

Noel Burton-Roberts, Philip Carr & Gerard Docherty (eds.), *Phonological knowledge: conceptual and empirical issues*. Oxford: Oxford University Press, 2000. Pp. x+352.

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To the practitioners of other linguistic disciplines, phonology sometimes appears as a highly unified field where a shared body of ontological and epistemological assumptions makes cumulative progress possible (see e.g. Newmeyer 2000: §1.1). The volume under review provides a most effective antidote to this misconception. It consists of an introductory essay by the editors followed by eleven specially commissioned chapters, two of which (the papers by Bromberger & Halle and Hale & Reiss) are revisions of earlier publications. The contributors —whose varied backgrounds include generative phonology, generative syntax, laboratory phonology, phonetics, psycholinguistics, sociolinguistics, and philosophy— were all asked to reflect on the nature of phonology, and on the place and status of knowledge of linguistic sound patterns in relation to linguistic knowledge and nonlinguistic phenomena in general. The outcome of this exercise reveals a shocking lack of agreement: no consensus emerges as to what constitutes a phonological fact, what methods should be used for finding such facts, what theoretical entities should be postulated to account for them, and how such entities relate to those posited in other disciplines. Despite Newmeyer's (2000: §1.1) rosy depiction of research practice in phonology, however, this result is not surprising: the relationship between the linguistic and the nonlinguistic remains the most contentious problem in contemporary linguistics, and its attendant perplexities are most acutely manifest in the problem of the connection between phonology and phonetics.

The volume has appeared at a specially opportune moment. During the past ten to fifteen years, several factors have conspired to exacerbate the controversy surrounding the status of phonology and its relationship with phonetics, particularly within the generative paradigm:

(i) With the rise of the Minimalist Programme, mainstream generative syntax has witnessed a radicalization of the autonomy thesis: syntax is conceived of as wholly innate, strictly universal, and hermetically encapsulated. If this view is accepted, then the status of phonology within the generative theory of language becomes problematic, for it is clear that phonology will not share the radically autonomous nature attributed to syntax. In the volume under review, the papers by Noel Burton-Roberts ('Where and what is phonology? A representational perspective', 39-66) and Philip Carr ('Scientific realism, sociophonetic variation, and innate endowments in phonology', 67-104) directly grapple with this issue, which is also addressed in an appendix to the chapter by Janet Pierrehumbert, Mary E. Beckman & D. R. Ladd ('Conceptual foundations of phonology as a laboratory science', 273-303).

(ii) Nearly simultaneously, Optimality Theory (OT) has *de facto* become the dominant framework in generative phonology; but, by highlighting the grounded nature of many phonological constraints, the OT inquiry has further undermined the autonomy of phonology. The chapter by Mark Hale & Charles Reiss ('Phonology as cognition', 161-184) constitutes a violent reaction against this development.

(iii) Finally, experimental research has steadily eroded the empirical basis of generative phonology. In particular, a surprising amount of low-level nondiscrete sound patterning has been shown to be language-specific and therefore learnt, rather than the product of a 'universal phonetics' as assumed in SPE (Chomsky & Halle 1968). Gradient language-specific phonetics has also expanded at the expense of categorical phonology, as a host of phenomena previously thought to be discrete have proved upon experimental examination to involve continuous variables. This shift in the empirical foundations of phonology has accelerated dramatically since the first Conference in Laboratory Phonology was held in 1987. In the volume under review, the following articles rely on laboratory techniques: Pierrehumbert et al., which focuses on the nature of the laboratory phonology enterprise; Gerard Docherty & Paul Foulkes ('Speaker, speech, and knowledge of sounds', 105-129), which focuses on sociophonetic variation; Jennifer Fitzpatrick & Linda R. Wheeldon ('Phonology and phonetics in psycholinguistic models of speech perception', 131-160), which focuses on word recognition; Scott Myers ('Boundary disputes: the distinction between phonetic and phonological sound patterns', 245-272), which focuses on the distinction between categorical and gradient patterns; and Marilyn Vihman & Shelley Velleman ('Phonetics and the origins of phonology', 305-339), which focuses on the developmental study of phonological acquisition.

The chapters are arranged in alphabetical order by first author's surname. In the introduction (1-18), however, the editors do an admirable job not only of summarizing the content of each paper, but also of identifying and highlighting recurrent themes, and of locating each contribution within a taxonomy of approaches to the nature of phonology. In what follows I shall discuss a few of the leitmotifs running through the book. In the allocation of emphasis I will inevitably be guided by my own interests and concerns; this is the only practical expedient for a reviewer faced with a volume of such intellectual richness.

Several chapters touch upon the relationship between theory and data in the phonological enterprise. Docherty & Foulkes and Pierrehumbert et al. criticize research practice in mainstream generative phonology: they suggest that generative phonologists all too often advance far-reaching hypotheses on the basis of impressionistic evidence, fail to state the precise conditions under which those hypotheses would be falsified, and generally retain them in the face of major empirical difficulties. Carr redresses the balance by pointing out that generative practice can be exemplarily Popperian (74-75): bold (and, by the same token, potentially revelatory) conjectures are put to the test and, when clearly falsified, are discarded. Kiparsky provides a commendable example: in Kiparsky (1993) he

resolutely abandoned the Strict Cyclicity Condition, despite having personally invested large amounts of research effort in it during the 1980s.

