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Book review

How to marry (structuralist) contrast and (generative) processing

The Contrastive Hierarchy in Phonology, B. Elan Dresher, Cambridge University Press (2009). xii + 280 pp., Price: £60.00, ISBN: 978-0-521-88973-5

1. The heart of the book

Let us begin this review by zooming right away into the heart of Dresher's concern, which is also the contribution of the book to the field. Dresher makes two claims:

(1) a. the Contrastivist Hypothesis
phonological computation of a given language only operates on contrastive features.

b. the Contrastive Hierarchy
there is a formally defined method that allows the analyst (and the language learner, Dresher adds on p. 30) to establish which features (or feature values) are contrastive in a given language.

While the Contrastivist Hypothesis has emerged from the Toronto project,[1] the Contrastive Hierarchy is Dresher's own, and the actual topic of the book.

Dresher has read through the classical structuralist and generative literature that is relevant for contrast (starting in the 20s of the 20th century, up to OT and other contemporary approaches), and isolates two means of identifying which features of a phoneme are contrastive: Pairwise Comparison (henceforth PC) and the Contrastive Hierarchy (henceforth CH).

PC "designates as contrastive all and only features that serve to distinguish between pairs of phonemes" (p. 14). In order to illustrate this, Dresher uses the triplet *p*, *b*, *m* (which is supposed to represent French and Martinet's 1964:62ff analysis thereof, but this does not matter) and a given set of two binary features, [±voice] and [±nasal] (p. 13f). Another premise (which is not trivial at all from the modern point of view) is that feature matrices may be underspecified and hence ternary: a cell may contain +, − or nothing. In a perspective where phonologically relevant features (which are contrastive, i.e. have a distinctive function) are distinguished from phonologically irrelevant features (non-contrastive, i.e. which serve no distinctive purpose), the latter may be omitted from lexical representations since they are useless. In other words, empty cells represent redundant, non-contrastive features (or rather: feature values).

Given these ground rules, it does not take long for a practitioner to find out that p and b are only differentiated by [voice]: [nasal] does not help telling them from one another. Therefore no lexical specification can bypass [voice] in order to make p and b different. The same is true for b and m, whose only difference is nasality: [voice] cannot differentiate them.[2] This is what PC means; in our case the feature matrix under (2) below is produced.

(2)

	p	b	m
[voice]	−	+	
[nasal]		−	+

Empty cells are irrelevant for contrastive purposes: p is certainly [−nasal] and m [+voice], but these specifications do not add any information.

[1] As Dresher explains in his comments on a draft of this review; the source that he refers to in the book (p. 74) is Daniel Currie Hall's (2007) Ph.D. More on the Toronto project in section 2 below.

[2] For the sake of exposition, the fact that sonorant and obstruent voicing may not be the same phonological object is ignored. Dresher mentions this caveat on p. 118, note 9.

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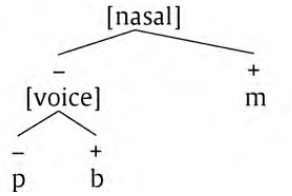
Let us now look at how the Contrastive Hierarchy treats the same set of segments. The how-to is as follows: ''put all the potentially distinctive features into an ordered list, and divide the inventory successively on the basis of this list until every segment has received a distinct representation'' (p. 15); these instructions are formalized as the Successive Division Algorithm (SDA) on p. 16. Critical to this approach is the existence of a hierarchy of features: in our case there are two possible orderings, [nasal] > [voice] and [voice] > [nasal]. The former first divides the set {p, b, m} into nasals {m} and non-nasals {p, b}, and then disambiguates the latter with the help of [voice]. The result is shown under (3) below.

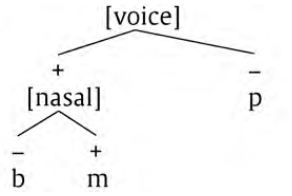
(3)



	p	b	m
[voiced]	–	+	
[nasal]	–	–	+

The difference with respect to PC is exactly one cell: this time the non-nasality of p is also declared contrastive. Let us now look at the reverse feature ordering [voice] > [nasal]. The result appears under (4) below.

(4)



	p	b	m
[voiced]	–	+	+
[nasal]		–	+

Again, the difference is just one cell, but a different one: the non-nasality of p is as irrelevant as under PC, but the voicing of m is now knighted contrastive.

We thus observe that not only PC and the CH produce different results, but also that the CH identifies different contrastive feature values depending on how features are ordered. This is unlike the behaviour of PC, which has no internal parameterization and for a given set of features will always produce the same contrastive specifications.

This result is promising in two respects. For one thing, if there is an independent way of finding out which feature specification is contrastive and which one is not, evidence will be able to decide which one of the three predictions is correct (or which one(s) is/are wrong). Dresher will argue that phonological processing is the referee that we are looking for: contrastive specifications impact computation, which therefore echoes back evidence that may or may not be compatible with the three competitors. This perspective is secured by (or rather: supposes) the Contrastivist Hypothesis: phonological processes *exclusively* use contrastive information.

The other promising result is the fact that PC is monolithic, while the CH allows for some variation. An obvious argument that properly falsifies PC is the existence of cases where the same inventory turns out to have distinct contrastive specifications in different languages.[3] Again, the referee for evidencing distinct contrastive properties is phonological computation: the same item in the same inventory may behave differently in different languages.

A simple case are common five-vowel inventories {i, e, a, o, u} which are described by resorting to four features: [round], [low], [high] and [front]. On pp. 57f Dresher quotes a reasoning of Trubetzkoy's who takes advantage of a process in Artshi (Central Daghestan) whereby the contrast between rounded and unrounded consonants (i.e. with and without a labio-velar secondary articulation C^w one presumes) is neutralized before o, u. Hence, goes the argument, the five-vowel system of Artshi divides into rounded and unrounded items before any other division is made. That is, [round] > [low], [high], [front] in Dresher's terms. In Japanese, another five-vowel system, the same processing argument can be made, except that this time the opposition between palatalized and non-palatalized consonants is neutralized before i, e. Hence the vocalic space is first divided along the feature [front]: [front] > [round], [low], [high].

PC is unable to express this process-motivated variation. If thus phonological computation is indicative of contrastive specification (i.e. if the Contrastivist Hypothesis is correct), and if the examples are real and recurrent, PC must be wrong. On the other hand, the CH can accommodate this kind of variation through different orderings of features.

This is the logic of the argument that is developed in the book. We will now zoom out again and approach the book as if we opened it on the first page.

[3] This also concerns Calabrese's (2005) Visibility Theory, as Dresher argues (pp. 241f): Calabrese uses a mix of PC and CH, which however does not allow a given set of segments to take on distinct contrastive specifications.

