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1 Overview and structure of the volume

Perspectives on Element Theory (PET), edited by Sabrina Bendjaballah, Ali Tifrit, and Laurence Voeltzel, is a collection of 8 papers stemming from the *Elements: State of the Art and Perspectives* conference organized by the Laboratoire de Linguistique de Nantes (LLING UMR 6310 CNRS/Université de Nantes) on 14-15 June 2018. The papers represent a selection of those presented at the conference and a further contribution by Henk van Riemsdijk.

As claimed in the introduction, PET "aims at providing an overview and an extension of the Element Theory [ET] program by exploring new lines of research" (PET: 1), which are developed along a few common threads that run across and tie together most of the chapters. These are fundamental "theoretical and empirical questions that have been implicitly taken for granted until now" (PET:1), such as the nature and number of privative melodic primes, the tension between the latter and the structure in which they might be embedded, their relation with phonetics, their role in suprasegmental phonology, and the hypothesis that the nature of the representational primitives and the principles holding on their combination and distribution are shared by phonology and syntax. In the introduction, the editors provide a succinct and clear discussion of the crucial relevance of these questions for ET, as well as a brief historical overview of the most important stages in the development of this theory, which helps the reader to contextualize the proposals of the papers within the ET tradition.

As expected, despite the common threads running across PET, each paper engages with (a subset of) these themes at different degrees of depth, which clearly depend on the ideas that the authors have been developing in their previous work. Interestingly, some of the authors have not been previously working on ET and the closely related Government Phonology (GP) models. This is the case for Elan Dresher, Eric Raimy and Henk van Riemsdijk, who approach some of the above-mentioned themes from their own perspectives and, crucially, discuss the ways the insights provided by their own previous work might support, or disprove, some of the hypotheses put forward by ET. The other authors - Phillip Backley, Harry van der Hulst, Markus A. Pöchtrager, Kuniya Nasukawa, Nancy C. Kula and Connor Youngberg - are (more or less closely) related to standard ET/GP. Also in this case, the authors deal with the above-mentioned themes based on their previous work, which in several cases challenges some of the core hypotheses concerning the representational and the computation side of ET/GP.

Neither the proposals of the first group of authors, nor those of the second group, are unheard of, as most of them they have already been published elsewhere. As a consequence, PET does not provide many really innovative proposals. However, it has the undoubted merit of collecting them together, thereby providing an accurate synoptic overview of some of the lines of research departing from relatively standard ET assumptions, as outlined in (Backley 2011).

2 Fundamental topics and new proposals

In what follows, I provide an overview of the main themes of PET, focusing on focus on the most innovative proposals concerning the main themes mentioned above.

2.1 Number of primes

The hypothesis that the smaller representational primitives of phonology are privative has a long tradition (Anderson and Jones 1974, Schane 1984, Kaye et al. 1985). Within such a tradition, a recurrent theme is how many representational primitives we should assume, the goal being the development of a restrictive theory - i.e. featuring as few representational primitives as possible - while keeping a satisfactory level of empirical coverage. In Backley (2011), which provides as a sort of standard ET model, the number of elements is reduced to 6: |A|, |I|, |U|, |ʔ|, |H|, |L|. Despite the popularity of Backley (2011)'s model, attempts have been made at further reducing it. One such attempt is pursued by one of the contributors to PET - Pöchtrager - who, expanding on previous work replacing |ʔ| by constituent structure (Jensen 1994), argues that also |A| and |H| should be replaced by structure (Pöchtrager 2006, Pöchtrager and Kaye 2013). In PET, Pöchtrager employs his model - GP2.0 - for a unified treatment of vowel quality, length, and tenseness/laxness in RP English. As in his previous work, Pöchtrager relies on a conception of structure that resonates with x-bar syntax, and, in this paper, argues that nuclei have a bipartite structure, i.e. "maximally two heads, xn and xN, with xn on top of xN", where xn/xN can i) be empty or host |I|, |U|, ii) take another constituent (i.e. N′, N″, or the (O)nset) as complement, and iii) maximally project up to two bar-levels. In RP English, the set of empty structures (i.e. containing no |I|/|U|) that can be derived by this system are interpreted as [ɑː], [ɜː], or [ʌ], depending on their structural size. Crucially, these structure contain no |A|. What matters is just the size of their phonological representation, as well as the *command* relations entertained by the constituents of such structures. This system allows Pöchtrager to develop a detailed account of the relevant patterns, thereby providing support for his reductionist approach to the number of elements. Note though that n and N can also be considered as two different representational primitives, so it is not really clear if we can talk about reduction *stricto sensu*.

