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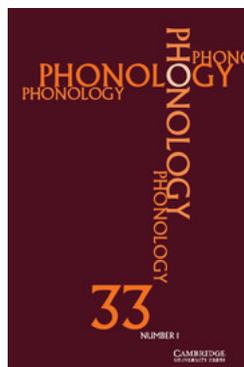
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Review

Steve Parker (ed.) (2012). *The sonority controversy*. (Phonology and Phonetics 18.) Berlin & Boston: De Gruyter Mouton. Pp. xvi + 487.

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The sonority controversy, edited by Steve Parker, comprises twelve chapters about sonority, written from a variety of angles.* The book is organised into five parts: ‘Sonority and phonotactics’, with six contributions, ‘Sonority and phonetics’, with three, and ‘Sonority and language acquisition’, ‘Sonority and sign language’ and ‘Sonority and computational modeling’, each represented by a single chapter. The volume has a brief introduction, in which the editor identifies the need for a contribution on each topic, emphasises the controversial character of the notion of sonority and allied topics, summarises the articles that make up the volume and shows how they are interconnected.

Despite the long-established argumentations based on sonority, dating back at least to Sievers (1881), the subject of sonority has never previously been the explicit focus of an entire book. Aware of this, the editor has sought to fill the gap with a fresh, comprehensive overview of the field. This new summary is extremely valuable. As discussed below, most contributions provide cutting-edge results, framed within the latest phonological models and informed by the most advanced phonetic and computational techniques. Various phonological models, submodels and refinements are employed, including Optimality Theory, Stochastic Optimality Theory, Harmonic Grammar, the Split Margin Theory, relational alignment, relational alignment in stringency form and the P-map, and the proposals are supported by a rich set of techniques and methodologies, including real-time magnetic resonance imaging (MRI), motion capture and the latest connectionist networks.

The weight of the book lies, somewhat conspicuously, in the relationship between sonority and phonotactics, a distribution that reflects their traditional reciprocal interest, and which Hyde (2013) identifies as a major shortcoming of the volume. The empirical interest of most contributions, including those in Part 2, ‘Sonority and phonetics’, involves instances of consonantal contact, which allow the authors to test from different perspectives classic

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sonority-based generalisations on segmental organisation within the syllable and across syllables, such as the Sonority Sequencing Principle (SSP), the Minimum Sonority Distance (MSD) principle, the Sonority Dispersion Principle (SDP) and the Syllable Contact Law (SCL).

In accordance with the title of the volume, the articles also reflect the classic debates around the notion of sonority, and shed new light on them: whether sonority has a phonetic basis, which phonetic correlates best define phonological sonority and whether sonority even exists at all. Of special interest are the reflections on some of the most charged debates, which the reader can find spread among the chapters: about the explanatory adequacy of traditional sonority-based arguments, about whether sonority-based principles are universal or whether this is just apparent, about whether they are too specific to be encoded in the human genome, about their diachronic genesis and their perceptual grounds, and finally about the synchronic knowledge speakers have about them and how this knowledge is acquired.

The kaleidoscopic nature of the volume also brings a multidimensional perspective on a variety of topics. One such topic is the analysis of word-initial sibilant segments followed by a consonant, which are classic SSP-disobeying structures, analysed in the volume as involving appendices or extrasyllabic segments (in the contributions by Baertsch and Cser), as exponents of excellent carriers of phonetic cues (Henke *et al.*) or as an illustration of formal reversal (Smith & Moreton). Another case is provided by liquid segments, which display ambiguous behaviour with regard to sonority and which are the subject of a formal analysis (Baertsch), a descriptive approach (Cser), a typological study (Parker) and even an MRI analysis (Proctor & Walker).

However, this overlapping of subject matter does not always guarantee communication between the chapters of the volume. A deeper interconnection would have enriched the overall result and would have avoided redundancy concerning the basic facts of sonority. This is perhaps the only aspect of this volume that I would identify as a shortcoming. In what follows I review each of the chapters in order.

