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On substance and Substance-Free Phonology: Where we are at and where we are going

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1. INTRODUCTION

Baudoin de Courtenay distinguished between the physical properties of speech sounds, on the one hand, and the abstract representations of those speech sounds in the minds of human beings–phonemes, on the other (Baudouin de Courtenay 1870 [1972]: 211f.). The phoneme is a symbolic marker that encodes all of the properties of a particular speech sound which are linguistically relevant, from which properties that are of no significance to its status as a meaningful linguistic object have been stripped away. The discovery of the phoneme is a triumph of rationalist science (see van der Hulst 2013), establishing the ontological status of a mental object that is not directly recoverable from the physical signal that carries it; it has been called the single most important discovery in the field of linguistics (Goldsmith and Laks 2019: 323).

In generative theories of phonology, following developments and ideas that originated with the Prague school of linguistics (Battistella 2022), the phoneme was reconceptualized as an object divisible into atomic units, known as *distinctive features* (Jakobson 1939; Jakobson et al. 1952; Jakobson and Halle 1956). In structuralist terms, features marked oppositions between distinctive sounds in a language; a voiced labial stop is distinct from a voiceless labial stop despite their shared manner and place of articulation because their sub-phonemic value for voicing is contrastive. From their structural function as contrastive markers, the use of phonemes was extended to be a vehicle for acoustic information correlated to the physical properties of the production of individual speech sounds (Jakobson et al. 1952). This information was in the form of acoustic and articulatory "correlates", rather than any kind of high-fidelity reproduction of an acoustic signal or articulatory configuration (Halle 1983: 94).

The feature has been, ontologically speaking, remarkably consensual in generative thought. It has played a fundamental role in most, if not all, of its principal

iterations. This is not to suggest that there has been no debate concerning the nature and content of features – for example, questions related to the valency of feature values[1] have produced a great deal of discussion in the literature.

More recently, work in Substance-Free Phonology (Hale and Reiss 2000a, 2008; Reiss 2018) has questioned the conception of features as bearers of substantive content. While there are a number of different approaches to details of the substance-free approach (see Blaho 2008: 8ff. for discussion), there is a shared view which holds that there are no acoustic or articulatory correlates in phonological representations (Blaho 2008; Chabot 2021; Hale and Reiss 2000b,a, 2008; Iosad 2017; Odden 2006; Reiss 2003, 2008, 2018; Samuels 2011; Volenec and Reiss 2017, 2020), meaning for example that there is nothing inherently laryngeal in the conventional notation [+voice], and that an arbitrary tag such as [+alpha] would function just the same within the formal system of phonological computation. This conception of features works across phonological theories – rule based or constraint based – independently of other aspects of phonological representations.

The substance-free research program has sparked intense research into the basic properties of features, how they relate to the acoustic and articulatory phenomena of which they are representative, and their status as representations in phonological systems. Some of these questions have long lain dormant as seemingly settled in the literature, while others have emerged concurrently with research in substance-free phonology. This special issue of the *Canadian Journal of Linguistics/Revue canadienne de linguistique* collects contributions from leading scholars in the field who have worked on some of the essential questions raised by substance-free phonology.

In this introduction I will briefly trace the development of features in phonological theory, with particular emphasis on their relationship to phonetic substance[2]. I will show that substance-free phonology is, in some respects, the resurrection of a concept that was fundamental to early structuralist views of features as symbolic markers, whose phonological role eclipses any superficial correlates to articulatory or acoustic objects. In the process, I will highlight some of the principal questions that this epistemological tack raises, and how the articles in this volume contribute to our understanding of those questions[3].

2. Symbolic markers: The emergence of features as cognitive symbols

In structuralism, phonological inquiry was principally concerned with the relationships that hold between phonemes in language-specific systems, in particular

[1]See van der Hulst (2016) for an overview.

[2]Much of the historical discussion is informed by the very good historical work in Anderson (1985); Encrevé (1997); van der Hulst (2013) and the relevant chapters in the excellent volume edited by Dresher and van der Hulst (2022).

