

REVIEWS

PATRICIA ASHBY, *Speech Sounds* (2nd edn.). London: Routledge, 2005. Pp. 121. ISBN 0-415-34178-7.
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This book is largely intended for students of English phonetics (especially for beginners) but it is also suitable for any student of phonetics with an advanced knowledge of English. It does not cover all fields of phonetics but focuses rather on articulation.

Speech Sounds is divided into ten chapters. Chapter 1 introduces the difference between spoken language and written language. The author also deals with general concepts such as SPEECH SOUND, VOWEL, CONSONANT and VARIETIES of spoken language although she concentrates on English varieties only. In chapter 2, phonetic transcription is introduced, starting from the Roman alphabet, since the phonetic and the Roman alphabets have symbols in common. Southern British English (SBE) is presented as a model for foreign students/speakers of English. Chapter 3 deals with the production of consonants. The author describes the whole process of sound articulation between our lungs and lips. The air-stream passes through the larynx, where we find the vocal cords, which play an important role in consonant articulation and are responsible, for example, for differentiating voiced from voiceless consonants, depending on whether they vibrate or not when the air-stream passes through. Chapter 4 is devoted to SBE vowels and their description in terms of quality and duration. A distinction is also made between simple and complex vowels, in the author's terms PURE VOWELS, and DIPHTHONGS or GLIDING VOWELS. In chapter 5 the organs of speech are presented, with a description of the function of each in terms of active and passive articulators. The author emphasises that the so-called organs of speech have other primary biological functions, such as breathing, biting, licking, etc. Consonants are also described, based on place of articulation. Manner of articulation and airstream mechanisms are treated in chapter 6, and chapter 7 deals with approximants, fricatives, affricates, trills and taps. The IPA chart appears in chapter 8 and a complete table of all the symbols is given on page 66. We are given very reasonable guidelines for reading and interpreting this chart. Chapter 9 deals with two aspects of the consonantal variation associated with obstruents: aspiration and glottalisation. Chapter 10 carries further the description of consonants by describing the concept of double articulation and of secondary articulation, and includes a discussion of their diacritics.

At the end of these ten chapters there is an appendix outlining the reasons for the study of phonetics. A number of professional applications for phonetic knowledge are also briefly described, such as speech therapy, forensic phonetics and voice/accents coaching. Finally, the reader is invited to visit the homepage of the International Phonetic Association.

The appendix is followed by three further sections. On pages 94–97 bibliographic references are provided for further reading in the areas of general phonetics, English phonetics, dictionaries of phonetics, practical phonetics, intonation, English accents, the physics of speech and the phonetic representation of speech sounds, advanced general phonetics and experimental phonetics. On pages 98–117, we find answers to the exercises contained in each chapter and finally, on pages 118–121, the book ends with a subject index.

Speech Sounds is by no means voluminous, yet it summarises all the principles of articulatory phonetics in a very clear and intelligible way, so that even a beginner in the study of this field should be able to use it without need of further explanation from a teacher. Chapters are organised in such a way that readers are fully aware of the topic under discussion and the extent to which their own understanding is progressing.

Each chapter begins with a three- or four-line summary that introduces the topic about to be dealt with and highlights the most important concepts that should be understood by the end of the chapter. There are exercises at the end of each section so that readers may test their understanding before proceeding. Illustrations are also provided throughout and are especially notable in chapters 4, 5 and 6.

The build-up of fundamentals of articulatory phonetics is made in a way which applies sound pedagogical principles. A good example can be found in the introduction to transcription. The reader is not required to learn all the symbols at once but, as already mentioned, begins little by little with the symbols which are most similar to the Roman alphabet. From there on, the author introduces further symbols and diacritics. The chapters are also well connected, each one acting as a starting point for the next. The author makes no presuppositions about previous knowledge, the basic concepts are introduced step by step so that anyone can take up the subject from the very beginning without fear or worry.

In the description of forensic phonetics in the appendix, readers are told where they can find free software for acoustic analysis, and provided with an introductory bibliography for forensic phonetics. Surprisingly, there is no mention of the homepage of the International Association for Forensic Phonetics and Acoustics (IAFPA) <http://www.iafpa.net>. There is a mention of the *Journal of Forensic Linguistics* but it has now changed its name to *The International Journal of Speech, Language and the Law*.