2. Contrast refereed by phonological computation (and vice versa)

The book under review is a central piece of the research on markedness and contrast that has been conducted at the University of Toronto over the past 15 years (as Dresher explains in the acknowledgements, the group being headed by Keren Rice and himself). The result of this research is a theory called Modified Contrastive Specification (MCS), which defines the frame of Dresher's book (and is presented in section 7.2). The book offers a condensed summary of the historical work that was done on the structuralist and generative literature, exposes the two leading ideas of MCS regarding the organization of phonology (the Contrastivist Hypothesis and the Contrastive Hierarchy) and provides empirical support for them. The title of the book correctly identifies its focus, i.e. the Contrastive Hierarchy, a term that was coined by Dresher in order to refer to the procedure that he believes is correct for finding out which melodic features exactly are contrastive in a given language. Dresher has published a number of articles on this issue for about a decade, which are now quintessenced in the book. Another important contribution to the project around the Contrastive Hierarchy is Daniel Currie Hall's Ph.D. dissertation (Hall, 2007).

So what is it that Dresher wants to show? Aside from the two specific claims discussed in section 1, a more general goal is to re-establish contrast in the position that it deserves in phonological theory, and from which it was evicted by the generative school (chapter 5 is called "Generative phonology: contrast goes underground"). This involves much historical work, as Dresher points out in his programmatic statement at the outset of the book.

> "I will argue throughout that contrast is too central to be kept out of phonological theory for long, and I will show that it gradually leaked back into generative phonology in various forms. It is one of the aims of this work to reconnect phonology with its roots in this respect and to establish phonological contrast as a central principle of phonological theory." p. 8

Dresher's overall goal is thus to contribute to the reconciliation of generative theory with the central insight of structuralist thinking, i.e. contrast. Dresher is certainly right that this reconciliation is long overdue, and that contrast (or systemic properties of language) needs to enter generative phonology through the front door, rather than ashamedly covered and incognito through the back door. There is no way for phonological theory not to understand that the same "physical" or phonetic item, say [i], may behave differently in different languages depending on its relationship with other items in the systems at hand – or, as Dresher would put it, depending on which features in the system are contrastive. Of course, Dresher's way to restore contrast in phonological theory is not the only attempt in this direction, but Dresher argues in chapter 8 that it fares better than currently entertained competing models (perceptual-functional, dispersion theory, Structured Specification theory, Clements' theory and Calabrese's Visibility Theory).

In short, what the reconciliation is all about is the **interaction of static (the system, inventories, contrast) and dynamic (phonological computation) properties of phonology**. The former represent the heart of structuralist, the latter the essence of generative insight. This is a Hercules' labour, more easily said than done – but identifying the task is a good thing to start with. Dresher does not make the challenge explicit when he defines the scope of the book; rather, it progressively emerges in the discussion as Dresher shows that those in the history of (structuralist and generative) phonology who have applied the wrong method for identifying contrastive features (i.e. PC) ignored the connection of their findings with phonological processing: "pairwise comparison tends to predominate where an analysis is based on abstract theorizing with no real empirical consequences" (p. 9, Dresher often talks about "empirical consequences" when referring to phonological processing).

This is the real Gordian knot of the book, and Dresher argues, very convincingly in my opinion, that contrast alone is not worth much: it only makes sense if it is correlated to phonological computation – and it is phonological computation that referees competing contrastive specifications which are compatible with the static record. The computational referee, then, invalidates PC and shows that the CH is correct.

The competition between the two methods is thus the heart of the book, and in fact its real contribution to the field. The idea that there is a systematic and non-arbitrary correlation between systemic properties of the phonological units that are present in a language and the kind of processing that they are involved in is certainly not commonplace in contemporary phonological thinking. However, it is not absent from the record either: some of the approaches discussed by Dresher in the aforementioned chapter 8 of the book implement this relationship to a certain degree, and Steriade (2007) for example writes in her handbook chapter on contrast that "it is [...] inaccurate to say that constraints on alphabets [...] only apply to define the underlying inventory: some of these constraints are persistent (Myers, 1991) and prohibit the same feature combinations throughout much or all of the derivation" (Steriade, 2007:145f).

Hence it is not the reconciliation of contrast and computation as such that is Dresher's original contribution to the field. Rather, it is his specific way to realize this reconciliation that makes his work outstand (and compete with others). Dresher argues that the key to the problem is the correct method for identifying which features exactly are contrastive in a language (intuition and common sense will not do): PC is wrong, the CH is right, and this is shown by the computational referee.

Once the correct contrastive specifications are recorded in the lexicon, Dresher argues, the Contrastivist Hypothesis does the rest of the labour: since only contrastive features may be used in phonological computation, contrast automatically bears on processing. Or, in other words, the Contrastivist Hypothesis is the shuttle that carries contrast into computation. Both are therefore indissociable: they stand and fall together (Dresher insists on this fact in the conclusion of the book).

After having exposed the two competitors PC and CH as well as the logic of the argument(s) in the first two chapters, Dresher is concerned with showing that other approaches to contrast, structuralist and generative alike (including the recent OT-inspired literature as well as the work by Clements and Calabrese), is not on the right track because either no connection with processing is made, or no specific discovery procedure for identifying contrastive features is set up.

3. A historical and cumulative view on contrast

3.1. Exegetic work on the more and less recent literature

It was mentioned that the entire book revolves around the competition between PC and the CH. But how do we know that there are no other methods for identifying contrastive features? And who is to be credited with the paternity of the two competitors?

In fact both PC and the HC are already an abstraction: they are the fruit of Dresher's reading through the relevant literature since the phoneme was invented by Baudouin de Courtenay (1894, 1895)[4] through the structuralist and early generative literature up to Lexical Phonology, autosegmental theories of the 80s and current work including OT. Neither method is explicitly established in any specific text that could be named, but both are practised for as long as the idea of contrast is around: whoever talks about contrast must somehow establish which items are contrastive, and which ones are not. Hence there is no nominal paternity to be distributed, and the question whether there are other methods is also (implicitly) negated by Dresher: since the 19th century phonologists have used these two methods and no other.

Even more surprising, but indeed consistent with the fact that neither procedure has been explicitly identified by phonologists, is the fact that there does not seem to be any discussion in the literature about the comparative merits of PC and the CH. Dresher is rightfully baffled when he has to report (pp. 37ff) that a step in structuralist analysis as critical as the identification of those properties of sound that are distinctive was the subject of very little, if any debate: every author has his own ways of establishing the set of distinctive features, typically without even discussing nor bothering to make explicit the means by which he arrives at his result; and it is a trivial experience for the reader who wants to know how contrastive features are identified to see that authors are often perfectly inconsistent in their methods, applying PC to some data set, but the CH to some other in the same book or article. It was already mentioned that the rationale which Dresher says governs the distribution of the two methods is phonological processing: authors apply PC when reasoning on static inventories, but use the CH when they take into account actual phonological processes.