In the chapter 'Sonority and sonority-based relationships within American English monosyllabic words', Karen Baertsch extends the applications of the split margin hierarchy proposed in Baertsch (2002) to sonority relationships between the syllabic constituents of American English monosyllables. The split margin approach refines Prince & Smolensky's (1993) sonority hierarchy by establishing a straightforward correlation between the constituents of the syllable. This hierarchy identifies three types of constituents that behave alike and which are targeted by three distinct universal hierarchies: M_1 , a singleton onset, the first element of a complex onset or the second element of a complex coda; M_2 , a singleton coda, the second element of a complex onset or the first element of a complex coda; and P, the peak. Constraints governing the M_1 constituent prefer low-sonority segments, and those governing the M_2 constituent prefer high-sonority segments. The split margin hierarchy has already been shown to have applications which offer compelling accounts for mirror effects between the syllabic constituents (see, for instance, Davis & Baertsch 2011, where the proposal is applied to the intricate behaviour of liquids in Campidanian Sardinian). The author argues that it avoids some of the drawbacks of alternative approaches, such as relational alignment

(Gouskova 2004) and relational alignment in stringency form (de Lacy 2004), which target sequences with identical intrasyllabic and intersyllabic distances in the same way. (For a critical comparison of these three approaches, see Pons-Moll 2011: 110–113, 160–164.)

The author shows how this hierarchy is able to capture not only classic SSP and MSD effects (and how it succeeds in circumventing their main shortcomings), but also additional unnoticed effects that occur in the onset, the peak, the coda or even the rhyme, without the need to resort to additional constraints unrelated to sonority, such as the OCP. Most of these effects are what the author categorises as the ‘worst of the best’. In the cases identified, a dispreferred segment is tolerated when it occurs in isolation, but not when it occurs in a branching structure, i.e. in combination with other elements. Nasal consonants, for instance, are acceptable as singleton onsets, but not as the first element of a complex onset (a nasal followed by a glide cannot constitute an onset in American English, although it satisfies the minimum sonority requirements of the language, as does for instance a sequence of an obstruent followed by a liquid). Similar situations are found within the coda and within the rhyme (for which Baertsch provides a thorough and novel account): although nasal and lateral segments can be peaks in unstressed syllables, they cannot be followed by otherwise well-formed coda segments. Rhotic segments, which, given their higher sonority, are more acceptable as peaks, are allowed to surface both in unstressed and stressed syllables and when followed by a consonant, but not by a consonant cluster. It is only the best peaks (e.g. vowels) that can surface with coda clusters, an instance of what we might call the ‘best of the best’. Baertsch provides convincing arguments that the relationships between the constituents of the syllable extend much further than classic statements about the structure of the syllable tend to tell us, and that the split margin approach is an ingenious tool for dealing with them.

András Cser’s chapter, ‘The role of sonority in the phonology of Latin’, provides a good descriptive survey of phonological patterns of Classical Latin which are governed by sonority requirements. The chapter, which deals both with the static distribution of segments within the syllable and across syllables and with dynamic phonological processes occurring in various morphological domains, invokes standard principles such as the SSP and the SCL, which interact with more unorthodox – and somewhat more ad hoc – generalisations such as the Place Condition, the Inverse Place Condition and the Generalised Place Condition. The data are drawn from various verse corpora, and the author openly acknowledges the problems derived from dealing with the pronunciation of a dead language: conjecture is inevitable.

Following an instructive review of the segmental inventory of Classical Latin, Cser introduces the basics of its syllable structure, and shows that it largely conforms to the SSP and the SCL. The author highlights, however, some well-known disobeying structures, such as those involving [s], which can appear flanked by stops (*dexter* [ks.t] ‘right’, *depstum* [ps.t] ‘pastry’) and at word boundaries (*spirare* [sp] ‘breathe’, *stare* [st] ‘stand’; *ops* [ps] ‘help’, *rex* [ks] ‘king’), structures that have survived, to differing degrees, in various Romance languages. He also discusses more intricate phenomena, such as the way in which coronal segments in the coda or onset can exceptionally be involved in a violation of the SCL (e.g. *ipse* [p.s] ‘himself’ and *parvus*

[r.w] ‘small’ are both allowed, although they display rising intersyllabic sonority). The author relates this behaviour to the above-mentioned Place Condition and Inverse Place Condition respectively. (Similar place interferences are found in the survey provided by Henke *et al.* in the following chapter; it would have been instructive to see how the perceptual approach might account for these.)

Cser’s observation concerning onsets consisting of a stop + liquid is of interest: those with a lateral are much rarer than those with a rhotic, and also more prone to being broken up by the insertion of a vowel, a fact that the author attributes to the lower sonority of the former. This tendency is consistent with the phonetic results in Parker (2008), and seems to have persisted in Romance languages, where the asymmetry manifests itself in various ways (see Pons-Moll 2008, 2011).