To sum up, the book is a very useful tool for anyone interested in acquiring fundamental knowledge of articulatory phonetics. It is written in an easy and intelligible way and, although it focuses on English phonetics, any student of phonetics will find it of interest since the articulatory properties of language are common to all speakers. The pattern of progression also provides interesting directions for teaching and exercises, which include material from languages other than English.

JOHN COLEMAN, *Introducing Speech and Language Processing* (Cambridge Introductions to Language and Linguistics Series). Cambridge: Cambridge University Press, 2005. Pp. 314. ISBN: 052-182-365X (hbk), 0521530695 (pbk).
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It is unfortunate that there is still today an enormous gap between the community of linguists and phoneticians on the one hand and that of engineers and computer scientists on the other. Each community needs the other and, in an ideal world, linguists would provide theoretical frameworks and data which are useful to engineers, while engineers would provide tools which are useful to linguists. The exchange between the two communities, however, is in practice very slow. It often takes decades for ideas which are current in one community to be adopted by the other. The ideas of non-linear phonology which have dominated phonological analysis since the 1970s, for example, are only recently being integrated into speech synthesis and speech recognition systems. At the same time, linguists and phoneticians working on corpus analysis often use extremely primitive tools and software: there is still today, for example, no widely available tool for robust automatic alignment of a waveform with a transcription. Although such tools do exist, they are generally not available in a form which the average linguist or phonetician can easily use. The result is that linguists working on spoken corpora can spend hundreds of hours providing manual alignment of their data and, worse of all, that this manual alignment is very often not even fed back as a resource for evaluating automatic

alignment algorithms. Any attempt to bridge this gap is consequently more than welcome. John Coleman's *Introducing Speech and Language Processing* is precisely such an attempt and is consequently to be highly recommended.

All in all, John Coleman does an excellent job of presenting many of the major algorithms in use today in both speech technology and natural language processing, and he does so clearly and concisely, adopting much of the time a very laudable hands-on approach: readers are almost immediately confronted with a program written in C, which the author then proceeds to explain in some detail. As an exercise, the readers are asked to compile and run the program and then to modify it in various ways. This is almost certainly the most efficient way to get students over the first hurdle of thinking that they will never be able to understand anything about programming. Instead of writing little programs that display silly messages like 'Hello world!' on their computer screen, they are shown how a list of understandable instructions can be used to produce a sound, which they can then hear, display and modify.

Another original aspect of this book is the fact that it attempts to deal simultaneously with both signal processing and natural language, showing that the two areas have a lot in common. This again is a very welcome step and we can perhaps now look forward to a new generation of linguists with a solid background in both these areas.

The two 'strands' of the book, as Coleman calls them, 'Speech' and 'Language', are interwoven so that after an introduction and three chapters dealing with Speech: 'Sounds and numbers' (chapter 2), 'Digital filters and resonators' (chapter 3) and 'Frequency analysis and linear predictive coding' (chapter 4), the readers are then introduced to the concepts of 'Finite-state machines' (chapter 5), this time using the language Prolog rather than C. This gives them enough background to move back to the 'Speech/C' strand and subsequently to be introduced to a selection of techniques used in speech recognition (chapter 6), before shifting back once more to the 'Language/Prolog' strand, with the final three chapters on 'Probabilistic finite-state models' (chapter 7), 'Parsing' (chapter 8) and 'Using probabilistic grammars' (chapter 9).

Like other books in the Cambridge Introductions to Language and Linguistics series, this one is extremely well produced and attractively presented. The text is accompanied by numerous illustrations and includes a useful glossary of technical terms as well as an index and a list of references. All the software described in the book, together with a C compiler and a Prolog interpreter are included on the accompanying CD-Rom and the reader is also referred to a companion website (www.islp.org.uk) with additional links and updated information. Thus, whether or not this is the perfect introduction to speech and language processing for students with no technical background, it's probably as close as we are likely to get for some time.