Much of Dresher's work, both over the years and in the book, is thus historical and exegetic: here is what Jakobson wrote, and here is how it *could be* interpreted. It looks like Trubetzkoy used PC, rather than the CH in order to arrive at his feature specification in this case, while here his analysis seems to suppose the CH. On this occasion, Martinet is not explicit about how he establishes his correlations, but an analysis in terms of the CH seems compatible with what he does.

Dresher does a lot of translating work as well: in order to communicate with modern phonologists he often needs to doctor original phonetic symbols, terminology or graphic arrangements. Also, he needs to guess what a description in prose of, say, Martinet, would have produced in an environment where binary features are used (p. 13). For there were no binary features then: Trubetzkoy and his contemporaries used simple adjectives in order to characterize properties of sound, and these adjectives were not meant to be a piece of a fixed inventory of terms; adjectives used for the purpose of description do not really have the same ontological status as phonological primes that are supposed to be universal. For example, can the impressionistic and purely descriptive terms "hush" (translation of the French adjective "chuitant" which is used to refer to [ʃ, ʒ]) and "hiss" (French "sifflant", literally "whistling") that Martinet uses be simply converted into binary features (p. 60)?

But in order to assure interoperability with later binary views (and indeed with Dresher's own binary environment), Dresher needs to venture into translation. That is, Trubetzkoy did use some method in order to decide that this or that property of sound is contrastive, but if we do not translate its terms into a common language with Jakobson, Halle and others, we will never be able to compare. This may also involve the modification of labels: Jakobson and Lotz (1949) "tense" for example is converted into "voice" in order to be able to be compared with Martinet's (1964) system (pp. 14f).

Dresher has put a lot a work into trying to stand in Trubetzkoy's, Jakobson's, Martinet's, Halle's, etc. shoes, and his meticulous reading is rendered by a very careful wording where formulations such as "is compatible with", "could be understood as", "may be construed as", "is a possible interpretation of", "could only be arrived at if the author used method X" etc. are predominant. In this context, a pervasive goal that Dresher pursues all through the book (on many occasions, and particularly on p. 25 and in section 7.3) is to show that phonologists have always hierarchized features in their practice, even if they used PC, even if this was not made explicit, and even if they were unaware of what they were doing.

On many occasions, it is rather difficult to judge whether Dresher's interpretations, translations into modern vocabulary and categorizing as PC or CH are correct: one would have to read every article and book quoted. There is every reason, though, to believe that Dresher has done a marvellous historical and exegetic job when extracting information from the literature. This job is certainly not the smallest merit of the book: Dresher asks a question that (almost) nobody has asked before (how do we identify contrastive features?), and extracts the two methods that phonologists have tacitly used in the past and are still tacitly using today. The identification of these two methods, PC and the CH, is thus a merit by itself, as much as the

[4] On several occasions Dresher says that the lower limit of his time window are the 1920s, but his reading and background obviously go beyond that.

(implicit) assertion that there is no other method around. Dresher shows convincingly, I think, that the means which have been used by phonologists in order to determine which features are contrastive reduce to PC and the CH.

3.2. Explaining the course of phonological planets

As a whole, Dresher's book is spreading a very pleasurable flavour that is rarer and rarer in the hasty world of the post-modern publication- and impact-factor driven agora where the half-life period of theories is cut down to a year or so: the reader meets a real scholar who has taken all the time necessary in order to really stand on the shoulders of giants. Dresher's theory is not just another notational gimmick that nobody will remember the name of in five years. The reader is assured in advance that the time spent on this book is no time wasted: before making any claim or statement as to how contrast works in phonology, Dresher has exhaustively (one senses, or almost, if this is not possible) appreciated previous work, ranging from Baudouin de Courtenay to OT; he will therefore not reinvent the wheel, and he has learned lessons from history. That is, the reader is not just served an amorphous list of events; rather, like all good historical work, Dresher *interprets* facts and events, and it is only in the view of his mind and the quintessenced ink which he puts on paper that the history of the subject matter – contrast – emerges.

This involves namely establishing historical generalizations and causal chains in the succession of events. Large parts of the book are devoted to a review of contrast in the history of phonology, and Dresher offers quite a number of rationales that are designed to explain the course of phonological planets, most of which cannot be mentioned here.

One reasoning is about the eviction of the CH in the late 50s and during the 60s: the CH dominated the 50s (Jakobson, Halle's Sound Pattern of Russian), but was abandoned as a result of the importance granted to feature economy and information theory, which led to the decline of the Contrastivist Hypothesis. This, in turn, estranged contrast from empirical content (i.e. phonological processing), and therefore it was an easy job for critics of underspecification (ternary feature values: plus, minus, nothing, which culminated in Stanley's 1967 article) to throw out the CH with the ternary bathwater (pp. 9, 77).

Aside from the general absence of contrast in SPE, genuine generative action in the 60s also contributed to unhorse the CH: Halle's famous argument against the phoneme made at the 1957 LSA meeting (and in the Sound Pattern of Russian) destroys the Contrastivist Hypothesis and as a consequence the CH because it makes non-contrastive features ([voice] in Russian t͡s, t͡ʃ, x, which lack a voiced partner) manipulable by phonological computation just like contrastive features (p. 94). The markedness conventions of the ninth chapter of SPE went in the direction of the CH, but insulated markedness from phonology proper: markedness bears only on underlying inventories, not on processing (the rule component only manipulates +/−, not m/u values). SPE's linking convention reintroduces the relationship with processing through the back door, but does not take account of language-specific contrasts (pp. 110ff).

Finally on various occasions, Dresher explains the decay of a theory with its inability to establish an explicit method for identifying contrastive features. Regarding underspecification theories of the 80s for example, he writes (p. 129): "the lack of an adequate mechanism for deciding which features to omit ultimately led to a backlash against theories of underspecification."

Condensing all this, Dresher exposes his view of the global picture of the history of contrast in the conclusion of the book (pp. 250f): just like Plato's erring halves that seek to be reunited in love, the CH and the Contrastivist Hypothesis were always separated. Until the 50s, the latter was adopted, but the former remained inexplicit or fell behind PC. The 50s being the turning point in history, the CH was now adopted, but in turn the Contrastivist Hypothesis was abandoned. Without the Contrastivist Hypothesis, however, the CH had no chance to survive and was washed away under external pressure (economy, anti-ternarism). Both can only work in tandem, and this is the heart of Modified Contrastive Specification (MCS).