[3]My thanks to Elan Dresher, Heather Newell, and Tobias Scheer for their valuable comments on an earlier version of this text.

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those relationships which are contrastive. Since contrast is not a property of any acoustic signal, it follows that what is linguistically interesting in the structuralist view is not found in substantive facts. While the structuralists assumed a strict relationship between the mechanistic effects in phonetics and their mental "impressions", they were not particularly concerned with exploring what that relationship was like. Phonology, for a structuralist, is abstract and essentially substance free.

2.1 Structuralism and symbolic markers

Structuralist thinking maintained a very strict delineation between the phoneme as a kind of speaker knowledge, and the physical properties of produced speech. This is an extension of the distinction made by Saussure between *langue* and *parole* (Saussure 1916 [1967]): the structuralist phoneme fits squarely into the realm of *langue* (van der Hulst 2013: 174). In the Saussurian conception of *langue*, the reality of language is only partly reflected in *parole*, or facts about acoustic signals; more interesting is the nature of its mental impressions (Joseph 2022: 212). The early structuralist phoneme is not divisible into sub-phonemic features, but the critical role they play as symbolic markers distinct from physical properties inherent in sound is clearly articulated.

Sounds, in Saussure's view, have articulatory and acoustic dimensions, but these are abstracted away in phonemes, subsumed by mental classifications that constitute a kind of knowledge in the minds of speakers about how each phoneme relates in terms of differences to all other phonemes in a language (Saussure 1916 [1967]: 166): "dans la langue il n'y a que des différences". A physical description of linguistic sounds in terms of acoustics or articulatory facts does not explain their function; rather, linguistic sound is understood as a systematic relationship between the sounds of a given language which stand in opposition to one another.

To understand phonemes as linguistic objects the way Saussure viewed them, they have to be analyzed as symbolic markers in a system of contrasts – their acoustic and articulatory content is not sufficient for understanding what that system is like. What is important for understanding *langue* are the meaningful distinctions it contains. In this light, the basic phonological representations are mental objects, symbolic markers in a network of abstract relationships, and their relationship to substantive properties is secondary, at best.

Edward Sapir emphasized the importance of the phoneme as "symbolically utilizable counters" (Sapir 1925: 39). Like Saussure, Sapir's conception of the phoneme is based not just on the paradigmatic function of a phoneme as a mental representation for a set of internally varying linguistic sounds, but also its position as a distinctive object in a structural network. The "psychological aloofness" in this relationship of differences is what Sapir called a *sound pattern* – the relation of distinct sounds in a language relative to each other. Also like Saussure, Sapir viewed phonological knowledge as being distinct from phonetic knowledge, where the former did not necessarily depend on the latter.

Sound patterns, in the Sapirian sense, are characterized by the contextual variation internal to languages, in which speakers may hear as being the "same" sound

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acoustic events which are "perceptibly" different forms, as the phonetic context varies (Sapir 1925: 42). Phonemes, however, are not categorized in the minds of speakers in terms of their physical properties, but as a symbolic, *mental* representation of contrast. In this sense the phoneme is abstract (see Twaddell 1935), and for Sapir (1933), it has "psychological reality" for speakers; as such it is a real object, the locus of phonological knowledge.

In this view, phonemes are the subjective reality for speakers, not the acoustic signals which can be shown to be objectively real (Sapir 1933). Phonological knowledge is a first-person experience, a mentalistic domain concerning the psychology of individuals, and not available to direct, empirical investigation. In structuralist thinking, though there must be "a certain amount of contact" between phonetics and phonology, they are fundamentally independent from each other (Trubetzkoy 1969: 4). This is an important conceptual distinction which establishes, in very clear terms, a bulkhead between phonetic substance and phonological knowledge, a kind of substance-free phonology with two ontologically distinct realms.