What follows are a few thoughts on what might possibly have made the book even better. As a Macintosh user, I was personally at first disappointed to see that the software, originally developed for use in a Unix environment, has been written for PC/Windows users only, although the author adds a note for Mac and Unix users saying that the software can be compiled and run under other operating systems, given appropriate technical support. The first program, *coswave.c* compiled successfully on my Mac OSX system, but others repeatedly gave a 'Bus error'. The same thing happened on a Linux system and my colleague, Robert Espesser, suggested modifying the source code, replacing all occurrences of '*length' by 'length' and all occurrences of 'length' by '&length'. Once this was done, the other C programs all compiled successfully, so potential readers using Mac/Unix need not be put off by this.

In chapter 5, 'Finite-state machines', the author says that the model NFSA1 (figure 5.3) accepts 'almost all the monosyllabic words in Mitton 1992 . . . apart from a few very unusual words, mostly foreign words' (115). There is one important group of words which are not accepted by this model, however, and that is all those which begin with a vowel or with /ju/ ('I' and 'you' are hardly rare or foreign!). In fact this would have been a good opportunity to introduce the solution to this problem: two empty transitions (1, ", 4) and (1, ", 3). Alternatively, the vowel/glide problem could have been solved by allowing more than one start state just as more than one end state is included. The presentation of probabilistic finite state models

in chapter 7 is rather more abstract than a lot of the other material and it is a pity that the students could not have been given some practical applications using Hidden Markov Models. At the end of the chapter, there is a seven-page criticism of Chomsky's objections to Markov models, as formulated in the late 1950s and 1960s, which seems out of character with the introductory/didactic nature of the rest of the book.

Table 5.1 presents an Ascii coding of the IPA, credited to Mitton 1992. This is, in fact, an only very slightly modified version of the SAMPA alphabet developed in the 1980s during the European Esprit Project SAM (Wells 1997). The only differences are the symbol /&/ for the vowel of 'hat' instead of the SAMPA symbol /{/ and /0/ instead of the SAMPA symbol /Q/ for the vowel of 'hot'. In XSAMPA, /&/ is an open front rounded vowel and '0' is used as a diacritic for devoicing as in e.g. /b_0/). It is a pity that this attempt to define an International standard for Ascii coding is not given due credit here.

The use of Prolog for the 'Language' strand made me wonder if readers would ever be able to produce anything useful for their research with this language. But, on reflection, the same applies to C. The author's aim is clearly not to turn the readers into programmers but to get them to understand how the algorithms work. In fact students might usefully be warned about the dangers of amateur programming instead of using tried and tested freely available software. In his conclusion, Coleman suggests that readers that have reached this point should set their sights higher and 'get to grips with some more technical works', recommending among others works on C and Prolog programming. In my opinion, once readers have acquired the level of understanding provided by this textbook, they would probably do better to concentrate on learning to use some of the excellent software that is freely available today, rather than expecting to write such software themselves. They are much more likely to be able to produce useful applications using, for example, the scripting facility of *Praat* (Boersma & Weenink 2005) or with the *Cambridge HTK Language Modelling Toolkit* (Young et al. 2005), both of which are referenced on the companion website, rather than writing their own programs. Perhaps the most surprising omission in the book is a description of the mechanism of neural networks although Coleman does give references (7). The subject could, though, have been given a brief presentation so that the basic ideas would be familiar. For a hands-on approach to neural nets, the student could be referred to David Weenink's tutorial in the online documentation of the *Praat* software (op. cit.). Another tool which they might usefully have been introduced to is that of Regular Expressions, using Perl (Wall et al. 2000), which in my experience, like the *Praat* scripting language, is one that students with a humanities background can quickly learn to apply.

In conclusion, Coleman has produced an excellent textbook and one which will be extremely valuable to many students and teachers since it does a great deal to render accessible an area which is usually only covered by much more technical works. Even so, readers should be warned that they must not expect an easy ride through the lands of speech and language processing, although they can be guaranteed that it will be an exciting one.