4. Doubts and objections

Below two issues are raised that challenge central pieces of Dresher's argumentation: there may be a way to falsify the Contrastivist Hypothesis that is not explored in the book (section 4.1), and the variation created by different feature orderings may turn out to be an artefact of binary melodic primes (as opposed to unary primes), rather than a fact about language (section 4.2). Finally, I comment on the strange way Dresher implements the CH into OT (section 4.3).

4.1. Conditions of falisification of the Contrastivist Hypothesis

It was mentioned that Dresher's CH can only bear on the behaviour of the computational system via the Contrastivist Hypothesis (the necessity of this tandem is also emphasized in the conclusion of the book). The CH thus stands and falls with the Contrastivist Hypothesis, and it is therefore worth examining whether this hypothesis is correct. What would be evidence that falsifies the Contrastivist Hypothesis? Dresher devotes section 7.9 "Refining the Contrastivist Hypothesis" to this question. He rightfully points out (and illustrates) that there are a number of apparent counter-examples, which however are fairly easy to spot and which evaporate upon closer inspection. They have two sources: either they rely on a faulty identification of contrastive features, that is using PC, or they mistakenly attribute a sound pattern to phonological computation, when it is in fact the result of the phonology–phonetics mapping.

Dresher holds indeed that there may be considerable slack between the phonological identity of a phoneme and its actual pronunciation (pp. 168f): a vowel that is contrastively specified [+low] may be pronounced [a], [æ] or [p].[5] Dresher also discusses a case where a vowel that is completely colourless, i.e. which has only zero values for all features, is pronounced [i] in some Inuit dialects, rather than [ə] as may be expected. The mapping from phonological to phonetic identity, Dresher argues, has got nothing to do with contrastive specifications or phonological computation: it is hard wired in the language and applies after phonology when feature matrices are transformed into actual sounds. Sound is therefore manipulated twice, by phonological computation and by the subsequent mapping to phonetics. If thus patterns that are due to the latter are mistakenly attributed to the former, the illusion may arise that phonological processing uses non-contrastive features. In conclusion, the Contrastivist Hypothesis only applies to patterns that are caused by "real" phonological computation; it does not extend to the phonology–phonetics mapping, which may involve all features, contrastive and non-contrastive alike.

Finally, Dresher admits that the Contrastivist Hypothesis is too strong as it stands: Hall (2007:87f) introduces the notion of "prophylactic" features, which are non-contrastive (and hence invisible for phonological computation) but nevertheless need to be present in lexical representations in order to keep phonemes distinct that would otherwise be indistinguishable.

With all these reservations and caveats in mind,[6] I would like to point out a way that may allow to falsify the Contrastivist Hypothesis, and which is not considered in the book. The most obvious means indeed is to look at phonological computation and to show that an active feature (value) is non-contrastive. Defenders of the Contrastivist Hypothesis can then argue that this is misanalysis, i.e. that the feature (value) is in fact contrastive.

But what about the reverse strategy? It should also be true that computation identifies *non*-contrastive features. In case there is an active process in a language that manipulates a given feature, but the feature does not react, it must be non-contrastive. For example, in systems with final devoicing, sonorant voicing is not an active phonological feature, and therefore non-contrastive. It seems indeed that there is no final devoicing system on record where sonorants devoice in word-final position in the same way as obstruents do. The prediction, then, is that in languages with final devoicing, phonological computation never operates over the voicing of sonorants. That is, sonorants should be entirely transparent for processes that manipulate voicing, as a target as much as as a trigger. It seems to me that this is an incorrect prediction: I am aware of two cases where sonorants pattern with voiced obstruents (as opposed to voiceless obstruents) as the trigger of the lengthening of the preceding vowel in a final devoicing system. The languages in question are German and Czech (or rather, Western Slavic).

In both cases, the process whereby vowels lengthen before sonorants and voiced obstruents, but remain short before voiceless obstruents, is of diachronic nature. And in both cases, this diachronic change falls into a period for which we know that the language did have final devoicing. The Czech (Western Slavic) case is discussed at some length in Scheer (2004:§431, forthcoming). The German facts are better known; they are visible synchronically in strong verbs as well as in the distribution of long and short (tonic) vowels. Strong verbs with a stem vowel <ei> [aj] and <ie> [ii] in present tense (traditional classes 1 and 2) have preterit forms and participles with a long vowel iff the following consonant is a sonorant or a voiced obstruent, but show short vowels in the two derived categories in case of voiceless obstruents. Hence *bleib-en* [aj] "to stay, inf." – *blieb* [ii] "id., pret." – *ge-blieb-en* [ii] "id., part." and *frier-en* [ii] "to be cold, inf." – *fror* [oo] "id., pret." – *ge-fror-en* [oo] "id., part." have long-vowelled preterits and participles, while *reit-en* [aj] "to ride, inf." – *ritt* [ɪ] "id., pret." – *ge-ritt-en* [ɪ] "id., part." and *schieß-en* [ii] "to shoot, inf." – *schoß* [oo] "id., pret." – *ge-schoss-en* [oo] "id., part." bear short vowels.

Behind this synchronic window is a diachronic process that has lengthened Middle-High-German (mhg) short vowels before sonorants and voiced obstruents. Hence mhg *bad* [a] > nhg (New-High-German, i.e. modern German) *Bad* [aa] "bath", mhg *büne* [y] > nhg *Bühne* [yy] "stage", against mhg *blat* [a] > nhg *Blatt* [a] "sheet (of paper)". This obstruent- and sonorant voicing-driven process is reviewed in the classical literature (Burghauser, 1891; King, 1969:51ff; Iverson and Ringen, 1973; Kyes, 1989:162), and is studied in detail by Caratini (2009). On the other hand, we know that Mhg, intermediate evolutional stages and Nhg are final devoicing languages (e.g. Iverson and Salmons, 2007).

The question is whether this pattern will be accepted by Dresher as a proper falsification of the Contrastivist Hypothesis. This depends on whether processing is also evidence for features that are *not* contrastive (and not just for those that are contrastive).

4.2. The opposition PC vs. CH is perhaps an artefact of binary primes

It was shown in section 1 that the two methods PC and CH produce different results. This is absolutely critical for Dresher's purpose since the goal of the book is to show that the different predictions made unseat PC. In a second step, it was also shown that the CH allows for different contrastive specifications for a given inventory (and a given set of features). This, in turn, is a very convincing argument against PC since the study of languages shows that identical inventories may produce distinct contrastive specifications.