As it was for Saussure and Sapir, the Praguian phoneme was the most basic phonological unit, impossible to divide into smaller entities. Trubetzkoy positions individual phonemes relative to others in a system organized according to their structural correlations, where phonemes are grouped together – or distinguished from one another – in terms of the presence or absence of certain sub-phonemic traits like voicing or nasality. Trubetzkoy's emphasis was not so much on physical properties of sound, but rather on the way these systematic properties determined the way phonological systems were organized (Trubetzkoy 1969: 71f.).

Trubetzkoy thus views an opposition as something that characterizes those properties which distinguish individual phonemes, but also those properties which are common to sets of them. These sub-phonemic properties are not inherent to the content of phonemes, but emerge as a function of their respective roles in a system of phonological contrasts. So, for example, consider a consonant inventory such as that in (1):

(1) p t k
    b d g

Each pair of phonemes on the vertical axis shares a place of articulation, while each set on the horizontal axis shares a specification for voicing. Each axis, though, also reflects distinctive contrasts; voicing on the vertical, and place of articulation on the horizontal. The contrast based on voicing, for example, is thus not a property of /p/ or /b/, for example, but of their systematic relationship to each other and to other phonemes. Thus, a sub-phonemic classificatory scheme begins to emerge, based on correlations between segments: a voicing correlation, a place correlation, and so forth. Correlations were revealed through analysis of distinctive patterns, not through observation of phonetic properties.

The work of Roman Jakobson had a transformative effect on the structuralist conception of the phoneme, formalizing the shattering of phonemes into distinct features while infusing them with phonetic information from the physical world exterior to minds (Jakobson 1939, 1949 [2012]). In this sense, Jakobson is the link between

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the structuralist work of Saussure, Sapir, and Trubetzkoy, and generative phonology as formulated by Halle (1959) and Chomsky and Halle (1965, 1968). In the Jakobsonian conception of features, the sub-phonemic classificatory scheme developed in Prague becomes explicit, as contrast-marking features become formalized as an inherent property of the phonemes themselves.

For Jakobson, the distinctive properties of the phoneme represent the whole of the reality of the structuralist phoneme (Jakobson 1949 [2012]). Binary oppositions form the basis of binary distinctive features (Jakobson et al. 1952; Jakobson and Halle 1956), each predicated on the presence or absence of some phonological property. In the Jakobsonian view, the content of features is not, however, based on abstract oppositions, but on acoustic and articulatory correlates to those oppositions, inherent in the features themselves. Thus, there is an opposition between dental consonants and velar consonants, which is reflected acoustically in their relative pitch, and phonologically by features which reflect that acoustic difference – acute and grave, respectively.

The imbuing of phonetic substance into features marks a radical departure from the earlier structuralist ontologies. Jakobson's work marks a departure from the substance-free structural world, emphasizing the phonetic information in features. The substantive view would come to be virtually axiomatic in the following half-century of phonological thought, forming the basis for virtually every theory of sub-phonemic primes (see Durand 2005 and Cohn 2011 for overviews of the use of phonological primes in various theories).

2.2 Generativism and articulatory features

The advent of generative phonology marked a stark break from the structuralist paradigm (Chomsky and Halle 1965, 1968), notably where dynamic processes of alternation were concerned. In representational terms, however, the conceptual break between the structuralists and the new wave was somewhat less dramatic, having been announced by Jakobson's research program. The generative view of features was the logical extension of the notion of oppositions as conceived of by Sapir and Trubetzkoy: while the structuralists were explicit in their view that the phoneme was the basic representational unit, in the generative view the phoneme was dissolved into matrices of Jakobsonian features, known as segments (see Encrevé 1997).

The generative feature is conceptually Jakobsonian, though its phonetic content was recast as solely articulatory, rather than acoustic. In the canonical theory laid out in Chomsky and Halle (1968), features played three critical roles. First, they defined the contrastive oppositions in a segmental inventory as a series of binary distinctions. In this role, they look much like Sapir and Trubetzkoy's symbolic counters. Second, they made explicit the shared property of segments that is the essence of a natural class. That is, they serve as a kind of index for phonological rules that target sets of segments, as well as various other static and dynamic natural-class based generalizations.