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CAROLINE FÉRY & RUBEN VAN DE VIJVER (eds.), *The Syllable in Optimality Theory*. Cambridge: Cambridge University Press, 2003. Pp. ix + 415. ISBN: 0-521-77262-1. doi:10.1017/S0025100306232675

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Yet another book about the syllable, one could say. Still, the editors convincingly argue that the book fills a lacuna by providing a systematic treatment and evaluation of the role of the syllable in the most popular modern phonological framework – Optimality Theory. The volume is a collection of fifteen chapters grouped into five parts, each dealing with a different aspect of syllable-based phonology. Part One, ‘Introduction’, prepared by the editors, is an excellent, short but comprehensive, overview of the problems the book will be concerned with. Part Two, ‘Syllable structure and prosodic structure’ (four chapters), deals with weight issues. The five chapters of Part Three, ‘Nonmoraic syllables and syllable edges’, treat the notorious ‘unsyllabifiable’ segments. Part Four, ‘Segments and syllables’, includes four chapters on the segmental structure of syllables, and finally, Part Five, ‘How concrete is phonotaxis?’, provides an apparent anticlimax with a chapter proposing syllable-independent phonotactics.

Féry & van de Vijver emphasise the mutual benefit relation between the syllable and Optimality Theory (OT): while OT sheds new light on old syllable-related issues, the syllable allows OT to make valid phonological generalisations. For instance, they show that OT is able to account for syllable typology by means of its markedness and faithfulness constraints rather than by means of rules and rule conspiracies. The universally predictable implicational hierarchy of syllable structures can be explained as a result of the interaction (shown via ranking) among the constraints. If markedness constraints (like ONSET and NOCODA) fully dominate faithfulness constraints (e.g. a constraint against deletion and against epenthesis), we obtain the most unmarked syllable type, namely CV. The authors claim that the advantage of the OT explanation as opposed to the ‘conspiracy of rules’ explanation lies in the fact that while the rules ‘do not know’ their own ultimate function (e.g. hiatus avoidance, which may be obtained either via consonant epenthesis or vowel deletion), constraints always rank with reference to this ultimate function (i.e. faithfulness constraints with reference to markedness constraints). This advantage granted, it is worth remembering that Natural Phonology in both its earlier and later facets has advocated a functional account of phonological structures by means of either (earlier) simultaneous ordered application of universal natural processes or (later) preference hierarchies (compare markedness constraints) and semiotic principles (compare faithfulness constraints). The Swabian example (9) is easily handled by a process-based interpretation ($bi[s]t \rightarrow bi[f]t \rightarrow bi[f]$).

Incidentally, the authors state that ‘in Hawaiian, hiatus is freely allowed’ (5), which is disputable. In fact, certain combinations of two vowels in Hawaiian are pronounced as one-syllable diphthongs (cf. Schütz 1995: 18), and diphthongisation is certainly one of the hiatus-avoidance strategies.

The syllable as a prosodic constituent is a leitmotif of Part Two. In ‘Sympathy, cumulativity, and the Duke-of-York gambit’ John J. McCarthy replaces the opaque Duke-of-York derivation in Bedouin Arabic ($ʔákalat \rightarrow ʔkálát \rightarrow ʔakálat$) with the improved sympathy theory account, in which the notion of cumulativity is employed. While in a Duke-of-York derivation, ‘later steps do not accumulate the results of earlier steps’ (25), in non-Duke-of-York derivations exactly this happens. In this way, the intermediate steps are not vacuous/opaque any more. The clear advantage of this analysis over the rule-based analysis is that it is transparent. However, the apparatus for comparing and evaluating unfaithful mappings is very complex, while in the case of Duke-of-York derivations usually one intermediate-stage

rule is at stake. The old question of the abstract simplicity vs. concrete complexity of a phonological description returns. But candidates also differ by properties which are not governed by faithfulness constraints: these are non-contrastive properties like syllabification. McCarthy argues that it is faithfulness to moras, rather than syllables, that is the basis of contrast in syllabicity.

Stuart Davis argues for the underlying moraic nature of geminates in ‘The controversy over geminates and syllable weight’. He concludes that geminates are always underlyingly moraic, while their surface nonmoraic behaviour might be due to either their extraprosodicity or the language-specific role of some high-ranked constraints.