Now there is a presupposition that is never really made explicit, but which is critical for all this: the fact that the melodic primes which phonological units are made of are binary features. Dresher mentions privative primes in a note on p. 2 (rather

[5] But not [e] or [u]? Unfortunately Dresher does not discuss the question exactly how large the slack may be.

[6] Including the one mentioned in note 2: sonorant and obstruent voicing may not be the same thing (in this case, it needs to be explained why voiced obstruents and sonorants sometimes pattern together, as is the case in the phenomenon discussed below). Still another presupposition for the reasoning below is that final devoicing is a "real" phonological process, i.e. not something that is decided elsewhere.

evasively), and he refers to them indirectly on p. 130 in the introduction to the section "Theories of feature organization": Dependency Phonology, Radical CV Phonology and Government Phonology are mentioned in relation with the representation of subsegmental structure, but then only Feature Geometry is discussed, for lack of space. Dresher also addresses privative primes in section 2.7.2 (two pages and a half), without however indicating any concrete implementation or any literature item. Finally, the privative option appears here and there in the book when Dresher reports on work of authors (namely Daniel C. Hall) who use privative features. In these situations, Dresher always "translates" privative into binary primes without comment, or indicating that this does not make any difference anyway. In note 31 on p. 209 for example he writes that "(2007, 2008) adopts privative features [high], [low] and [peripheral] (for [round]). For ease of exposition I will continue to use binary features."

Dresher correctly observes on p. 33 that "the effect of feature ordering is greatly reduced with privative features as opposed to equipollent features", but does not draw any conclusion from this diagnostic. The section ends in a vague recommendation: "if it is important to know the scope of contrast and which segments it affects in a privative feature system, we will have to keep track of this information with some machinery in addition to the representations themselves" (p. 34).

It is understandable that Dresher wants to keep his CH independent of any theory-specific choice, namely regarding the internal structure of segments: the CH ought to be of general validity in phonology no matter what secondary choices are made by individual analysts. I fear, however, that this is wishful thinking. The choice of (binary or privative) *features* vs. *unary melodic primes* (which are necessarily privative) does impact the CH, and it may turn out that the opposition PC vs. CH is not a fact about language, but a mere artefact of binary features. That is, for a given inventory, PC and the CH produce different results when binary features are used, but yield the same melodic identities in a unary system. Therefore the effect of feature ordering may not only be "greatly reduced" in a unary environment as Dresher writes – it may be actually inexistent. This means that the CH is irrelevant should it turn out that unary primes are the correct approach to melodic representation. It does not mean, however, that unary melodic representations are unable to assign different contrastive specifications to a given inventory. This can be done, only is it done by different means: section 5 explains how contrast may be encoded in a unary system, and how variation regarding contrast that is found across identical systems may be expressed.

In order to see that the game is not the same in a unary environment, a minimum of background regarding the workings of unary melodic primes (also called monovalent or holistic) needs to be introduced. The first difference to be made concerns the *size* of melodic primes: traditionally features are assumed, but since the mid-80s there is a well established tradition in phonological theory which considers that the smallest melodic building blocks are (1) bigger than a single feature, (2) privative and (3) pronouceable in isolation. These are absent from Dresher's book (except the one reference mentioned to Dependency and Government Phonology). Privative features are an entirely different approach whereby the basic building blocks are regular features (with about the same labels as binary features), whose contribution to the definition of segments, however, is expressed by their presence vs. absence, rather than by a positive vs. a negative value. Hence features may or may not be privative, while unary primes are necessarily privative.

Here is an example of a privative prime that is bigger than a single feature: ‖i‖ represents the high front tongue body position, i.e. specifications of two different features: [−back], [+high]; it produces contrast by being either present or absent. The unary idea was introduced by Anderson and Jones (1974) and then implemented in three theories in the 80s, each with its own characteristics: Dependency Phonology (Anderson et al., 1985, condensed in Anderson and Ewen, 1987), Government Phonology (Kaye et al., 1985; Harris and Lindsey, 1995, 2000) and Particle Phonology (Schane, 1984; Carvalho, 1994).

When unary primes combine, their basic characteristics merge in order to produce an intermediate item (along the lines of colour mixing). This may be best illustrated with vowels: ‖i‖ in isolation is [i], ‖u‖ in isolation is [u], and ‖a‖ in isolation is [a]; ‖i‖+‖a‖ yield a front mid vowel e/ɛ, ‖u‖+‖a‖ produce a back mid vowel o/ɔ, and ‖i‖+‖u‖ defines a front high rounded vowel y/ʏ; finally, schwas such as ə/ɨ are typically empty/colourless, i.e. made of no phonological primes at all.

Another issue in melodic representation is the kind of relationship that primes entertain: while there is general agreement that relations between linguistic objects, in phonology and elsewhere, are asymmetric and hierarchical, opinions diverge as to how this insight should be formally expressed. The most obvious take is the one of Feature Geometry, which applies the autosegmental idea to the infrasegmental area (this tradition is discussed by Dresher in chapter 5.4). The alternative is the heart of Dependency Phonology, i.e. a dependency relation: the idea is that one item is more important than the other(s) and contributes more to the result of the reunion (cf. also Liberman and Prince, 1977 labelled trees where sisters are either weak or strong). Government Phonology (GP) follows this line of attack (here the distinction is between heads and operators), while Particle Phonology expresses asymmetry by the number of copies of the same prime that contributes to the definition of a segment: [i] is the prime ‖i‖, [e] identifies as ‖i+a‖, [ɛ] as ‖i+a+a‖ and [æ] as ‖i+a+a+a‖ (Particle Phonology is the only theory where the presence of several copies of the same prime impacts the result). Hulst and Ritter (1999, 2003) provide an informed overview of the various implementations of the dependency programme.

On the backdrop of this general description, let us see what kind of result one of the privative systems mentioned really produces when it comes to the expression of contrast. The system examined is the one of Government Phonology (which I am familiar with), and specifically the 10-element system of Kaye et al. (1985) (unary primes are called elements in GP). Melodic representation has been further developed since 1985 in GP (the revised system recognizes only five elements, see section 5), but this is irrelevant for the treatment of the three-item set *p*, *b*, *m* that was examined in section 1. Relevant primes are L "non-spontaneous voicing" and N "nasality". Important for the discussion is the fact that in this system sonorants never bear

the prime L since their voicing is different in kind from the voicing that opposes voiced and voiceless obstruents. In the system of Kaye et al. (1985), the test-set of section 1 is thus distinguished as under (5) below.