In contrast, Pierrehumbert et al. lay considerable emphasis on operational definitions and ancillary instrumental theories (281-282); they claim that agreement on their rôle binds the community of laboratory phonologists together, enabling progress. In this connection, however, Carr observes that such tools do not by themselves deliver a coherent account of the architecture of phonology and its place in human cognition (84). The point is well taken. Pierrehumbert et al., for example, assert that, ‘In so far as we know the denotation of the term “syllable”, it is provided by work such as Bell and Hooper (1978), Derwing (1992), and Treiman et al. (2000)’ (282). But, surely, having criteria for delimiting syllables in surface representations and assessing their relative phonotactic acceptability falls short of elucidating the rôle of syllable structure in phonology. Relatedly, Eysenck & Keane (1995: 466) note that in cognitive psychology a long experimental tradition has frustratingly failed to deliver overarching cognitive architectures. Interestingly, Pierrehumbert et al. defend the epistemological stance of laboratory phonologists with arguments from philosophers of science such as Laudan and Hull; in this they contrast with Carr’s invocation of classical Popperianism, and with what they call the ‘Kuhnian glamourizing of conceptual upheavals in linguistics’ (275). This shows that, whilst the philosophy of science can play a useful rôle in clarifying the intellectual position of individual linguists or schools, there is little chance of its being applied normatively so as to regulate the conduct of research.

Also worthy of comment is Docherty & Foulkes’s specific complaint about the neglect of sociophonetic variation in the generative tradition. It is true that, insofar as variation is language-specific and therefore learnt, phonological theory must make provision for it. In addition, phonology must accommodate the fact that variation along certain dimensions may be —and often is— socially evaluated. Nonetheless, Docherty & Foulkes fail to justify their claim that specifically sociolinguistic variation is as revealing in respect of the nature of phonological representations and processes as lexical contrast. In particular, they do not address the observation that no particular dimension of variation can be predicted to bear social evaluation in any given language, given the fact that the link between linguistic variables and social values is culturally contingent.

Another thread in the fabric of the volume is the debate concerning the relationship between gradient and categorical sound patterns. In this area, the opinions voiced by some of the contributors are informed by their adoption of exemplar-based models of phonology, where lexical representations (and indeed phonological knowledge in general) inhere in the multiple traces of phonetic events stored in a pattern-associating memory. Exemplar-based models are explicitly endorsed by Docherty & Foulkes and Pierrehumbert et al. The latter specifically claim that categorical phonological patterns have no independent existence, but emerge from nonlinearities in continuous phonetic patterning (283-289). Vihman

& Velleman state their position in more guarded terms. They highlight discontinuities in the phonetic behaviour of young children which, in their view, reflect the onset of phonological organization superimposed upon ongoing phonetic learning. However, they do not state whether such discontinuities involve the rise of discrete symbolic generalizations, or rather nonlinearities in the behaviour of neural networks.

It appears, though, that exemplar-based models, with their attendant dissolution of the gradient/categorical dichotomy, have not yet gained complete ascendancy among experimentalists. Notably, Myers mounts an admirably lucid defence of the classical modular approach, which assigns categorical patterns to the phonology proper and gradient patterns to a phonetic implementation module. First, Myers establishes that the choice between categorical and gradient analyses is experimentally decidable. Comparing two tonal rules in Chichewa, he shows that phrase-final high-tone retraction must operate categorically, since phonetic functions governing the timing of F_0 peaks perform measurably better if the high tone is assumed to shift phonologically onto the phrase-penultimate syllable (249-252); in contrast, a putative rule of forward high-tone spread proves to be an artifact of F_0 peak delay in syllables of relatively short duration. Having accomplished this, Myers then turns to a very useful checklist of diagnostics for categoricalness and gradience (259-267).

Fitzpatrick & Wheeldon argue for a psycholinguistic model of spoken-word recognition where, at an initial stage, discrete features are extracted from the acoustic stream and directly mapped onto an underspecified lexicon. Interestingly, a subsequent stage in the recognition process involves the grammar (conceived very much in orthodox generative terms) assigning full phonological representations to activated lexical entries.

A third strand of argument in the volume concerns the substantive content of phonological representations and the phonetic grounding of phonological patterns. The chapters by Sylvain Bromberger & Morris Halle ('The ontology of phonology (revised)', 19-37) and John Harris & Geoff Lindsey ('Vowel patterns in mind and sound', 185-205) uphold the traditional position that distinctive features, though internal mental objects, have substantive phonetic content: articulatory in the case of the binary features assumed by Bromberger & Halle (in the SPE tradition), auditory in the case of the vocalic elements with stand-alone interpretability proposed by Harris & Lindsey. Ontologically, Bromberger & Halle describe features as constituting 'mnemonic elements' (30) in the context of underlying representations and 'phonetic intentions' (25) at surface level; for Harris & Lindsey features are 'auditory images' (195, 203).