Haruo Kubozono proposes ‘the syllable as a unit of prosodic organization in Japanese’ (99), a language traditionally analysed as moraic. His support for trochaic feet in Japanese (either HL or HH) comes to a large extent from the so-called external evidence, i.e. loanword truncation, a secret language (‘zuzya-go’, the secret language of jazz musicians), motherese and emphatic memetics. This is a very welcome contrast to the OT authors who adhere, in the traditional manner, to the so-called internal evidence. Kubozono argues convincingly that the prosodic asymmetries observed in Japanese, in both extragrammatical and grammatical phonological behaviour (e.g. in word formation processes), cannot be explained without recourse to the syllable, and especially to the distinction between heavy and light syllables.

From Draga Zec’s chapter, ‘Prosodic weight’, we learn that prosodic constituents (moras, syllables, feet, prosodic words) have their own minimal sonority thresholds, whereas sonority itself is a family of constraints that govern the relations among the constituents. In particular, it is not only moras and syllables, but also higher prosodic constituents – the foot and the prosodic word – that impose their own minimal sonority thresholds. This means that the extrasyllabic portion of a higher constituent may influence weight distinctions based on the sonority of the nucleus. For instance, in English, there are two types of syllable nuclei: a vowel or *r* nuclei, and an *l* or nasal nuclei, whose distribution is very restricted. The latter are light nuclei, restricted by the sonority threshold imposed by the foot. A further consequence is that prosodic heads differ from non-heads by their phonotactics.

Part Three examines the edges of words vs. the edges of syllables. It is traditionally assumed that word structure is more liberal than syllable structure in what can appear at their beginnings and ends. The chapters in this Part support a view of a weak interpretation of the so-called Strict Layer Hypothesis. That is to say that a ‘spare’ constituent may be attached to a non-immediate prosodic ‘layer’, e.g. a mora may be attached to a foot rather than to a syllable. In OT this means that the constraints of NONRECURSIVITY and EXHAUSTIVITY are violable.

Paul Kiparsky speaks of such unaffiliated moras in his chapter ‘Syllables and moras in Arabic’. These are onsetless semisyllables attached directly to the prosodic word. They may persist into the output if a language/dialect allows clusters. In the paper three dialect groups of Arabic vernaculars are considered. They differ precisely by their treatment of semisyllables. The author argues for a serial organisation of phonology and morphology, in a Lexical Phonology fashion as opposed to the parallel organisation of OT.

Young-mee Yu Cho and Tracy Holloway King also use semisyllables in their analysis of Georgian, Polish and Bella Coola, in the chapter ‘Semisyllables and universal syllabification’. They define semisyllables as nonmoraic. The paper starts with an observation that the Universality and the Exhaustivity hypotheses about syllables may not hold for all languages, and especially not for languages which are rich in consonant clusters. The authors point to problems with strictly syllable-based solutions in such languages. Their solution relies on semisyllables. Since a semisyllable contains no mora, it has no nucleus, no coda, no suprasegmental features (stress, accent or tone), it is prosodically invisible and can appear only at the edge of a morpheme (in other words, the distribution of semisyllables is dictated by morphology). Importantly, Sonority Sequencing Generalisation (SSP) applies to clusters containing semisyllables: they are thus always rising onset clusters. The authors perform a successful semisyllabic analysis of the complex clusters of Georgian, Polish and Bella Coola, in all cases allowing one semisyllable per morpheme edge. Still, language-specifically,

additional assumptions about the moraicity of segments need to be made (e.g. in Bella Coola already fricatives can be moraic) in order to complete the analysis. Some languages do not allow semisyllables at all, e.g. Korean, which results in e.g. loanword repair by epenthesis. One thing is certain: no matter the (OT) disguise, the idea of semisyllables is far from new, and the analysis in the paper owes much more to the original *Nebensilben* by Sievers (1881) than is actually admitted. Crucially, even if there were no counterexamples to SSP-governed semisyllables, what remains to be explained is why they combine with syllables in the way that they do. For instance, why should *s* combine with stops so readily? Since semisyllables are claimed on morpheme peripheries, are we dealing with morpheme structure conditions rather than strictly phonological conditions?