(5)

	p	b	m
	L	L	
	N		N

That is, b bears L (but not N), m bears N (but not L), while neither prime contributes to the articulation of p. Hence L is distinctive for b, N for m and none of the two primes for p. The critical observation is that this is the *only* possible result that the system allows for: it is produced by PC as much as by the CH, no matter what ordering of primes is assumed. Let us first look at PC: the only way to make p different from b is through the prime L, and the only way to make m contrast with p, b is the prime N. Hence the presence of L in b is necessary as much as the presence of N in m. Also, there is no variation possible: p could not possibly be co-defined by L (since it is unvoiced), m could not bear L either (since it is a sonorant), and N could not be present in either p or b (because they are not nasal).

The effect of unary (and hence privative) primes is that there is no choice for the empty cells: if an item is not co-defined by a given prime, this prime is absent, and there is no way to play with a difference between a minus and "nothing", or with a plus and "nothing". When looking at (2), (3) and (4), it appears that it is precisely the variation plus/zero and minus/zero of the cells that are empty under (5) which creates the difference between PC and the two hierarchies of the CH in the binary system.

Finally, attributing values of L before values of N, or applying the reverse order, makes no difference in the unary system either. N > L opposes {m} (N present) to {p, b} (N absent) in a first step, and then differentiates {p, b} by attributing L to b, but not to p. The result is (5). L > N offers more of the same: first {b} (L present) is opposed to {p, m} (L absent), then {p, m} are told apart by N, which co-defines m, but not p. Again (5) is produced.

Let us sum up the situation: the question is not whether the particular privative system tested, Kaye et al. (1985), is correct or not (it is certainly not). What is demonstrated is that the Contrastive Hierarchy is *not* independent of "secondary" choices such as the kind of melodic primes (binary vs. privative, features vs. unary primes) and the attitude that is adopted regarding questions such as sonorant vs. obstruent voicing. If it turns out that the correct melodic primes are unary items (along the lines of Kaye et al.), rather than binary features, there is no difference between PC and the CH, and the ordering of primes has no effect at all. Or, in other words, Dresher's book and all the demonstrations that it contains are not about phonology – they are valid only for a certain type of phonology where it is decided beforehand that melodic primes are binary features, rather than unary items.

A fair question, then, is how unary systems such as Kaye et al.'s express the obvious variation that Dresher's most convincing argument is based on (see section 1): identical inventories may have distinct contrastive specifications, as witnessed by the distinct behaviour of their computational systems. The answer is the aforementioned slack between the phonetic realization and the phonological identity of segments (see section 4.1): an [ɛ] may have a number of phonological identities, and the main factor of variation is the different weight of the primes that contribute to its articulation. Gussmann (2007) for example holds that [ɛ] in Polish is sometimes I-A (headed), I-A (headed) at other times, and I-A (headless) still on other occasions (where underscored primes are heads).

Gussmann deduces these three distinct identities from the different behaviour of [ɛ] in phonological processing (note that there is no way to distinguish the three [ɛ]'s on phonetic grounds). In other words, three phonologically distinct units are "absolutely neutralized" on the surface: they happen to be pronounced identically in Polish, and this is what makes Polish different from other languages that may have the same surface inventory, but where [ɛ] corresponds only to one single phonological expression.

4.3. The Contrastive Hierarchy OTed: a strange system

After having argued that Feature Geometry may be reduced to the CH under certain conditions at the end of the preceding chapter, Dresher shows how the CH can be expressed in OT in chapter 6. He argues that OT by itself has no specific take on contrast and hence needs to somehow express this notion (this is certainly true, as it is for other theories). Dresher's goal, then, is to show that the CH can be expressed in terms of OT or, in other words, that the CH is able to import contrast into the constraint-based system of OT. What he comes up with, though, is a rather strange system where contrast is not lexically recorded but the result of online computation, and where waterproof constraint rankings that have no relationship with morphology are called strata.

Dresher starts by arguing that the constraints which are called to incarnate the SDA cannot cohabitate with regular phonological constraints in the same constraint ranking: "[i]n standard OT there is no level that corresponds to the representations that are the output of the SDA" (pp. 144f). Therefore, "the SDA fits best into a multi-stratal or serial version of OT" (p. 145). It is only in the summary of the chapter on p. 161, however, that Dresher explains where this specific contrast-creating computation is actually located in the overall grammar: before the "real" phonology begins. That is, its output, contrastively specified segments, is the input to another round of GEN and EVAL where the actual phonological processes of the language are computed.

On page 148, the algorithm that can convert any contrastive hierarchy into a constraint hierarchy is presented. This algorithm takes fully specified feature matrices (all features bear a plus or a minus) as an input, and returns a (single) constraint hierarchy where constraints are ordered in "blocks": A >> B, C >> D, E, F for example has three "blocks", i.e. sets of constraints that entertain a ranking relation. Unfortunately, Dresher creates a fair amount of confusion by calling these "blocks" strata in his algorithm (e.g. "[i]n the next stratum, place the constraint MAX [FI]"). Since he has made reference to strata before, the reader will believe that the SDA not only is a stratum as a whole, but also falls into sub-strata. This is not the case (and something that I only understood when corresponding with Dresher on a draft version of this review): for each language, the SDA is expressed by a single constraint ranking, which is located before "real" phonology. On the basis of a fully specified input, it filters out those pluses and minuses that are not contrastive. The output is then made of contrastively underspecified matrices (plus, minus, nothing).

We are thus left with a two-step macro system where regular phonology is preceded by a waterproof computation whose only purpose is to transform fully specified into contrastively specified matrices, and which runs on a specific set of constraints that is unheard of in "real" phonology (something that should not exist in OT, where the constraint set is supposed to be universal). Interestingly, this is exactly what Dresher denounces in his historical survey of contrast (e.g. p. 114 about the encoding of markedness in SPE): the whole point of the book is *not* to insulate the mechanism that produces contrastive specifications from the component that manages phonological processing.

Another property of Dresher's system is that contrastive specifications are absent from the lexicon. This is really hard to understand for anybody who is familiar with contrast. Contrast is an idiosyncratic property of particular languages that is stable and owes nothing to specific derivations; therefore phonologists have always considered it a hard-wired lexical property. Thus far in the book, the CH was presented as a means for the child and the analyst to *discover* contrastive specifications (namely by relying on phonological processing). But once contrastive specifications are discovered, they enter the lexicon: there is no use to construct the same contrastive specifications over and over again every time phonology is run. Dresher does not mention or discuss this obvious issue[7] – the only thing that is made explicit is the fact that what is lexically stored are fully specified segments.

