheme in English and derive three distinct surface forms ([-t], [-d] and [-əd]) by way of phonological rules or constraint interactions, but it is not possible to posit a single underlying form for the verb *go*, which can be realized as /goʊ/ or /wɛnt/; why leaners should posit a single underlying form for the former, but not the latter, appears to be rather arbitrary. They also present a historical review of how the notion of underlying representations has arisen in the history of phonological thinking, which itself is very readable.

Chapter 5 discusses the consequences of their main proposal, especially that of eliminating abstract underlying representations. It presents five case studies, starting with a complementary distribution of stops and their continuant variants in Warembori. The second case study is a pattern that is probably familiar to all phonologists—nasal place assimilation in English, as observed in the behavior of the prefix [in-]. The focus is the question of why other prefixes such as [un-] and [non-] do not undergo nasal place assimilation. The answer provided in the book, in short, is that for these prefixes, forms that undergo nasal place assimilation are simply unavailable, i.e., not a part of their morph set. This analysis highlights a clear difference between the current proposal and OT, the latter of which claims that all potential candidates should be considered in phonological analyses. Three other cases discussed in this chapter are ternary suffixal distinctions in Mayak, tonal patterns in Kinande and Polish yers.

Chapter 6 provides a summary of each chapter, and touches upon various topics such as directionality, non-iteratibitiy, saltation, opacity (§6.1), syllables, stress (§6.2), language change, multilingualism, reverse engineering and frequency (§6.3). Discussions in this chapter tend to be brief and readers are often directed to other papers written by the authors and their students. Many questions are raised but are left for future research.

Now I would like to move on to more subjective experiences that I had while reading through

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[2]This book is not the first proposal to eliminate underlying representations from phonological theory. See Hyman (2018) for a review and a response to such proposals.

the book. As somebody who has engaged in OT-based research, Box 3.6 in the book, which summarizes the major differences between Emergent Phonology and OT, was of great interest, and I imagine that it will be so for many readers of this journal. The four major differences are: Emergent Phonology does not posit (1) the Richness of the Base, (2) GEN, which generates an infinite number of candidates, (3) faithfulness constraints, or (4) CON, a set of universal constraints. While the consequences of these differences are not fully explored in the book, it is a great exercise to carefully think about what these differences actually mean.

Richness of the Base, for example, was posited to avoid the so-called "duplication problem," a problem that the same grammatical restriction has to be stated twice, once in the phonological component and again in the lexicon (Prince & Smolensky 1993/2004). Would the duplication problem be a genuine problem for Emergent Phonology, and for that matter, phonological theories in general?[3] Given that the base is not rich, how does Emergent Phonology model how speakers produce nonce words? Japanese speakers, for example, spontaneously palatalize [s] before [i] in loanword pronunciations (Ito & Mester 1995), but how does Emergent Phonology account for this observation? Emergent Phonology does away with faithfulness constraints because it eliminates underlying representations. However, Correspondence Theory (McCarthy & Prince 1995)—one instantiation of faithfulness constraints in OT—was proposed not only to model input-output relationships, but also to capture similarities between, for example, base-reduplicant mappings and output-output mappings, and for that matter, relationships between rhyming elements (Holtman 1996). Are these observed similarities real? And if so, should a phonological theory capture the similarities? The universality of CON makes OT an inherently typological theory—positing a constraint in the analysis of one language forces us to commit ourselves to make it a claim about all other languages as well (McCarthy 2008). Is this property something that we are willing to let go of? The book opens up these interesting questions to be discussed in future conversation.

Another set of question arose as I read through Chapter 3, primarily regarding whether the assessment tables are truly domain-general devices. Assessment tables consist of ranked, violable wellformedness conditions and its function is to select an observed set of forms from several possibilities, which are thus very similar to OT tableaux. One specific question that I had was where these wellformedness conditions come from. The proposal in the book is that learners can deduce these conditions by observing actual phonological regularities in the language, perhaps using mechanisms like maximum entropy as in Hayes & Wilson (2008) (p.24).[4] A contrasting view would be to posit that such constraints are innate as in OT or that such constraints are deduced from learners' phonetic experiences (Hayes 1999). It is worth noting that the book deploys

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[3]See also Paster (2013) and Gouskova (to appear), who both argue that the duplication problem is not necessarily a problem; i.e., it is necessary to state constraints both at the lexical and grammatical level.

[4]Maximum Entropy model, although it is now widely used for phonological and other linguistic analyses (Hayes 2022), is equivalent to logistic regression (Jurafsky & Martin 2023: ch.5), and can thus be considered as a domain-general mechanism.

a specific schema for formulating wellformedness conditions (p.44), implying that there are restrictions on what kinds of wellformedness conditions can exist (see McCarthy 2003 for a similar proposal in OT). Can we, then, take this restriction as evidence for UG?

Another specific question that I had was whether every wellformed condition—or constraints and constraint rankings—can be learned from the ambient data or not, which has been a widely discussed topic in the OT research. One argument for the latter position that immediately came to my mind is the emergence of the unmarked effect (McCarthy & Prince 1994) in L2 phonology; e.g. L2 learners whose native language do not have codas sometimes show a spontaneous pattern of coda devoicing (Broselow et al. 1998). Similar patterns are observed in the context of loanword adaptation patterns (Shinohara 2004) and loanword phonology; for example, while Japanese native phonology prohibits both [si] and [ti], Japanese speakers are more prone to palatalize [si] than [ti] (e.g. [ʃiti], but not [sitʃi], for "city") (Ito & Mester 1995). The difference between [si] and [ti], as far as I know, is something that is not learnable from phonological regularities in the native lexicon of Japanese.

The third question was where the decision-making procedure comes from. Assessment tables, like OT tableaux, instantiate a specific mechanism to decide on a "winner" given a set of possibilities and a set of wellformedness conditions. It is not immediately clear whether this can be achieved via a truly domain-general cognitive mechanism, although I would like to point out that the decision mechanism proposed in the book very much resembles that of a heuristic decision making procedure discussed in the psychology literature, described in detail by Gigerenzer & Gaissmaier (2011).

In addition to these questions, there is one more aspect of the proposal that I would like to highlight—the authors propose that when learners divide their phonemes into distinct sets of sounds ("partitions"), the null hypothesis is that they opt for binary partitioning rather than complex partitioning (p.17). While bias toward simpler categorization may be observed in other modules of cognition, this proposal reminds me of the proposal by Gordon (2002), who argues that one principle that determines the distinction between a heavy syllable and a light syllable is that of formal simplicity (see also Hayes 1999). This aspect of the proposal could be another potential candidate for a language-specific mechanism, although it may as well be the case that it too can be derived from domain-general principles (see also Pater & Moreton 2012).

To conclude, even if one is not convinced by some specific aspects of the book, I believe that the most general message of the book, quoted below, is something that every practicing linguistic should bear in mind:

> [I]f one were to argue strongly in favour of innate regulatory principles that were inherently linguistic, it would be important methodologically to eliminate the possibility of adopting comparable principles that were rooted in general, nonlinguistic

₁₇₄ capabilities (p.2).

₁₇₅ For this reason alone, this is a book that is worth a serious attention.

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