Eric Henke, Ellen M. Kaisse & Richard Wright’s chapter, ‘Is the Sonority Sequencing Principle an epiphenomenon?’, is intended to show that a cue-based approach to consonant phonotactics has a broader empirical coverage than traditional segment-sequencing generalisations, such as the SSP or the SCL. Indeed, the authors claim that a perception-based account is superior, because, as well as subsuming the correct predictions of the SSP and the SCL, it avoids the incorrect ones, and covers a wider range of phenomena about which those principles have little or nothing to say, without the need to introduce additional mechanisms and stipulations. They illustrate the proposal by focusing on the phonotactics of obstruents and sonorants in Korean and Modern Greek.

The authors argue that the primary cause of phonotactic phenomena typically addressed in terms of sonority is the activity of objective and well-understood acoustic dimensions, including cue robustness and cue precision, that contribute to the auditory recoverability of segments; sonority is thus a mere epiphenomenon or, in the best-case scenario, just one more factor. The main body of the chapter is devoted to explaining the basics of cue theory, and to showing how it is manifested across segments, transcending segmental organisation across a variety of languages. The authors specifically apply the proposal to the phonotactics of Korean (in which various assimilation processes originally analysed in terms of the SCL are interpreted as a consequence of perceptually weak sequences) and Modern Greek (where a series of enhancement processes are interpreted as a means of avoiding perceptually weak sequences, rather than as an OCP effect). They also illustrate how the cue-based approach is able to explain the patterns in the two languages that cannot be accounted for in sonority-based approaches, as well as those that these approaches do predict. The chapter claims that sonority-based accounts are overrated; indeed, a significant part of it is devoted to pointing out the main shortcomings of traditional approaches to consonant phonotactics rooted in sonority.

Henke *et al.* claim that the phonetic correlates of sonority are problematic. Acoustic intensity and segmental duration have been shown to be the most reliable correlates (see Parker 2008), but once these parameters are tested cross-linguistically they vary dramatically, although this has no phonotactic consequences. However, these two factors are included amongst those that define cue robustness (e.g. loudness, temporal distribution, impact and

modulation), which, as we have seen, is one of the key features of their proposal. In a similar vein, they state that the phonological details of the sonority scale have been claimed to vary from language to language. The point of this criticism is not clear to me, since this variability in the details of the sonority scale is a common way of explaining contradictory patterns across languages, which remain whatever the theoretical perspective adopted.

More compelling are the criticisms concerning the under- and overgeneration of structures in sonority-based approaches. It is well known that sonority-sequencing generalisations fail to account for some sonority plateaux and reversals, such as sibilant + stop; for these, the authors propose an account that relies on the intrinsic internal cues of sibilants, which make them less dependent on formant transitions and explains their resistance to change in such clusters. On this point I have to agree that the proposal is much more realistic than any account involving extrasyllabicity or appendices for sibilant segments. At the same time, though, these internal cues do not seem to prevent sibilant segments from undergoing a series of processes in (internal) coda position, ranging from debuccalisation in Spanish and gliding in Occitan to rhoticism in Galician and some varieties of Catalan, which can be better understood as a means of improving the intersyllabic sonority distances (see Pons-Moll 2011). On the other hand, classic sonority generalisations lead to the generation of tautosyllabic clusters like [tɫ] and [dɫ], which are unattested in most languages; nothing is said about how the perceptual perspective would deal with those.

In any case, the most problematic aspect of Henke *et al.*'s criticisms is their insistence on deriving all phonotactic phenomena from the same kind of principles. They argue, for instance, that the SCL has nothing to say about changes in place of articulation, so additional principles are needed, and this is not necessary under the perceptual account. But the interaction of principles is precisely the essence of current theoretical frameworks such as Optimality Theory; moreover, the perceptually based account itself needs to be supplemented with independent principles, such as those referring to ease of articulation. On the other hand, one might wonder why these perceptual factors have no influence on the languages in which these apparent sonority-sequencing generalisations do not apply.

My contention is that there is no doubt that the SSP and the SCL are part of the speaker's synchronic knowledge (see Daland *et al.* 2011), and that it is very likely that these principles are grounded in perception. Rather than being incompatible views, these are two sides of the same coin. What remains to be better understood is where this knowledge comes from (see, in this respect, the review of the chapter by van de Vijver & Baer-Henney, and the references therein), how these perceptual factors have crystallised in the form of these principles and whether they are actually active in the synchronic grammars.