Finally, the features are more than symbolic markers, since they contain phonetic content that corresponds to instructions from phonology to the sensory-motor system

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when speech is produced. In this role, features serve as the direct mapping from the content of features to their phonetic representation. In this interface process, what are binary oppositions in phonology become more gradient, expressed on a numeric scale which defines the degree of an articulatory configuration: lowering of the velum, rounding of the lips, and so forth. Thus, a feature might be [+labial] in phonology, but [3.5 labial] in systematic phonetics. This interface function of features is trivial in a theory where features can be directly interpreted from their inherent, substantive content.

The set of features with a contrastive role is language specific, but the earliest iterations of generative theories of phonology assumed that every segment was specified for every feature in the set of features. The set of features, in turn, was determined by Universal Grammar (UG), and thought to be invariant in humans. In this conception of features, knowledge about phonetic properties that are relevant to the articulation of linguistic sound are encoded directly into the phonological grammar, and thus imputed to the genetic instructions which code for UG.

This has a number of consequences. The most far reaching is that substantive notions can be used to provide explanatory adequacy for phonological generalizations. The last chapter of *The Sound Pattern of English* (SPE) – the famous chapter 9 – identifies a weakness in the overly formal approach articulated throughout the book. In short, the nature of the rule-based computational system, and the particular set of articulatory features, meant that the theory could potentially account for typologically rare or nonexistent patterns that seemed arbitrary from a phonetic point of view in a significantly more parsimonious fashion than it could for some well-attested and functionally transparent ones.

The solution to this problem was to allow phonological computation direct access to the substantive properties inherent in features. This meant that in addition to imbuing features with intrinsic phonetic content, phonetic content seriously constrained the kinds of phonological processes in the theory's remit. This was done through the reinterpretation of another notion inherited from the Prague school, that of markedness. While for Trubetzkoy markedness was a fact about individual languages, the generative view recast markedness values as being universal (Dresher and Hall 2022; Rice 2007). In SPE terms, the binary values of feature specifications do not have equal weight – one value is "marked" relative to the other, and the grammar is sensitive to markedness, favouring less marked patterns. Markedness, the reflection of the substantive content of features, thus weights the grammar against phonetically arbitrary or unnatural processes.

Further developments in the wake of SPE, both outside generativism (Donegan and Stampe 1979; Stampe 1973) and within (Archangeli and Pulleyblank 1994; Hooper 1976; Vennemann 1971), crucially relied on the substantive content of features to circumscribe the power of phonological grammars and reduce the space between attested typology and languages predicted to be possible. Within generativism, substantive knowledge about the physical world became firmly entrenched by feature geometry, which built facts about the human vocal apparatus directly into the organizational structure of segments (Clements 1985; Sagey 1986). In Optimality Theory, representations are relatively impoverished, but the substantive

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content of features continues to play a central role in defining how markedness constraints interact with underlying forms in their mapping to surface forms (see Hayes and Steriade 2004 and contributions to that volume).

3. Substance-Free Phonology and burning boats

3.1 Features as purely symbolic markers

Over the course of the development of generativism, there were isolated arguments suggesting that the mixing of the phonetic and phonological domains was ill-advised, as for example when Fudge (1967: 26) argued that "phonologists (above all, generative phonologists) ought to burn their phonetic boats and turn to a genuinely abstract framework." However, the dismantling of the structuralist bulkhead between phonetics and phonology with a concurrent reduction in the conceptual space between formalism in phonological theory and substance was carried out in an essentially universal way.

Hale and Reiss (2000b) mark an important critical break in this decades-long trend, by arguing for a sharp distinction to be made between *form* and *substance*, where form means grammatical processes (e.g., feature spreading) and objects (e.g., syllables) that are modality independent and distinct from substantive properties. The former are the symbolic objects of phonological cognition (Hale and Reiss 2000a), while the latter are physical objects which exist in the real world. In this view, the use of functionalist principles based on facts about physical objects in explanations for phonological patterns obscures the nature of the formal system, sapping phonological inquiry of explanatory power; an ontological scrambling known as *substance abuse*.