In ‘Onsets and nonmoraic syllables in German’ Féry discusses the behaviour of German onsets and observes that while higher prosodic constituents (prosodic words and feet) require an onset, lower prosodic constituents tend to get rid of it. [g] after [ŋ], [h] and [ʔ] are all onsets of some syllable. They are realised when they are onsets of some higher prosodic constituent (i.e. prosodic word, foot, moraic syllable), but not when they are onsets of nonmoraic syllables (i.e. schwa syllables, e.g. in *Ehe*, *Lampe*, *loben*, and semisyllables, e.g. in *Lob*, *Helm*, *fünf*). This helps reanalyze superheavy final syllables in German, which in turn allows including words containing them into the unmarked trochaic pattern.

Antony Dubach Green discusses onset clusters in ‘Extrasyllabic consonants and onset well-formedness’ and also claims (cf. Féry above) that the higher the prosodic constituent the more onset clusters are allowed. The evidence presented in this chapter comes from Icelandic, Attic Greek and Munster Irish. The author argues that differences in the tolerance towards marked clusters is accounted for by a universal and intrinsically ranked set of Onset Well-Formedness constraints against specific clusters at the left edge of particular prosodic constituents.

Similar arguments with reference to the right edge are found in the next paper, entitled ‘Beyond codas: word and phrase-final alignment’, in which Caroline R. Wiltshire proposes that final unsyllabified consonants do not contribute weight to the syllable. She emphasises the difference between syllable edges and the edges of higher prosodic constituents, and proposes a unified alignment-based account of how edges may either be stricter or more lenient in demands on structure. Alignment constraints reflect what within derivational framework is referred to as sensitivity of rules to prosodic boundaries. This is illustrated in the paper with languages aligning edges to consonants or vowels, e.g. in Leti a phrase-final metathesis guarantees that phrases end in vowels, in Yapese words end in a consonant (by the loss of the word-final underlying vowel), while in Pitjantjatjara there is an opposite requirement – words need to end in a vowel.

In the first chapter of Part Four, ‘On the sources of opacity in OT: coda processes in German’, Junko Ito and Armin Mester use local conjunction of constraints ([M&F] conjunction), as suggested by Łubowicz (1998), to distinguish formally between basic and derived inputs. For example, in Northern German, a final voiceless velar stop is spirantised only if it is derived (e.g. in *wenig*) and not when it is basic (e.g. in *Derrick*). Or, cluster simplification (e.g. in *Ding*) bleeds devoicing of the final velar (which, however, is not the case in colloquial German (cf. the pronunciation [dɪŋk]). In derivational frameworks, cases like these are accounted for by means of rule ordering (counter-feeding, bleeding).

The authors conclude that opacity belongs to phonology and cannot be dealt with either solely by morphophonemics or by an all-embracing phonological mechanism. As in traditional derivational phonology (not specifically Lexical Phonology, though), they support a serial relationship between word phonology and phrase phonology, by means of which some opacity can be explained. Interestingly, OT parallelism ITSELF is found to be a source of opacity.

Marc van Oostendorp, in ‘Ambisyllabicity and fricative voicing in West Germanic dialects’, argues basically for underlying fricative geminates (or long, and therefore, ambisyllabic consonants) as opposed to the short ones. The former are predictably voiceless, the latter voiced. Geminates are viewed as bisegmental units and not as moraic consonants. The direct implication of this argument is that at least some syllabic information is underlying,

which is controversial for the OT framework, especially in view of the so-called Richness of the Base Hypothesis, according to which inputs cannot be restricted in any way. It remains puzzling how it is to be decided within OT how much and which type of information should be underlying and in what form.

Ruben van de Vijver's chapter, entitled 'The CiV-generalisation in Dutch: what *Petunia*, *Mafia*, and *Soviet* tell us about Dutch syllable structure', supports, among others, the notion of ambisyllabicity, as was the case in the preceding chapter. The author discusses two theories of vowel representation in Germanic languages, i.e. the one relying on the difference in length and the one relying on the difference in quality (tenseness), and speaks for the latter. The whole discussion revolves around the vowel preceding the CiV-context in Dutch. The vowel tends to be tense; the cases in which it is lax are explained either by the ambisyllabicity of the C (cf. Sievers's Law, which states that surface realisation of [i] vs. [j] depends on their syllabic position, e.g. *soviet* vs. *mafia*, Sievers 1878) or by a lexical specification of the vowel as lax. Tense vowels are unmarked and therefore tend to occur more often. Thus, the OT solution proposed here appeals to markedness. It seems unclear, though, why the author speaks about the superiority of surface constraints (obvious in OT) while at the same time assuming some underlying/lexical information to be necessary for his account.