Steve Parker's chapter, 'Sonority distance vs. sonority dispersion – a typological survey', examines the typological consequences for onset clusters of two well-known tendencies derived from the SSP, namely the MSD and the SDP, which sometimes promote divergent patterns. Whereas the former demands that sonority increases maximally from the first segment of the complex onset to the second, the latter demands that the sonority from the first element of the complex onset to the nucleus vowel is maximally and

evenly dispersed. According to the MSD, therefore, an onset with an obstruent followed by a glide is the best possible structure, but according to the SDP an onset with an obstruent followed by a liquid is the most harmonic structure, since liquids are intermediate between obstruents and vowels in terms of sonority.

On the basis of an exhaustive examination of the attested onset clusters in a corpus of 122 languages, the author concludes that neither of the principles can be neglected, inasmuch as the MSD has priority over the SDP in some languages and *vice versa* in others. This finding allows Parker to establish two novel kinds of category, the GLIDE OFFSET CONTINUUM and LIQUID OFFSET CONTINUUM. The glide offset continuum characterises languages that restrict the offset (C_2) to glides, but which differ in the kind of anchor (C_1) they allow. The liquid offset continuum is relevant for languages which restrict the offset (C_2) to liquids and which also differ in the permissible segments in the anchor position. Within both categories, the possible anchor–offset combinations in each language follow classic implicational relations. Unlike other contributions in the book, such as the chapter by Henke *et al.*, the notion of sonority as a basic organisational feature of Universal Grammar is here strongly vindicated.

The empirical coverage and the theoretical devices used in the proposal, which are rooted in the relationships between the syllabic constituents, overlap to a certain extent with those in Baertsch's chapter (and her previous work), and some cross-referencing would have been beneficial. Parker's contribution is valuable in that it provides the first explicit confrontation between two tendencies which have potentially opposite effects on onset clusters, and tests them on the basis of an unprecedented set of languages. This research agenda, I think, should also be applied to codas, whose interlinguistic behaviour is much more unfamiliar and intricate than that of onsets.

In the chapter entitled 'Sonority variation in Stochastic Optimality Theory: implications for markedness hierarchies', Jennifer L. Smith & Elliott Moreton evaluate some of the formal implications that two competing approaches to markedness hierarchies have in constraint-based models, such as Optimality Theory or Harmonic Grammar, once intra-speaker variation is considered and implemented within Stochastic Optimality Theory. The analysis undertaken leads to the preliminary conclusion that, whereas the scale-partition constraint family (Prince & Smolensky 1993) correctly predicts – in principle attested – true harmony reversals, the stringency approach (Prince 1997, de Lacy 2004) cannot. The rationale provided is as follows: if the ranking of a constraint external to a markedness hierarchy is seen to vary with respect to at least three of its members, then the ranking between these members must also be variable, and this can, of course, lead to a harmony reversal. This can only arise within a scale-partition approach, since in a stringency approach a violation of a constraint targeting a certain structure necessarily implies the violation of the constraints targeting more marked structures. Within the context of the scale-partition constraint families, the authors also provide numerical arguments to discriminate true harmony reversals (e.g. those situations in which a less harmonic structure is preferred over a more harmonic one) from apparent ones (e.g. where the effects of a constraint unrelated to the markedness hierarchy interfere, leading to an apparent harmony reversal).

The chapter is technically appealing and formally rigorous, but on the whole ends up being somewhat speculative, given the lack of sufficiently detailed data to test most of its claims (most of the data that serve as illustration are drawn from previous studies dealing with L1 and L2 acquisition): the available data involving variation with respect to markedness hierarchies are not enough, qualitatively and quantitatively, to distinguish between true and apparent harmony reversals, to discriminate real variation from change over time and, above all, to confirm indisputably the authors' claim that the predictions of the two approaches to markedness hierarchies are distinct. Moreover, the number of tokens available in the studies taken as reference is not large enough to implement the stochastic model under ideal conditions. For this reason it is difficult to evaluate the empirical relevance and applicability of the findings. Finally, although the authors assert that their results for intra-speaker variation can be extrapolated to cross-linguistic variation, it is unclear to me why this should be the case. In relation to this, I wonder whether sonority reversals across languages should be attributed to specific phonetic differences in classes of sounds between languages within the context of a non-discrete, dense and gradient sonority scale, rather than to strict constraint re-ranking (see Pons-Moll 2011: 114 and references therein for further discussion).