Finally, it is not self-evident that the contrast-creating device qualifies for stratal status. In Lexical Phonology as much as in OTed versions thereof, strata are morphologically defined. A stratum corresponds to a certain chunk size in the cyclic (inside-out) derivation of words: the root and the stem are the most common strata. Dresher's contrast-creating device, however, has got nothing to do with morphology. The reference to strata and Stratal OT/DOT thus appears to be a simple means of making a serial derivation OT-compatible. It is true that Jerzy Rubach in his DOT (Rubach, 1997 and following) is sometimes tempted to create strata for purely phonology-internal reasons. This inflation of morphologically unmarshalled strata is a peculiar feature of DOT and certainly a point of critique in the literature. Dresher could thus claim to follow this track – but then a word would be in order to explain what he really means when he talks about strata. Another option may be OT-CC (McCarthy, 2007) where the phonological computation itself is serial (in Stratal OT and DOT the relationship between strata is serial, but phonological computation proper, i.e. what happens inside a stratum, is strictly parallel).

All this leaves the reader with a flat flavour that this chapter is born from the wish to make the CH OT-compatible at any cost. It is not so sure that hammering the CH into OT makes it score with either sympathizers or sceptics of OT.

5. Licensing Constraints: a set of instructions that derives inventories and processing

It was already mentioned several times that the ultimate challenge, i.e. the bearing of contrast on phonological computation, is not brought home by the CH alone: once the correct contrastive specifications are successfully identified and lexicalized, they only influence on processing because of the Contrastivist Hypothesis. In absence of this hypothesis, there is no way computation could distinguish contrastive from non-contrastive features.

Below I would like to point out the existence of an entirely different strategy for having systemic properties bear on computation. Rather than considering contrastive specifications lexical primes, the idea is that they follow from a set of instructions, so-called Licensing Constraints, which are also responsible for phonological processing. In other words, a unique set of constraints kills two birds with one stone by deriving both systemic (contrastive) and computational properties of the language. This is quite different from Dresher's system where contrastive specifications are derived from a constraint set: while Dresher puts a (derivational) firewall between the contrast-creating constraints and the constraints responsible for phonological processing, the *same constraints* in the *same constraint chamber* do both in the perspective to be fleshed out below.

As far as I can see, Myers (1991) is the earliest source of this approach. In a pre-OT environment, he proposes output filters ("persistent" rules, i.e. which are not ordered and apply everywhere) that are responsible for two facts: that there are no geminates in the inventory of English, and that geminates are not created in the course of a derivation. Another implementation of this idea is intimately related to unary primes: in Government Phonology, so-called Licensing Constraints were developed in the 90s on the basis of the aforementioned Kaye et al. (1985): relevant references include Kaye (2000, 2001), Charette and Göksel (1994, 1996) and Cobb (1997), Goh (1997).

[7] In his comments on a draft version of this review, however, he agrees: he thinks of the contrast-deriving device "as working primarily in the process of acquisition when the system of contrasts and underlying representations is being formed" (personal communication).

It was mentioned in section 4.2 that privative primes combine by assigning a different weight to each item. In Government Phonology, this translates as the head-operator relation (a phonological expression may or may not have a head, but if it does there is only one head). Two elements, say, I and A, may produce exactly three distinct expressions when combined (heads are underscored): I-A (headed), I-A (headed) and I-A (headless). In all cases, a mid front vowel is defined, but there is some slack between the phonological expression and the phonetic result: I-A may come out as [e] in some language, but may be pronounced [ɛ] or [æ] in some other language. Conversely, a given sound in a language may recover several phonological identities: Gussmann's (2007) analysis of Polish was mentioned in section 4.2 where the unique sound (and phoneme) [ɛ] can be either I-A, I-A or I-A depending on the morpheme in which it occurs. In all cases, phonological processing provides the decisive clues for setting up precise phonological identities on the basis of a set of candidate structures (Kaye, 2005:283 says that "the only source of phonological knowledge is phonological behaviour").

This system is but a specific implementation (based on the tools of unary primes) of the classical point of view whereby the phonological value of a unit is not predictable from its pronunciation (processing has a word to say), but where the relationship is not arbitrary either (see for example Dresher's discussion of Sapir on pp. 38ff): the pronunciation provides a "phonetic anchor" that guides the analyst. Also, the primes themselves provide some gross indication: I defines the high front tongue body position, U is rounding, A represents the low tongue body position. Hence something that is pronounced [u] will not be made solely of the prime I, and a phonological expression such as I-A will not be pronounced [ɔ].

A basic claim of theories of unary primes is free combinability: given the set of melodic primes and the properties of the operation that associates them, all and only those expressions that are generated must exist in natural language. At the level of a particular language, this means that there are restrictions that make those units which are not exploited unavailable: a language-specific system is the result of a specifically curtailed combinatory. The restrictions at hand are called Licensing Constraints (LCs) in the aforementioned literature. LCs are of two kinds: either they express restrictions on the headhood of a prime (e.g. "A cannot be head", "I must be head") or they restrict the ability of a head to license operators (e.g. "nothing can license A", "I must be licensed", where "license"/"licensed" means that an operator can exist in the vicinity of a head: only heads are licensors).

In order to illustrate how this works, and to show in which way processing impacts decision-making, let us look at the analysis of Turkish by Charette and Göksel (1994, 1996). The Turkish vowel system appears under (6) below.

(6)

ü		i	ɨ	u
	ö	e		o
			a	

A specific assumption made by the theory regarding ATRness is that ATR vowels are universally headless. This allows Charette and Göksel to set up the first LC based on the observation that there are no ATR contrasts in Turkish: "operators must be licensed". Since only heads are licensors, this amounts to excluding headless expressions. Hence the identity of simplex units, i.e. which are made of only one element, follows: a must be A, i must be I, u must be U, and ɛ is the empty set ø anyway. What needs to be determined is the identity of the four remaining vowels: e could be A-I or I-A, o could be A-U or U-A, ü could be I-U or U-I and ö could be I-A-U, I-A-U or I-A-U.

These options are refereed by evidence from vowel harmony, which comes in two varieties in Turkish: (1) front harmony produces a–e alternations in recessive nuclei and occurs in type 1 suffixes; (2) front/roundness harmony produces ɨ-i-u-ü alternations in recessive nuclei and occurs in type 2 suffixes (only the first nucleus of words is dominant in Turkish). Some illustration of these oft-quoted patterns appears under (7) below.