In the last chapter of Part Four, 'The relative harmony of /s+stop/ onsets: obstruent clusters and the Sonority Sequencing Principle', Frida Morelli approaches the *enfant terrible* of phonotactics and deals with it superbly. She proposes a system of markedness constraints relevant to obstruent clusters only and independent of the Sonority Sequencing Principle. She evaluates /s+stop/ onsets as the most harmonic obstruent clusters (cf. 365). She proposes that it is fricative+stop rather than stop+fricative clusters that are unmarked among obstruent clusters. This proposal stems from the observation that, out of 15 possible co-occurrence combinations of a stop (S) with a fricative (F) (i.e. FS, SF, SS and FF), only six combinations actually occur in languages. A scrutiny of those shows that FS is present in all, and, most importantly, it is THE ONLY ONE THAT CAN OCCUR ALONE, and thus, others always imply its presence! Additionally, there is a systematic place restriction on the fricative, i.e. it is /s/ in most cases. Morelli rightly concludes that sonority cannot be relevant to these clusters. What is relevant are the features of manner and place, for which respective markedness constraints are proposed. Her proposal is universally attractive since it (a) derives from the scrutiny of facts and (b) remains basically theory-independent.

Part Five contains Juliette Blevins's chapter, 'The independent nature of phonotactic constraints: an alternative to syllable-based approaches'. This is the most original contribution to the volume, since it simply denies the role of the syllable in establishing language phonotactics. Blevins accepts the existence of the syllable but sees phonotactics as independent of it. Phonotactic constraints are string-dependent and not syllable-dependent. Such syllable-independent phonotactics is easily adaptable to various phonological frameworks. Unmarked constraints directly reflect phonetic origins, they have the widest distribution in the languages of the world, and they incorporate implicational universals. The final statement in the chapter is worth quoting, since it is revolutionary with reference to the assumptions of OT (it undermines the necessity of constraint ranking) and, at the same time, it is conciliatory with reference to other theories of universal preferences, e.g. to natural linguistics (Donegan & Stampe 1979; Stampe 1979; Dressler 1985, 1996; Dziubalska-Kořaczyk 2002a, b):

The real challenge, then, is not to describe common and rare cross-linguistic phonotactics solely as the output of a ranked set of markedness and faithfulness constraints but to DISCOVER PRINCIPLES [emphasis mine, KDK] underlying these phonotactics, their roles within individual grammars, and any consistent or recurrent relationships that exist between phonotactics and syllable structure. (396)

The overall impression that the volume *The Syllable in Optimality Theory* gives is that, perhaps paradoxically, the syllable does not, or needs not, play a pivotal role. Syllabic constituents, other prosodic units, or intersegmental relationships in a string may have more

explanatory power. The various types of dilemmas that a phonologist faces when dealing with the syllable are aptly illustrated in the book not only by its chapters, but also in the drawings, whose author – Regine Eckardt – should be complimented for.

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HUHE HARNUD, *A Basic Study of Mongolian Prosody*. Helsinki: Publications of the Department of Phonetics, University of Helsinki (Series A, 45), 2003. Pp. 140. ISBN: 952-10-1347-8.
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The goal of this book is to present a study of the prosody of Inner Mongolian, of which the author is a native speaker. This book is primarily written for an audience of phoneticians, as well as Mongolian scholars, although the material is presented in a fashion that is clear and accessible enough for students of phonetics and phonology to engage in. This review will first present the content of the book, which will be followed by a critical evaluation.

This study centers around a long-standing problem in Mongolian phonology, namely, where word-stress is located. Mongolian has typically been described as a language with non-contrastive stress (i.e. that stress is predictable and does not form contrasts within the language). As the author notes, most descriptions of the language traditionally characterize word-stress as being on the word-initial syllable.