Ruben van de Vijver & Dinah Baer-Henney's chapter, 'Sonority intuitions are provided by the lexicon', is a remarkable contribution to the current debate as to whether speakers' knowledge of sonority is innate or learned from the structure and the frequencies found in the lexicon. The chapter also provides convincing arguments about how this referential lexicon is organised. While there is no doubt that the SSP is part of the speaker's synchronic knowledge, what is still a matter of debate is where this knowledge comes from. Studies such as Berent *et al.* (2007), focusing on English, Zuraw (2007), on Tagalog, and Ren *et al.* (2010), on Mandarin, conclude, on the basis of a set of experiments showing that native speakers are able to discriminate the relative well-formedness of onsets that are unattested in the respective languages, that they have sonority intuitions which go beyond the lexicon, and which can therefore be attributed to innate and universal grammatical knowledge (see also Dumercy *et al.* 2014).

In this chapter, though, it is shown that such knowledge can be derived from the lexicon, provided that the learner has access to an analysis of the words in the lexicon in terms of distinctive features. The results obtained from a judgement experiment (on nonce words containing attested clusters differing both in frequency and sonority profile, and unattested clusters differing in sonority profile) and a learning simulation lead the authors to conclude that the lexicon has sufficient structure for speakers to acquire the generalisations concerning the SSP without *a priori* knowledge of these. If this is the case, as it would seem to be, learning phonotactic statements about sequences of natural classes of sounds from the lexicon gives rise to sonority intuitions that go beyond what is directly observable in the language. It should be said that whereas the authors consider and reject the hypothesis that the learner only analyses words in terms of atomic segments, the data say nothing about the hypothesis that segments and features are two levels of analysis, both available to the grammar (Nazarov 2014). All that matters

is that features be present, but the data do not require absence of segments as a separate level of analysis. Furthermore, one might ask whether the features necessary to generalise beyond particular segments must be innate and universal, or whether they, too, can be learned from the lexicon itself. These are issues which need to be explored.

This research strategy and its main findings are compatible with Daland *et al.* (2011), who demonstrate that phonotactic generalisations are indeed projected from the lexicon and that any lexicalist model dealing with them must be equipped with both a sufficiently rich representation of the phonological context (e.g. syllabification) and a sufficiently rich representation of sonority itself (e.g. by means of features).

In ‘Sonority and central vowels: a cross-linguistic phonetic study’, Matthew Gordon, Edita Ghushchyan, Bradley McDonnell, Daisy Rosenblum & Patricia A. Shaw seek to determine whether it is possible to outline a specific acoustic dimension that can account for the low position of schwa in the sonority scale, especially in comparison to peripheral vowels. The authors measured four potential acoustic correlates of vowel sonority (duration, maximum intensity, acoustic energy and perceptual energy) in five languages that differ in relation to the stress patterns associated with schwa: Armenian, Javanese and K^wak^wala, where schwa, unlike the peripheral vowels, rejects stress, and Hindi and Besemah, where schwa and the peripheral vowels behave in the same way in relation to stress.

The study concludes that the low sonority of the schwa is indeed predicted by one or other of the acoustic dimensions considered, but that it is not possible to identify a single acoustic correlate that can explain the low-sonority status of the schwa across the languages under examination, nor even the differences between vowels paired with schwa within the same language. For instance, while duration and perceptual energy appear to be relevant in most of the languages, they are not conclusive in Armenian. Nor do the distinct phonological patterns in relation to stress seem to have a decisive acoustic correlation: schwa appears to be consistently weak, regardless of its phonological behaviour. In some more sporadic cases the results are in fact contradictory: in Armenian the schwa shows a greater maximum intensity than the high vowels, although only the former rejects the stress. On a larger scale, the investigation points to the conclusion that phonological sonority cannot be grounded in a single acoustic parameter, but rather on a – as yet to be defined – combination of distinct acoustic and articulatory parameters, each with greater or lesser importance depending on the language.

‘Sonority and the larynx’, by Brett Miller, is an attempt to identify and rationalise the articulatory primitives underlying the intrinsic perceptual properties of segments that have been shown to be a viable alternative to sonority explanations for segment organisation. The proposal thus builds on previous cue-based accounts of sonority effects (Wright 2004, Steriade 2009), and extends the empirical scope to less common sounds which are not often considered in the ‘sonority literature’, such as implosive and glottal consonants, which are difficult to characterise in terms of sonority, given their placeless nature (e.g. Lloret 1992).