Substance-Free Phonology (SFP) thus marks an effort to reorient phonology away from substance and substantive effects in phonology. Instead, the emphasis is on the computational system of phonology (Hale and Reiss 2000b,a), not on the functional principles at its margins which contribute to typological tendencies. In this computational system, there are symbolic features over which computations operate, and these features are the primitive units of phonological representations, but they are devoid of any phonetic content in the grammar itself. In SFP, it is incoherent for a phonological process to be stated in terms of articulatory configurations, since the process is deaf and blind to such substantive facts.

At its heart, SFP is an application to phonology of the Minimalist program established in Chomsky (1995, 2002), which asks to what extent the role of UG can be reduced in phonology while still accounting for linguistically significant generalizations. SFP posits the minimum number of primitives required to account for knowledge speakers have about the phonology of their language (Hale and Reiss 2000a). Inherent in the SFP approach is a return to the structuralist bulkhead between symbolic phonology and the physical world of phonetics. Indeed, Hale and Reiss (2000b,a) argue their view is "Neo-Saussurean", since the computational system of phonology can treat features in an arbitrary way; their only property is that each one is different from every other. It follows that facts about typology or explanations

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derived from functional notions are facts about extra-phonological domains (see Chabot 2021: 161ff.).

Beyond the reevaluation of the role of substance in phonology, the SFP approach requires reconsidering a number of questions that drew only sparse attention in post-SPE work:

(1) The role of UG in determining the set of features and their language-specific configurations

(2) The nature of the interface between phonetics and phonology

(3) How features index natural classes.

This volume collects contributions from scholars who have contributed to investigating one or more of these questions in the light of SFP. What emerges is a picture of an active research program that is engaged with some fundamental questions of phonology, and the consequences of the substance-free research program for phonological theory at large.

3.2 Does the genome know about phonological features?

The common thread that runs through any substance-free theory of phonology is the assumption that features do not contain any phonetic information, neither articulatory nor acoustic. This means that, like for the structuralists, features are symbolic counters, with an ontological status in phonology that is independent of any facts about the physical properties of speech. If features are devoid of phonetic content, then it becomes a logical possibility that any label such as [voice] or [labial] does not reference featural content in any meaningful sense.

Indeed, this logical possibility marks one of the principal divergences in the substance-free research program (see Samuels et al., this volume). On the one hand is the "orthodox" position, advanced most lucidly by Volenec and Reiss (2017, 2020) and Volenec and Reiss (this volume). The orthodox position holds that, while individual features contain no phonetic information themselves, the set of features is universal, determined by UG, and each has specific, UG endowed phonetic correlates. In this view, features represent articulatory and acoustic information in an abstract form (Volenec and Reiss 2017); they have no articulatory or acoustic content themselves (Reiss 2018), but are imbued with substance during *transduction*, the process that converts phonological vocabulary to phonetic vocabulary in the interface between those two domains.

All schools of SFP view the computational system of phonology as being able to effect phonetically arbitrary computations, but in the orthodox view the features themselves are bound to a specific phonetic expression. The process of transduction itself is not arbitrary but rather is"lawful" (Volenec and Reiss 2020: 24). That is, in transduction, features cannot cheat destiny: [+labial] must be realized with specific neuromuscular correlates even if in phonology itself [+labial] does not mean anything at all, being invisible to computation except as a symbol which can be operated over. Thus, in the orthodox position, features look much like those of Chomsky and Halle (1968) in that they form a universal set determined by UG. Crucially, they also cannot

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be entirely decoupled from phonetics, since their phonetic correlates are also determined by UG; Hale and Reiss (2008) argue that this must be so, because if it were not, then language acquisition would not be possible. This is what Volenec and Reiss (2020: 27f.) have dubbed the "logical argument": there can be no learning if the dimensions in terms of which experience is encoded are not innate.

However, this view has been challenged both indirectly in Boersma (1998: 161) and Cowper and Hall (2015: 160), and directly in Odden (this volume), where it is argued that phonology can be acquired without requiring innate phonological features. The contribution to this volume by Boersma et al. shows that a system which is capable of learning can learn features with no pre-determined knowledge of phonetic or semantic substance. This means that humans may be, in principle, capable of constructing phonological systems without any UG endowed set of universal features.

