Mark Hale & Charles Reiss, *The phonological enterprise*. Oxford: Oxford University Press, 2008. Pp. xii + 292.

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In this book, Mark Hale & Charles Reiss (henceforth H&R) start by explaining what the 'phonological enterprise' is. For them, the enterprise is not to account for speech sound patterns, but rather to develop a theory of a physical object: the part(s) of the mind/brain devoted to the manipulation of symbols that are ultimately converted by other mind/brain modules to articulator movements that result in human speech. In short, H&R's book is about the phonological component (PhC), and reaffirms the tenets of generative phonology.

H&R touch on many topics: the book provides a critique of phonological methodology, sketches of a theory of learning and the PhC, and a critique of Optimality Theory. However, the central issue is the 'data [that] constitute evidence for the nature of U[niversal] G[rammar], and how this data should be used in theory construction' (2). The authors argue that work in generative phonology tends to assume explanations of speech sound patterns that are based entirely in the PhC; other modules and factors that could in fact be responsible are often ignored. Following on from this point, H&R contend that many universals and universal tendencies in sound patterns are in fact due to extra-PhC modules and factors. H&R strongly argue that a PhC is necessary, but because it is not needed to account for many sound patterns, they propose that it is much more powerful than in most other generative theories. The rest of this review will discuss H&R's proposals in sequence, and relate their work to other literature.

In terms of methodology, if a phonologist hears someone devoicing stops at the end of words, his/her reaction would probably be to ascribe such devoicing to a phonological rule or set of interacting constraints. However, H&R observe that the apparent devoicing could be due to many other factors (59–60, 108). The perceptual system of the listener might be trained to ignore the acoustic properties that mark word-final voicing. Alternatively, the listener might have damage to the peripheral perceptual apparatus (the ear, its nerve connections, the auditory processing module). These observations are clear arguments for not trusting impressionistic data, with which I wholly agree. In fact, I suspect a number of phonologists would agree; in some phonological subfields, like intonational phonology and 'laboratory phonology', impressionistic data is almost never trusted (see below).

Devoicing could also happen in the speaker, though not in their PhC. It could be a neuro-motor problem: H&R point out that the captain of the *Exxon Valdez* devoiced final stops when he was intoxicated (59–60). I imagine that, depending on one's phonetic theory, a person's phonetic module might 'neutralize' a PhC contrast between [+voice] and [−voice], realizing them both with the same articulatory configuration. Alternatively, the lack of final voiced stops might be due to lexical gaps rather than an active PhC process.

H&R also observe that many typological gaps can be ascribed to the learning process: many sound patterns do not exist because there is no series of misperceptions or articulatory modifications that could lead to them.

H&R's concern about methodology has a long history in generative phonology. Chomsky & Halle (1968: 110–111) express concern about whether English vowel reduction is really due to the PhC, or to another module. They point out that since they do not know much about these other modules and performance factors, their claim that vowel reduction is due to the PhC 'must be taken as quite tentative', and go on to say that '[w]hen a theory of performance ultimately emerges, we may find that some of the facts we are attempting to explain do not really belong to grammar' (111).

H&R imply that a great deal of work in generative phonology tends to assume that the PhC is responsible for observed speech sound patterns, without spending much time considering the contribution of other modules and factors, or even just acknowledging them. To be sure, apart from Chomsky & Halle's caveat above, I have not found systematic, widespread overt recognition in the generative phonological literature that particular sound patterns could be explained by non-PhC modules/factors. As the Chomsky & Halle quote above reveals, disregarding other modules/factors was necessary in the past because little was known about them. And H&R rightly suggest that, if such concerns had not been put aside, phonologists would have been unable to provide any explanatory accounts (105). However, enough is now known about articulatory and acoustic phonetics, perception, parsing, the auditory processor, learning, and diachronic change

that it has become difficult to justify NOT explicitly considering these other modules. It seems quite reasonable to me that every work in generative phonology that presents data should have to explain why it is the PhC – and not another relevant module/factor – that is responsible for the patterns observed in the data.

A concern with H&R's book is that, apart from John Ohala's work (cf. Ohala 1990), it does not acknowledge the work that DOES care about such methodological issues and the influence of PhC-external factors on sound patterns. However, some subfields are very concerned about such issues. Even the earliest generative theories of intonation were acutely sensitive to the different roles of the phonological and phonetic modules. Pierrehumbert (1980) is careful to identify aspects of the intonation speech signal that are due to modules outside the PhC (i.e. the phonetic module). In fact, the methodology that continues to be the accepted standard for generative work on intonation rejects impressionistic descriptions of intonation, apparently being fully cognizant of the dangers of impressionistic data and the distortions an observer's perceptual system can create. (I should point out here that it is perhaps unsurprising that H&R do not cite work on intonation, given that their book has an almost exclusively segmental/featural focus.)

Recent research into loanwords has similar concerns. For sure, a lot of work has assumed without comment that all sound changes seen in loanword adaptation are due to the PhC. However, a growing body of work criticizes this viewpoint, emphasizing the importance of the perceptual system in shaping loanword form (e.g. Peperkamp & Dupoux 2003). There is also a considerable body of work in 'laboratory phonology' that takes great care with such concerns.

In short, I suspect that a lot of phonologists are really quite concerned about methodology and the relevance of their data to the PhC, even if it has become common practice not to mention caveats like Chomsky & Halle's in print. For example, René Kager, on being asked about the quality of data for metrical stress theory, said in an interview that '[it] leaves many things to be desired … often these patterns are described just from [an] impressionist[ic] angle … it really takes more close acoustic analysis' (Kager 2007).