A similar reductionist program is pursued by van der Hulst. His model - Radical CV (van der Hulst 2020) - builds on the hypotheses that i) a prime can occur under different nodes of a subsegmental tree, thereby receiving a different phonetic interpretation (Anderson and Ewen 1987), and ii) primes entertain a head-dependent relation (Anderson and Ewen 1987). This allows for a drastic reduction of the number of primes, which boil down to C and V, which represent two opposite, antagonistic specifications of one and the same phonetic dimension. This is because a contrast previously formalized by two primes can be conveyed by one and the same prime occurring on different nodes (onset head *vs* onset dependent *vs* rhyme head *vs* rhyme dependent, manner *vs* location *vs* laryngeal, primary *vs* secondary). For instance, depending on its position in the structure, the V prime can identify vowels, sonorants, but also [voice], [low] and [open place]. In PET, van der Hulst provides an overview of the basics of his model and discusses theory-internal alternative approaches to tongue root distinctions (ATR, RTR) and nasality based on Gaam and Nez Perce harmonic systems. Furthermore, he draws a comparison between Radical CV and GP, noting that "there is a

sense in which the choice of only two elements in Radical CV converges with a particular version of GP that only adopts six elements". This sense is one in which |A|, |I|, |U|, |ʔ|, |H| and |L| are conceived of as arranged in antagonistic pairs (i.e. similarly to C and V), where |A| and |ʔ| represent two opposite extremes on the resonance dimension, |L| and |H| on the frequency dimension, and |I| and |U| on the color dimension. In standard ET, these dimensions are not given any formal status, whereas in Radical CV they are, in the sense that they correspond to the Laryngeal, Manner and Place node, respectively, to which the Supralaryngeal superordinate node is added. Thus, whereas in standard ET we have six elements, in Radical CV we have two primes, plus four nodes. Note that, as in the case of Pöchtrager's n and N, these nodes can also be considered representational primitives, as they cannot be further decomposed, can be manipulated by phonological computation, and contribute to the phonetic interpretation of C and V.

Thus, standard ET and Radical CV are extensionally equivalent with respect to the number of primes, whereas Pöchtrager's model reduces their number to three (but see above). Note that the picture that emerges from comparing these approaches is characterized by a trade-off between the number of primes and structural complexity: whereas standard ET and conservative GP approaches minimize the subsegmental structure and maximize the number of primes (*viz* many elements on small trees), Radical CV and GP2.0 minimize the number of primes by maximally exploiting the structural dimension (*viz* a few elements on bigger trees; see Cavirani and van Oostendorp 2020 for further discussion on the trade-off between structural complexity and number of primes, and for a radical proposal featuring one prime).

Apart from Pöchtrager and van der Hulst (and, to a lesser extent, Youngberg), the other authors do not directly engage with the issue discussed in this section. A quick hint is also made by Dresher, who argues for a principle of feature economy, whereby "phonological inventories prefer to reuse the same features", and suggests that "constraints on what a feature can be [...] could bring the set of possible features closer to that of [ET]". However, this "is left for future research" (PET:40-41).

2.2   Innateness of primes

Whereas the discussion concerning the number of elements has attracted the attention of several authors, the issue related to their universal *vs* emergent nature has been rarely addressed. Most of the authors, including the contributors to PET, assume that they are universal. There are exceptions, though. One is van der Hulst, who argues that "features result from an innate categorization principle that splits phonetic substance into two opposing categories" (PET:113). This *Opponent Principle* is argued to be a sort of third factor principle (categorical perception), thus not part of UG. What is part of UG, according to van der Hulst, is the way these opposite categories are formalized/grammaticalized, i.e. C and V, as well as the set of universally ranked, articulatory-grounded superordinate nodes, where manner outranks place. Note that this emergent features hypothesis, or, conversely, the idea that elements do not universally correlate with acoustics, allows for extending the formal/representational system proposed by van der Hulst - i.e. the representational primitives and their hierarchical organization - to sign languages (van der Hulst 1993).

Something similar is held by Dresher. In his paper, he provides an overview of the main ideas of the Contrastive Hierarchy Theory, which maintains that representational primitives

are binary and emergent. In this case, what is universal is the concept of contrastive hierarchy, i.e. the principle that allows the learner to build her phonological inventory by splitting the phonetic dimension of speech into categories depending on their contrastiveness and maximizing the use of the features already postulated. Referring to previous literature (Samuels 2011), he also provides arguments supporting feature emergence that include the fact that innate features are i) too specific to be used for modeling sign languages, ii) empirically inadequate, and iii) unnecessary, as some of the features need to be learned anyway based on phonological activity.