The author identifies two scalar primitives, the ‘source scale’ (referring to the nature of the sound source) and the ‘aperture scale’ (referring to the

attenuation derived from the impedance in the vocal tract), each with its own organisation of classes of sounds. When combined, the two scales give rise to a complex sonority hierarchy that reproduces the intrinsic relative perceptibility of segments.

An interesting situation arises when pairs of sound types show contradictory rankings in each of the scales. In this case, it is predicted that they are unranked for sonority, which has significant typological consequences. The members of unranked pairs are those that are rarely or never adjacent within the syllable and even across a syllable boundary, so that it is impossible to find phonological evidence for their relative sonority ranking. Voiced stops, for instance, rank higher on the source scale than voiceless fricatives, but the latter rank higher on the aperture scale, explaining why it is hard to find phonological evidence for their relative sonority ranking. This chapter is a good complement to that of Henke *et al.*, in that it explores the articulatory bases of the perceptual accounts of segment organisation, and includes an extensive survey of underdocumented and controversial sounds in the literature devoted to sonority, such as implosives and glottals. Unlike the rest of the contributions in this volume, the author attempts to integrate the results provided in the other chapters into his proposal.

In the chapter entitled 'Articulatory bases of sonority in English liquids', Michael Proctor & Rachel Walker examine the articulatory behaviour of tautosyllabic liquid–vowel and, especially, vowel–liquid sequences in American English, using MRI with three adult male speakers. The research seeks to discover why vocalic contrasts are more reduced before rhotics than before laterals, why vowel contrasts are reduced when another consonant in the coda follows both liquids and what determines which vocalic qualities survive in these specific contexts. The empirical focus, therefore, overlaps in part with that of Baertsch, in that the intricate relations between the elements in the rhyme also come under scrutiny, but in this chapter the argumentation follows another approach. Among the findings are, first, that the overall vocal tract aperture, on which most sonority studies exclusively rely, is not the only factor involved in the different behaviour of liquids in the contexts mentioned, and that other factors (such as the dorsal configuration, the degree of stricture, the articulatory stability and the coordination of gestures) must also be considered. Second, the fact that there are more restrictions on rhymes with a rhotic than with a lateral in the coda is due to the articulatory characterisation of English rhotics as more intrinsically vocalic than laterals, a result that is consistent with some of the premises in Baertsch's chapter. Third, the greater articulatory overlap between vowels and the class of liquids explains the reduction of vocalic contrasts in this context. Finally, the vowels that tend to survive with both kinds of liquids are those that better align with the dorsal position of the liquid, that is, [ɑ ɔ] before the rhotic, and [ʌ ɔ ʊ] before the lateral. On the basis of these results, the authors conclude that there is a need to enrich the notion of sonority by taking into account a wider range of articulatory properties.

'The Sonority Dispersion Principle in the acquisition of Hebrew word final codas' is an insightful and compelling chapter, in which Outi Bat-El describes and evaluates the acquisition of word-final codas in three Hebrew-acquiring children, two displaying normal development and one diagnosed with a

mild development disorder. Although the SDP would predict that in coda position sonorants should be acquired first, the author shows how this is not the case when it comes to production data. Bat-El identifies, instead, a U-shaped development, with an early phase of dominance of obstruent codas, followed by a period of dominance of sonorant codas, and a final consolidated phase with obstruent codas (in accordance with the frequencies of the target language).

Rather than taking this behaviour as an argument undermining the role of the SDP in the acquisition of codas in Hebrew, the author argues that the principle does emerge once perception data are considered. While it is true that production data show a clear preference for obstruent codas (for which the articulatory effort required is less than for sonorants), perception data show a clear preference for sonorant codas, which is reflected in the higher number of attempted targets with sonorant codas (especially in the slow learner) and which conforms to their higher perceptual accessibility. The dichotomy between production and perception in relation to sonority has therefore a clear-cut correlate in the acquisition of consonant codas in Hebrew. Another interesting conclusion to be drawn from the data collected in this study is that the slower the development, the more evidence there is for the SDP, and in general for any universal principle not supported by the ambient language: fast learners produce word-final obstruents very early as a result of their frequency in the language, so that the SDP has little chance of materialising; in contrast, slow learners are less receptive to the ambient language, giving universal principles such as the SDP an opportunity to surface.