(7)

alternation	stem	relativiser =type 1	imperative = type 2	gloss
i - e - i	gir	gir-en	gir-in	enter
e - e - i	kes	kes-en	kes-in	cut
ü - e - ü	gül	gül-en	gül-ün	laugh
ö - e - ü	gör	gör-en	gör-ün	see
u - a - u	kur	kur-an	kur-un	establish
o - a - u	sor	sor-an	sor-un	ask
a - a -ɨ	kal	kal-an	kal-ɨn	remain
ɨ - a -ɨ	kɨs	kɨs-an	kɨs-ɨn	reduce

The difference between type 1 and type 2 is a lexical contrast. Hence type 1 and type 2 suffixes must have different lexical representations, and all the rest should follow from the harmony process. The lexical identity of recessive type 1 nuclei must be A since harmony transports I from dominant to recessive nuclei: I-containing vowels (i, e, ü, ö) trigger front harmony, while I-lacking vowels (a, u, o, ɨ) do not. In front/roundness harmony, the active primes that spread from dominant to recessive nuclei are I and U. Therefore the lexical identity of recessive type 2 nuclei must be ɨ: this is the vowel that appears when the dominant nucleus has got nothing to spread, i.e. when it does not possess either I or U (case of a, ɨ).

This record prompts the following generalization regarding the "hierarchical" behaviour of the three basic primes: (1) I always spreads, on both empty (type 2) and A-containing (type 1) nuclei; (2) U spreads, but only on empty (type 2) nuclei: no

roundness harmony is observed with A-containing (type 1) nuclei; (3) A never spreads on any recessive nucleus under any circumstance. Why is that so?

Charette and Göksel propose to look at vowel harmony in terms of licensing: the harmonic prime in the recessive nucleus is licensed by its antecedent in the dominant nucleus. Spreading is thus an instance of element licensing: the head licenses a copy of itself in the recessive position. In this perspective, the behaviour of A, which never spreads, indicates that there is a Licensing Constraint "A does not license operators". This rules out a number of candidate identities of complex vowels that we were left with upon the inspection of the static properties of the vocalic system.

(8)

vowel	candidate identities	compatible with LC "A does not license operators"
e	A-I	
	A-I	←
o	A-U	
	A-U	←
ü	U-I	←
	U-I	←
ö	A-I-U	
	A-I-U	←
	A-I-U	←

Hence a generalization gained on the grounds of phonological computation disambiguates the phonological identity of two vowels, e (which must be A-I) and o (which must be A-U). It helps shrinking the candidate set for ö, but leaves us with two possible identities; finally, it is non-instrumental regarding the disambiguation of ü. Charette and Göksel (1996:14ff) rely on additional evidence in order to make a decision in favour of a third LC: "U must be head". This identifies ü as U-I, and ö as A-I-U. The overall "grammar" of LCs for Turkish, then, is made of three items: (1) "operators must be licensed", (2) "A is not a licensor" and (3) "U must be head".

6. Conclusion

Again, the purpose of the preceding section is not to argue that the specific analysis of Turkish presented is correct. It means to show that Dresher's CH is not the only way of either discovering contrastive properties of sound, of anchoring them into lexical representations, or of making them interact with computation. The CH is an emanation – and a consequence – of a choice that is made prior to talking about contrast and its interdependence with computation: binary features. In a unary environment, the rules of the game are not the same: (1) contrast cannot be expressed by the difference between empty cells and cells with a positive/negative value (because there are no ternary specifications); (2) the slack that is able to make identical-looking systems different and different-looking systems identical does not identify as a feature hierarchy (the CH), but as different weightings of primes (head vs. non-head) which are defined by Licensing Constraints.

But beyond this, the two options – the CH and LCs – represent quite different world-views of the central question that Dresher raises in the book: how to model the interdependence of static (contrast, inventories) and dynamic (phonological computation) properties of sound. Dresher's solution favours distinct and insulated statements about how to discover lexical properties of units (the CH), and how computation interprets these units (the Contrastivist Hypothesis). On the other hand, Licensing Constraints kill two birds with one stone: a single set of instructions does all the labour. As a consequence, static properties of sound, i.e. inventories and contrastive specifications, are not a lexical or a phonological primitive: they are the result of active grammatical forces that marshal lexicalization in specific ways. In any case, the idea to unite static and dynamic aspects of phonology under one roof can only work this way round: lexical structure may be the result of computational instructions, but computational instructions cannot be derived from lexical specifications.

Elan Dresher has written a finely argued and carefully researched book. It is certainly unequalled in its historical depth and expertise: an inescapable reading for anybody who wants to know about contrast and its odyssey in phonological theory since the early 20th century. I am not aware of any other piece of literature where the different attempts of implementing contrast into various formal systems and theories is followed that thoroughly, and where its crossing (or conflict) with other trends in phonological thinking is construed into a consistent picture. Dresher's historical generalizations (e.g. that economy, the conflation of morpho-phonology with phonology and anti-ternarism are responsible for the eviction of contrast from generative theory) may be right or wrong (I believe they are right), but in any case they are novel and interesting.

Beyond the historical interest, the central merit of the book is to put the question of how contrast interacts with processing to the fore, and to provide a solution. The question is critical for phonological theory, and a generative answer to the structuralist challenge is overdue. Dresher argues that his solution is the only one left standing given that PC is wrong; he then tries to make the CH and the Contrastivist Hypothesis theory-neutral: the message is that whatever theoretical obedience is followed, no phonologist can get around this tandem. This is where the book jumps the track: Dresher's solution

is tied to the assumption that melodic primes are binary, and that ternary values (plus, minus, nothing) are legal. This system is not transposable to a unary environment. Hence after having shown that the tandem CH – Contrastivist Hypothesis beats PC in the binary theatre, one is now curious to see which way the competition goes with the alternative that is based on unary primes.

The present review does not afford this labour: I do not know whether Licensing Constraints are able to handle relevant empirical situations, and it is true that the LC-based literature is sparse and does not cover much material (but the situation on Dresher's side is not that different after all). The review merely indicates the existence of the unary alternative and points out a number of relevant differences, which could be used in order to referee the competitors: the unified perspective where static and dynamic aspects follow from LCs against two separate mechanisms (the CH and the Contrastivist Hypothesis) and the eventual existence of evidence that the Contrastivist Hypothesis is wrong.

Finally, one may also turn tables and consider the competition a referee for the binary vs. unary debate that has raged high in the 80s but more or less disappeared from the agenda in times where most phonologists have gone back to a set of unstructured SPE-type features (*[labial], *[coroal], *[dorsal], etc.). That is, if static properties of sound can be insightfully married with phonological computation on the basis of the unary technology, this approach is bolstered. If on the other hand the binary features allow for a better understanding of the static-dynamic interplay, advantage is given to this type of melodic representation.

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