Apart from these two scholars, all contributors to PET, and virtually all the scholars working with ET, assume that primes are innate and privative.

2.3   Privative primes and ternary oppositions

As mentioned in section 2.1, a trade-off can be identified in the literature between the number of primes and the subsegmental structure in which they are arranged, as the enrichment of the latter allows for a reduction of the former. Another positive outcome of a rich subsegmental structure is that it allegedly allows the formalization of ternary contrasts, which seems to favour binary feature systems over privative ones. This is the main topic of Raimy's paper, who, building on Avery and Idsardi (2001), proposes a model that can formalize ternary contrasts without using binary features. Simplifying, Raimy assumes that - similarly to what is proposed by van der Hulst - articulatory features (*gestures*) are organized in antagonistic pairs (e.g. [front] and [back]), and are dominated by organizational nodes defining the *dimension* over which these features contrast (e.g. Tongue Thrust). These nodes, in turn, can be dominated by other nodes (e.g. Dorsal), which can in turn be dominated by other nodes too (e.g. Oral Place). Crucially, these organizational nodes are argued to allow for the distinction between marked, superordinate, and unspecified feature marking. Interestingly, Raimy illustrates his proposal by developing an analysis of voicing assimilation in Polish varieties that contrast with the one by Cyran (2011), the main differences being that the latter uses elements and abides by the *laryngeal relativism hypothesis* (thus by the hypothesis that phonology is substance-free), whereas the former uses different primes and adheres to the *feature realism* hypothesis. This brings us to the next broad theme of PET.

2.4   Primes' substance

Another long-standing issue in ET is the relation between the elements and the phonetic substance they correlate with, which is part of the broader issue concerning whether phonology is better conceived of as substance-free, or substance-full. This theme is addressed by Raimy, who defends an intermediate position, dubbed *substance impoverished* phonology. This position is basically the one that is held by all the scholars working with ET, including those contributing to PET. For instance, Backley maintains that elements "refer to the physical speech signal [but] also denote abstract phonological categories [that] express lexical contrasts" (PET:15). Similarly, Dresher concedes that "phonetics is clearly important, in that the [...] features must be consistent with the phonetic properties of the phonemes [but the] specification of a phoneme could sometime deviate from the surface phonetics" and, crucially, he considers "as most fundamental that features should [...] reflect the phonological activity"

(PET:36). Along similar lines, van der Hulst does "not accept that features are 'purely abstract', nor that structures can arise that are 'phonological unicorns', i.e. structures that are not phonologization of actual phonetic events that occur in human languages" (PET:113). Thus, despite conceiving of phonological primes as a cognitive objects that are not directly determined by phonetics, ET does not ignore their phonetic side, and positions itself half way between substance-free and substance-led phonology.

The question, if anything, concerns the phonetic module elements correlate with: articulation or acoustics? The standard-ET answer to this question is acoustics. This is maintained (albeit not discussed) by all the contributors to PET, with the exception of Dresher and Raimy, who rather argue for an articulatory grounding, and van der Hulst, who proposes that "both acoustics and articulation deliver cognitive substance that provide the 'raw material' that phonological elements categorize" (PET:113).

2.5 Melodic primes and suprasegmental phonology

The hypothesis that primes have both a physical and a cognitive dimension allows us to exploit them for the representation of different kinds of organizational nodes, both in the subsegmental - as in the van der Hulst system, where they are formalized as C and V - and in the suprasegmental dimension. The latter possibility is explored by Backley in the opening paper of PET, where he provides an overview of the theory that he has been developing in the last few years together with Kuniya Nasukawa: Precedence-free Phonology. In this new theoretical development, elements are arranged in hierarchical binary structures, where a head takes a complement and recursively projects up to and above the segmental level, and thus plays a role at, and indeed formally replaces, the nucleus, rhyme, syllable and foot nodes. Furthermore, Backley proposes that heads i) are restricted to the set of resonance elements - |A|, |I|, |U| - i.e. those that correspond to nuclear domains, ii) are decided on a language-specific basis, iii) have only a structural function, whereas the melodic function is by the dependent elements. Note this system can be considered another instance of the general idea that increasing the structural complexity of representations allows for reducing the number of representational primitives, as representational primitives such as N, R, σ and F (or whatever format one prefers to adopt) can be replaced by a resonance element.

A comparable attempt at unifying melody and prosody is pursued by van der Hulst. In this case, though, what is being 'recycled' in other levels are the primes that traditionally refer to syllabic constituents, i.e. C and V, which are used to encode the subsegmental properties of segments, as well as further projections of the nucleus, namely the rhyme and syllable nodes.