In this "radical" counter-position, UG does not contain a set of universal features; rather, features emerge during language acquisition as a function of the language-specific phonological system that speakers need to build (see Mielke 2008). For example, if learners are exposed to a pattern of lenition which targets a phonetically heterogeneous set /p t k l/, some feature F_{α} shared by all of the targets of lenition emerges and constitutes the basis for the natural class. In this view, features are purely symbolic counters which unite natural classes, but have no universal phonetic correlate (Blaho 2008; Chabot 2021; Dresher 2014; Iosad 2017; Odden 2006; Scheer 2019).

In this volume, the radical position is explored by Odden, by Samuels et al., and by Scheer. Odden's contribution to this volume shows that segments are assigned features by learners as they acquire the phonology of a natural language, Kerewe. Odden shows that all of the features required by a speaker of Kerewe to construct a system of contrastive segments can be learned as a function of the role they play in phonological rules. That is, learners posit the existence of a feature when that feature is referenced by some process of alternation that targets a natural class.

In cases where no alternation provides any evidence for natural classes, features can emerge as a function of their contrastive role, as they mark distinctive objects. As for the structuralists discussed in section 2.1, the role of contrast is of fundamental importance. In generative terms, both Hall (2007) and Dresher (2009) suggest that phonological computation operates *uniquely* over contrastive features – non-contrastive aspects of phonology are invisible to phonological computation.

This *contrastivist hypothesis* (Hall 2007) revives the role of contrast in defining phonological systems (something that is explicitly denied in the orthodox position, see Reiss 2018). The *contrastive hierarchy theory* says that learners arrive at a set of hierarchically ordered features that allow all phonological contrasts in their language to be expressed (Dresher 2009, 2014, 2018). The contrastive hierarchy and Odden's rule-based system both provide avenues through which learners can arrive at an emergent system of features used in a phonological system. This is not to say that "nothing can be in the intellect which was not first in the senses," since the capacity for segmenting the continuous speech stream into discrete segments and

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extracting features from those segments is a part of the human Faculty of Language, and thus a genetic endowment of the human species.

3.3 Features and the interface between phonetics and phonology

In both views discussed above, there is a conceptual necessity for an interface between phonetics and phonology that maps between the symbolic features and their phonetic correlates. In Chomsky and Halle (1968), the interface was trivial: the mapping was inherent in the feature label itself. A feature [+voice] was translated at the interface in a direct mapping to an object with an identical label, but with a numbered value in the place of the bivalent [±] feature values in phonology. The numbered value of phonetic features captures the gradient nature of phonetic objects, but the interface is otherwise straightforward and requires no particular elaboration.

In SFP, however, this direct interface is not available, since features themselves contain nothing to be directly translated. Volenec and Reiss (2017, 2020) assume that, in the same way that the set of features is UG endowed and universal, their translation at the interface is also determined through a universal mechanism. Volenec and Reiss assume that the phonetic exponence of features is not language dependent, but rather is mediated through an interface that directly links features to specific neuromuscular correlates in phonetics, and this interface is universal. Key to their approach is the idea that substance-free features can be freely combined in segments, meaning that a relatively small set of universal features allows for a kind of combinatorial explosion, giving rise to a great deal of variation and many possible surface segments (see Hale et al. 2007, and Samuels et al., in this volume).

Such a universal interface system is not available in the radical SFP approach, since features emerge on a language-specific basis. It follows that their interpretation at the interface cannot be universal. Scheer (this volume) develops an extensive discussion of what is needed in such a theory of the interface. In his account, the interface is arbitrary and language specific, capable of mapping any phonetic category to any feature (see Chabot 2019).