The early production of obstruent codas, on the other hand, is interpreted as an effect of the excessive accumulation of independently marked elements in the acquisition of new elements, which makes it unfeasible for them to be acquired at once. Codas are prosodically marked and sonorants are segmentally marked, and this explains why children select the less marked and 'already acquired' segments (e.g. obstruents) as opposed to the more marked and 'not yet acquired' segments (e.g. sonorants) when having to acquire a new marked prosodic structure (e.g. a coda). This chapter provides an in-depth account of child language acquisition, which has the virtue of being much more than an obvious, superficial interpretation of the observable facts.

The main purpose of Tommi Jantunen's chapter, 'Acceleration peaks and sonority in Finnish Sign Language syllables', is to test the Acceleration Peak Hypothesis, according to which the physical manifestation of a sonority peak in sign language is an acceleration peak, as has been claimed in previous studies, such as Luck & Sloboda (2008). This follows from the general belief – paradoxically not yet tested – that peaks in signed syllables can be associated with phonologically definable movements that are meant to enhance the visibility of the signing.

In order to assess the correlation between sonority and acceleration in sign language, the author measures the number of acceleration peaks that signed syllables can include and how exactly these peaks are distributed along syllable-to-syllable transitions. The analysis is based on an unprecedented corpus of motion capture data consisting of about 52 seconds of a continuous monologue signing by a native Finnish deaf subject.

Contrary to the Acceleration Peak Hypothesis, the author finds that, although acceleration is indeed involved in the production of signed language syllables, these can contain from zero to three acceleration peaks, not just one, and that peaks are also found in transitions, not only within syllables, as the hypothesis predicts. As such, the hypothesis cannot be maintained, at least according to the results obtained in this study. In the light of these results, the author also considers alternative correlates for sonority in signed language, such as velocity, force and displacement, but shows them to be just as problematic.

The chapter's main conclusion is that the actual correlates of sonority in signed language, if they exist, are still to be discovered, and that more data are required. Although the results of the study are inconclusive, the methodology used (based on motion capture data) makes this contribution an interesting precedent for future studies of signed languages.

In 'Sonority and syllabification in a connectionist network: an analysis of BrbrNet', Paul Tupper & Michael Fry evaluate the original version of BrbrNet, a connectionist implementation of syllabification in Imdlawn Tashlhiyt Berber analysed within the framework of Harmonic Grammar by Legendre *et al.* (2006), in line with Dell & Elmedlaoui (1985). The authors identify some problematic cases related to timescales in which an incorrect syllabification is obtained, and they propose an alternative set of parameters (which differ largely in timescales) for which BrbrNet produces the correct syllabification for all input strings. The drawback of this necessary modification of the set of parameters, though, is that the network is no longer sound from a neurological point of view. The authors show that even with more moderate modifications of the time scales, BrbrNet is not neurologically plausible, when more realistic phonological systems with many more constraints are considered. This is because the scale range of the parameter weights grows exponentially with the number of constraints. The authors conclude that the new generation of models that integrate linguistic and neurological analyses, rendering BrbrNet outdated, such as Gradient Symbol Processing (Smolensky *et al.* 2010), have to be similarly tested, to establish both their soundness and feasibility when a large number of constraints are taken into consideration.

Leaving aside the limitations identified in the introduction to this review and some of the shortcomings mentioned in my review of the individual chapters, *The sonority controversy* makes a remarkably positive contribution to the field of phonology and phonetics in terms of both the quality and novelty of its proposals. The diverse perspectives adopted by the volume's contributors provide a rich approach to the topic of sonority. This collection will without doubt prompt a rethinking of many issues related to the topic, and will supply researchers with fresh ideas, new experimental methods and the latest formal devices.

REFERENCES

- Baertsch, Karen (2002). *An optimality theoretic approach to syllable structure: the split margin hierarchy*. PhD dissertation, Indiana University.