In contrast, Hale & Reiss defend a more emphatically autonomist position in their article, which, alongside the expected tirades against OT, includes a striking repudiation of chapter 9 of SPE (168-169). Hale & Reiss acknowledge that, through the mediating rôle of transducers, phonological representations enter into nonarbitrary relationships with phonetic events; but they insist that the

computational system treats features like arbitrary symbols. Skilfully wielding Occam's Razor, Hale & Reiss argue that the grammar should not incorporate markedness statements, which redundantly duplicate the effects of processes of misacquisition and change caused by phonetic factors. This highly effective argument constitutes a valuable contribution to the debate surrounding OT: as Hale & Reiss show, it is incumbent upon the proponents of OT to demonstrate that an adequate account of phonological acquisition and change cannot dispense with cognitive representations of markedness.

Other aspects of Hale & Reiss's thought-provoking chapter are far less successful. When it comes to identifying phonological facts whose explanation lies in arbitrary formal properties of UG, they have nothing of interest to say (177-179). At other times, they are borne aloft on the tide of their own shrill rhetoric to transparently fallacious conclusions. Thus, they suggest that a hypothetical 'disfunctionalist' version of *Con* made up of constraints promoting unfaithfulness (OBFUSCATE) and markedness (NOPAIN—NOGAIN) would produce the same effects as standard faithfulness and markedness constraints. This is plainly not the case: the ranking OBFUSCATE » NOPAIN—NOGAIN, for example, predicts a system where the most marked feature occurs everywhere (neutralizing underlying contrasts) except where it would faithfully realize input specifications.

Harry van der Hulst ('Modularity and modality in phonology', 207-243) arrives at a similar conclusion: phonological entities have no intrinsic content. He argues for this view on the grounds that phonological theory must accommodate both spoken and signed languages, and so the elements of phonological representation cannot be modality-specific; *a fortiori*, they cannot have phonetic substance. Van der Hulst claims that phonological representations consist of the abstract primes 'C' ('dependent') and 'V' ('head') arranged in hierarchical structures governed by the same principles as syntactic objects (e.g. X-bar theory). However, without hard empirical constraints on the possible phonetic instantiations of these structures, van der Hulst's intriguing idea runs the risk of degenerating into Procrustean slot-filling: any segment type that comes handy can be claimed to instantiate some configuration of abstract primes.

Both Hale & Reiss and van der Hulst can be read as reacting to the anomalous position which a phonology endowed with phonetic substance occupies in the Chomskyan paradigm, where autonomy is the hallmark of linguistic knowledge. A clear diagnosis of this problem is provided in Burton-Roberts's chapter, which sets the frame of reference for the entire volume. Burton-Roberts draws a fundamental distinction between two conceptions of Language and of UG. In the 'generic' conception, Language is a theoretical construct incorporating the properties shared by all particular languages; as an abstract type, Language does not exist independently of the tokens by which it is instantiated. In the 'realist' conception, in contrast, Language is (in Chomsky's words) 'a real object of the natural world': an innate module of mind present in all humans. Burton-Roberts shows that, under 'realist' assumptions, Language cannot contain a phonological

component, for phonological systems are conventional, language-specific, and learned. What, then, should be the status of phonology in the Chomskyan paradigm? In answer to this question, Burton-Roberts proposes his Representational Hypothesis: phonology consists of a set of cultural conventions for the external representation of linguistic (syntactic-semantic) objects, the latter being nonconventional and strictly internal; phonology, in short, exists outside UG. This claim is staked on purely conceptual grounds, and takes for granted a radical version of the autonomy thesis (see above); if its premises are accepted, however, the Representational Hypothesis offers an effective solution to some of the tensions that riddle the Minimalist Programme.

Developing the implications of the Representational Hypothesis, Carr asserts that phonological acquisition must be conceived of in thoroughly Empiricist terms (85ff). This poses intriguing questions. Carr does not openly reject opaque generalizations, which hold at relatively abstract levels of representation but not on the surface, nor does he explicitly deny the existence of covert phonological structure lacking phonetic exponence. In the absence of a phonological component to UG, however, both opacity and covert structure raise Plato's Problem. Carr holds that an Empiricist position is compatible with the deployment of nontrivial innate cognitive capacities in phonological acquisition, provided that such capacities are not specific to language; this would include, for example, the ability to normalize and idealize sensory stimuli (88). In Fodorian terms, however, it is hard to see how such merely 'horizontal' faculties could be instrumental in the acquisition of opaque processes and covert representational structure. An intriguing possibility which Carr does not raise is that phonological acquisition commandeers the resources of nonlinguistic 'vertical' faculties or modular 'input analysers': one could for example suggest that the acquisition of metrical structure relies on the contribution of a nonlinguistic rhythm module that is domain-specific but cross-modal.

All in all, I would not recommend this book to persons of delicate sensibilities or impressionable disposition: for the uninitiated, the contributors' bewildering variety of opinion and their often acerbic tone may prove disconcerting. Colleagues will probably find that the volume delights and infuriates, enlightens and obfuscates, in equal measure. It is a microcosm of the loose federation (one dare not say community) that concerns itself with linguistic sound patterns.

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