H&R's book can thus be seen as part of a surge in concern with the issue of the PhC's role vs. other modules and factors. Following Ohala's work, Blevins (2004) observes how the process of learning in diachronic change can explain why some sound patterns are frequent while others are rare and even non-existent. De Lacy (2006) argues that many putative universals are due not to the PhC but to other modules, closely agreeing with H&R's concerns about 'markedness'. Parker (to appear) contains a variety of relevant articles and a number of pertinent references.

As it turns out, a good proportion of H&R's monograph reflects work that was written and published before the majority of publications appeared that express the same or similar concerns. The central points of H&R's book are

based on manuscripts written in the mid-to-late 1990s, published in various venues in the late 1990s and early 2000s. I would guess that the authors may only have had time to insert one or two references concerning the role of the PhC; for example, Blevins (2004) is mentioned in the references, but fails to be discussed to any degree in the text. So H&R represents one of the earlier works to make the point about methodology. Even so, it is a shame that discussion of more recent work could not have been introduced in the later stages of the book's development; it would have made H&R's argumentation richer.

Certainly, the reader will be struck by how similar some of H&R's statements are to those by, for example, Ohala (1990) and Blevins (2004). For example:

> The relative rarity of a given phonological process, cross-linguistically, is a simple function of how likely the misperception (or sequence of misperceptions) required for the coming into being of that process is. (158)

However, it is important to acknowledge that such similarities are superficial. H&R's perspective is not the same as Ohala's and Blevins's. For example, in Blevins's (2004) proposals, the PhC appears to play a very different role, as the overall tone of the book suggests that the PhC's form – if it exists – is extremely powerful and quite unlike that proposed in generative theories (see de Lacy & Kingston 2006 for discussion). In contrast, H&R state that 'it is *not* our opinion that phonology itself can be explained away by reference to these other domains. We completely endorse a traditional cognitive science symbol-processing approach to phonology' (277; italics in the original).

H&R's sketch of their conception of the PhC suggests that it will be far less restrictive than other phonological theories (176) and might resemble the model espoused in Chomsky & Halle (1968), albeit ignoring chapter 9 (170). However, H&R's PhC is not all-powerful; its output is restricted by the properties of representational primitives and by rule- and/or constraint-creation mechanisms. Not a great deal of detail is provided, but it seems that H&R's conception is that the rule- and/or constraint-creation mechanisms might have properties that make the rules/constraints they produce quite restrictive.

How can H&R's theory of the PhC be tested? Given their theory, it would be unexpected to find that the PhC is unable to generate a particular output, and, what is more, that an output's sound realization is unlearnable. It would also be unexpected to find that a particular sound pattern could easily come about through misperception/misarticulation in learning, but that the PhC is incapable of generating the related output.

Recent work has identified two general ways in which these issues can be addressed. Most of such work is a response to claims that phonological restrictions are merely generalizations across the lexicon and/or to proposals

that seek to move explanation of sound patterns entirely outside the PhC (like, for example, Blevins 2004). One way identified is to use experiments involving online responses to test for PhC restrictions rather than rely on typological data. For example, Moreton (2002) uses experimental techniques to determine that American English speakers have an active prohibition against [dl] onsets but not against [bw] onsets, even though neither cluster exists in their lexicons. This kind of work shows that (at least) phonological restrictions are not simply generalizations across the lexicon. A variety of other methods are discussed in de Lacy & Kingston (2006).

The other tack is to identify situations in language change where there is avoidance of a sound pattern that is perceptually/articulatorily desirable. This involves identifying misperceptions (or a series of misperceptions) that could easily create particular phonological patterns, and then showing that such patterns never occur. For example, no language has epenthetic [k], but de Lacy & Kingston (2006) discuss how epenthetic [k] could develop in diachronic change – and SHOULD have in Hawai'ian (see further references in de Lacy & Kingston 2006).

A final note: H&R's consideration of various theories set within Optimality Theory often enhances their discussion. However, there is a long section (191–256) at the end of the book that provides an extended critique of Optimality Theory. I urge the reader to treat this section as if it were a completely different book; the section veers the book off course and obscures its central theme, which H&R in fact seem to acknowledge (257). Engaging with H&R's evaluation of Optimality Theory would take this review too far off course, so I leave it for another time.

To conclude, H&R is an early example (though published late) of a growing body of work that is unsatisfied with the methods used to determine whether speech sound data is actually phonological evidence. Enough is now known about non-PhC modules and factors that they must be considered when developing an account of speech sound data. In some phonological subfields and for some phonologists, this message has already been known, appreciated, and acted upon. For others, it will require careful thought about the validity of evidence commonly used to support PhC theories and development of appropriate methodologies.

Any phonologist would probably find H&R interesting to read, although I recommend reading it along with the larger body of work mentioned above. Of course, the book has limits: it does not engage productively with the existing literature that makes the same or similar points; it does not provide methods for testing its proposals; the theories of learning and the PhC offered are sketchy; the lengthy discussion of Optimality Theory does not mesh well with the book's aims.

After reading H&R and examining the other work that makes similar points, I was left with the sense that practicing generative phonology is very, very difficult. An incredible amount of care must be put into evaluating

speech sound data for its relevance to the PhC. It seems that phonologists have little choice but to know (or partner with someone who knows) a great deal about other modules, especially articulation and perception. Most of what we believe to be valid evidence for the form of the PhC should probably be reevaluated, and I suspect that it will be judged irrelevant or inconclusive.

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