Idsardi (this volume) extends the discussion of the interface beyond segmental features to the temporal domain, in an article that argues that phonology must map to temporal relations, which may be underspecified in terms of order. Temporal relations between segments have heretofore received relatively little attention in the substance-free literature (though see Chabot 2021: 199ff. and Scheer's contribution to this volume). Idsardi argues that temporal order between elements may not be defined in the representations themselves. In effect, speakers do not acquire knowledge about the relative order of features in a one-to-one fashion from the signal; rather, this knowledge emerges during development as an abstract precedence relationship.

Samuels et al. (this volume) point out that a language-specific interface theory has an advantage over the innatist view where modalities other than the aural-vocal are concerned. In particular, they discuss the whistled equivalent of Gomera Spanish known as Silbo Gomero, both of which they show have an equivalent

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phonological grammar; Silbo Gomero seems to be parasitic on the phonological system of Gomera Spanish, meaning that the features used in the whistled modality come from the aural-vocal modality. But if this is correct, the interface that is interpreting the whistled exponents of the underlying phonological system cannot be determined by UG, and must be acquired by speakers upon exposure to the whistled modality.

Samuels et al. further argue that the emergent position has an advantage over the innatist position in sign languages. Like the aural-vocal modality, sign language phonology can be characterized as operating over basic atomic features (see Stokoe 1960 [2005]; Sandler 1993, 2012, 2014; Brentari 2011; Marshal 2011). It follows then that the innatist position must posit a set of features used in the vocal-aural modality and an independent set of features used in the signed modality. This raises a number of obvious questions, including how evolution could have selected for this duality of patterning, and why features used only in the signed modality should lay dormant in the more typical aural-vocal modality. If, however, all phonological features underpinning all modalities emerge, then these difficulties are not just explained, they do not exist, since the same mechanism accounts for all modalities (see Poeppel et al. 2012).

3.4 Features and substance-free natural classes

The third major consequence of the innatist versus the emergent view concerns how features and natural classes interact. Both positions expressly recognize the importance of features in indexing natural classes, but because of the different stances they adopt concerning the origin of features, they make different predictions about how natural classes are constituted. In Volenec Reiss (2020: 41), it is clear that membership in a natural class is determined by features, as is the case in SPE. So, for example, they suggest that if a language has a vowel inventory that includes /i y u/, and a rule which targets /i/ and /u/, it will also target /y/ since all of them are phonetically high vowels and must contain a feature that is expressed as phonetic height. Put another way, natural class-hood is driven by the innate features that features are built from.

This feature-driven way of constituting natural classes is nonsensical in the radical SFP approach, since features emerge as a function of phonological behavior, which logically cannot be driven by features as in the orthodox position. The two approaches make substantially different predictions about what kinds of natural classes can be built, in two respects (see Samuels et al., in this volume).

First, the radical approach predicts that phonological rules may target, be conditioned by, and effect structural changes over phonetically-arbitrary natural classes (see Mielke 2008 and Chabot 2021), since there is nothing that requires a feature to have a uniform phonetic expression across a class. Put another way, in the radical SFP approach, features may be nothing more than indices for phonological processes, without having any expressible phonetic content (see Cavirani 2022).

The second prediction is that a phonologically-active feature which serves as an index for a natural class – with or without expressible phonetic content – may not be

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present throughout all the members of a phonetically-defined natural class. For example, in a language with a rule of vowel harmony that operates over a tense/lax distinction, it is possible for a phonetically tense vowel such as /i/ to not be subject to the harmonizing rule if it does not contain the relevant harmonizing feature (Dresher 2018: 23).

4. Conclusion

This volume has two related goals. The first is to provide an overview of the role features play in substance-free theories of phonology. As this introduction makes clear, there is a fundamental distinction between two schools within SFP that springs from their respective positions on the origin of features. Each position imposes different requirements on the phonetics/phonology interface, and each has consequences for other more general questions in phonology related to the building of natural classes and the kinds of phonological rules that interact with them.

The second goal is to unite contributions from authors who have worked on all of these questions. These articles should serve as a helpful guide for the reader interested in current issues in the substance-free research program. It is further hoped that their insights into deeper questions of phonology will be of use to phonologists who work on related questions in other frameworks.

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