2.6 Phonology-syntax analogies

Structural analogies between phonology and syntax have long since been noted (Anderson 1987), and keep inspiring the work of several scholars. This is clearly the case of Backley and Pöchtrager, who more or less explicitly model their phonological representations on x-bar theory (see also the papers collected in Nasukawa 2020).

In his paper, van Riemsdijk provides further arguments for this assumption by exploring the role a general (possibly language-external) principle such as the Obligatory Contour

Principle might play in syntax. In this case, thus, rather importing into phonology some of the formal tools developed in syntax, it is phonology that serves as the source of inspiration for the conceptualization of some aspects of syntax (which can hardly be considered a new development, if ones thinks about features). Beginning with a historical review of his previous work, which starts from a discussion of his source of inspiration - Jean-Roger Vergnaud's work - and covers his earlier work on categories and projections and their relation/cohesion, van Riemsdijk sketches a new approach to categorial representation that is very much reminiscent of autosegmental phonology. More specifically, he proposes a system with a Categorial Tier ("on which the values N and V are displayed in the form of a template: N V N V N V [...] that is very much like the standard template C V C V C V in phonology"), a Level Tier for projections (where (H)eads and (M)aximal also form a template: H M H M H M), an intermediate Phrase Tier that contains placeholders (X) representing "complete syntactic units", i.e. phrases, and a Merge Tier that represents "the spine of the (dendromorphic) projection as we know it". Crucially, the objects on these tiers are privative features, whose distribution is governed by the OCP. Furthermore, in order to formally encode the difference between lexical and semi-lexical heads, he also proposes to make use of the ET notion of headedness: |M̲.H| for functional heads, and |H̲.M| for semi-lexical heads. This, as well as a thorough development of these ideas, is left for future research.

2.7   Other innovations

Besides the major themes just reviewed, PET also offers some novel interesting proposals. For instance, Nasukawa and Kula provide a strict CV (Lowenstamm 1996, Scheer 2004) analysis of epenthetic consonants in Bemba and Lungu that features a new phonological operation - overlap concatenation. This operation consists in the superimposition of the last CV sequence of a prefix and the initial CV sequence of the following form, and it comes in two flavours, which depend on the morphological context. When prefixes attach to stems, asymmetric overlap concatenation applies, and the material contained in the non-empty C/V node of one form merges with the C/V node of the the other form. Thus, if the stem has an initial empty C, the content of the prefix-final C nodes can surface (given the impression of epenthesis). On the other hand, if a prefix attaches to another prefix, symmetric overlap concatenation applies, and the initial CV nodes of the second prefix completely overwrite the final CV of the preceding prefix, no matter if the CV nodes of the former are empty.

Similarly, the chapter of Youngberg adds an interesting new computational device to GP - Intervocalic Government - and builds on (a revised version of) Pöchtrager's proposal concerning the structural nature of what in standard ET corresponds to |A| (a similar proposal concerning |A| can be found in Cavirani and van Oostendorp 2020). This new type of government is argued to be sensitive to the elemental make up of the relevant V nodes and, crucially, to the presence of the structural version of |A|, which makes the nucleus containing it a good governor and, conversely, a bad governee. The empirical dimension on which this proposal is tested is represented by vowel sequences and hiatus resolution strategies in Tokyo and Owari Japanese.

3 Overall evaluation of the volume

All in all, PET succeeds in providing a picture of several new dimensions along which ET is being developed. Such a picture includes i) a few innovative GP/strict CV computational devices, ii) some discussion of fundamental properties of ET and their possible extension to syntax, coming both from scholars working with ET and scholars who adopt different theories, as well as iii) novel analyses of relatively well-known patterns.

Several of the proposals put forward in the various chapters are not new, but here they are nicely collected together, and arranged in a consistent narrative, each chapter touching upon some of the topics addressed in the previous one. This results in a well-structured and smoothly flowing book, which fulfills the desiderata announced in the introduction by the editors, i.e. the discussion of ET's fundamental "theoretical and empirical questions that have been implicitly taken for granted until now", and portraits ET as a lively and fertile research program. Because of this, PET represents an interesting read for scholars that are relatively familiar with standard hypotheses of ET/GP, and are eager to know more about the directions along which this research program is developing, as well as how the latter can inform syntax.

A few typos can be spotted here and there (e.g. alignment problems in tables, examples and figures, missing references, etc.), but they do not impact the readability and the overall quality of PET. If there is one aspect that could have been taken more care of, possibly in the introduction, it is a critical discussion and a thorough comparison of the various proposals, which, though, given the heterogeneity of the proposals, would have been quite a cumbersome and probably unsuccessful endeavour.

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