- Berent, Iris, Donca Steriade, Tracy Lennertz & Vered Vaknin (2007). What we know about what we have never heard: evidence from perceptual illusions. *Cognition* **104**. 591–630.
- Dalard, Robert, Bruce Hayes, James White, Marc Garellek, Andrea Davis & Ingrid Norrmann (2011). Explaining sonority projection effects. *Phonology* **28**. 197–234.
- Davis, Stuart & Karen Baertsch (2011). On the relationship between codas and onset clusters. In Charles E. Cairns & Eric Raimy (eds.) *Handbook of the syllable*. Leiden & Boston: Brill. 71–97.
- de Lacy, Paul (2004). Markedness conflation in Optimality Theory. *Phonology* **21**. 145–199.
- Dell, François & Mohamed Elmedlaoui (1985). Syllabic consonants and syllabification in Imdlawn Tashlhiyt Berber. *Journal of African Languages and Linguistics* **7**. 105–130.
- Dumercy, Laurent, Frédéric Lavigne, Tobias Scheer & Markéta Ziková (2014). Anything goes: Czech initial clusters in a dichotic experiment. Paper presented at the 22nd Manchester Phonology Meeting.
- Gouskova, Maria (2004). Relational hierarchies in Optimality Theory: the case of syllable contact. *Phonology* **21**. 201–250.
- Hyde, Brett (2013). Review of Steve Parker (ed.) (2012). *The sonority controversy*. Berlin & Boston: De Gruyter Mouton. *Lg* **89**. 976–979.
- Legendre, Géraldine, Antonella Sorace & Paul Smolensky (2006). The Optimality Theory–Harmonic Grammar connection. In Paul Smolensky & Géraldine Legendre (eds.) *The harmonic mind: from neural computation to optimality-theoretic grammar*. Vol. 2: *Linguistic and philosophical implications*. Cambridge, Mass.: MIT Press. 339–402.
- Lloret, Maria-Rosa (1992). On the representation of ejectives and implosives. In Wolfgang U. Dressler, Martin Prinzhorn and John R. Rennison (eds.) *Phonologica 92: Proceedings of the 7th International Phonology Meeting*. Turin: Rosenberg & Sellier. 123–133.
- Luck, Geoff & John Sloboda (2008). Exploring spatio-temporal properties of simple conducting gestures using a synchronization task. *Music Perception* **25**. 225–239.
- Nazarov, Aleksei (2014). A radically emergentist approach to phonological features: implications for grammars. *Nordlyd* **41**. 21–58.
- Parker, Steve (2008). Sound level protrusions as physical correlates of sonority. *JPh* **36**. 55–90.
- Pons-Moll, Clàudia (2008). Regarding the sonority of liquids. Paper presented at the 38th Linguistic Symposium in Romance languages, University of Illinois at Urbana-Champaign.
- Pons-Moll, Clàudia (2011). It is all downhill from here: a typological study of the role of Syllable Contact in Romance languages. *Probus* **23**. 105–173.
- Prince, Alan (1997). Stringency and the anti-Paninian hierarchies. Handout from LSA Linguistic Institute, Cornell University. Available (January 2016) at <http://rucss.rutgers.edu/images/personal-alan-prince/gamma/talks/insthdt2.pdf>.
- Prince, Alan & Paul Smolensky (1993). *Optimality Theory: constraint interaction in generative grammar*. Ms, Rutgers University & University of Colorado, Boulder. Published 2004, Malden, Mass. & Oxford: Blackwell.
- Ren, Jie, Liqun Gao & James L. Morgan (2010). Mandarin speakers' knowledge of the Sonority Sequencing Principle. Paper presented at the 20th Colloquium of Generative Grammar, Barcelona.
- Sievers, Eduard (1881). *Grundzüge der Phonetik, zur Einführung in das Studium der Lautlehre der indogermanischen Sprachen*. Leipzig: Breitkopf & Härtel.
- Smolensky, Paul, Matthew Goldrick & Donald Mathis (2010). Optimization and quantization in gradient symbol systems: a framework for integrating the continuous

- and the discrete in cognition. Ms, Johns Hopkins University & Northwestern University. Available as ROA-1103 from the Rutgers Optimality Archive.
- Steriade, Donca (2009). The phonology of perceptibility effects: the P-map and its consequences for constraint organization. In Kristin Hanson & Sharon Inkelas (eds.) *The nature of the word: studies in honor of Paul Kiparsky*. Cambridge, Mass.: MIT Press. 151–179.
- Wright, Richard (2004). A review of perceptual cues and robustness. In Bruce Hayes, Robert Kirchner & Donca Steriade (eds.) *Phonetically based phonology*. Cambridge: Cambridge University Press. 34–57.
- Zuraw, Kie (2007). The role of phonetic knowledge in phonological patterning: corpus and survey evidence from Tagalog infixation. *Lg* **83**. 277–316.