The first part of the study is based on a database of Mongolian spoken utterances. One male speaker of Mongolian served as the primary subject, while data from a second male speaker and a female speaker were used to confirm generalizations. The various acoustic measurements that comprise the database include measures of F0, intensity, and duration for mono-, di-, and trisyllabic words. The author's findings regarding F0 were that there are two distinct patterns found in both disyllabic and trisyllabic forms: for disyllables, an L(ow)–H(igh) pattern occurs in S(hort)–S(hort) and S(hort)–L(ong) forms, while an H–L pattern occurs in L–L and L–S forms. For trisyllables, there is an L–H–L pattern as well as an L–L–H

one, which only occurs in the S–S–S and S–S–L forms. In terms of intensity, the author found that ‘If a disyllabic word is of the S–S and S–L types, the second syllable is stronger than the first, while the first syllable is stronger if a disyllabic word is of the L–L or L–S type’ (39). Intensity patterns in trisyllabic forms tended to correlate with vowel quantity, such that higher values for intensity would fall on either (i) the initial syllable if all syllables were short vowels, or (ii) the leftmost long syllable. The contribution of duration plays a diminished role in word-stress, in part due to the vowel length contrast that is present in the language.

The second part of the study is based on a perception test. Given the variability of the different acoustic measurements in bisyllabic and trisyllabic words, this is an extremely wise move by the author. Performing a perceptual experiment enables the author to stand the acoustic data against perceptual data and native speaker intuitions, and allows the author to start to tease the various cues apart from each other. Three groups were involved: a group of native Mongolian speakers who had received some training in linguistics, a group of native Mongolian speakers naïve in linguistics, and a group of native Chinese speakers. Results from this study indicate that words beginning with a short syllable will have the second syllable stressed, while words beginning with a long syllable will have the initial syllable stressed.

Expanding on the first two studies, the author then investigates the intonational structures of the language. Declarative, interrogative, imperative, and exclamatory types of sentences were observed. While the first two studies were framed in a much more defined context, this excursus into intonation seems to be a much more descriptive and investigative endeavor.

The author claims that intensity is the most consistent correlate of word-stress, and that stress typically falls on the first syllable if it is long; if the first syllable is short, then stress falls on the second syllable. Finally, the conclusion offers a brief discussion of vowel centralization and how this effect has the potential of causing the misperception of initial stress.

There are some basic problems with presentation in the book which make it difficult for the reader to properly interpret the data. For instance, the range of values presented in the figures throughout the book is not held uniform across speakers. This makes it hard for the reader to judge how the effects of different variables compare to each other for different speakers. Furthermore, nowhere in the study are any significance values calculated for the differences that are presented. Again, this places too much of the job of interpretation onto the reader.

Many authors consider stress in Mongolian to be on the first syllable, as the author suggests. However, the author only cites a few references, most of which are extremely antiquated. In contrast, more recent treatments of the language consider stress to fall on the first syllable unless there is another heavy syllable present, in which case stress will fall on the leftmost heavy syllable (see, for example, Austin, Hangin & Onon 1963, Poppe 1965, Hayes 1995: 297, and references therein). A fairly exhaustive list of references and generalizations concerning stress in the language can be found in Svantesson et al. (2005: 96f., 223). Although absent from the book, the long list of potential references, and the endless list of theories on stress in the language are actually a credit to the author. Once one gets a picture of just how much disagreement there is regarding word-stress in Mongolian, one can further appreciate this type of study.

There is some mention at the beginning of the book that there may be a tonal accent in addition to the patterns of word-stress. This, however, isn’t discussed at any other point in the text. Given the interesting patterns of F0 that are found throughout the study, the possibility of a tonal accent in the language would be worth consideration. For instance, the word-final rise in F0 that is found throughout the study may correlate with Poppe’s (1965: 180) observation that ‘The musical tone is on the last syllable in di- and trisyllabic words’. One can hope that the author embarks on a follow-up study that deals uniquely with this topic.

Despite the minimal technical problems and sparse references, the author should definitely be applauded for taking on such deep and long-standing problems and applying a systematic approach to them. The book has great practical value, as it provides a basic model and procedure for other linguists to follow. In terms of readability, the material is presented in an extremely accessible manner, and the argumentation is logical and easy to follow. Furthermore, the appendices at the end of the book are thorough and helpful to the reader. In sum, it can

be stated that several factors have contributed to the achievements of this book: an author with native speaker intuitions about the language, the important use of perceptual data, and the sheer numbers that are involved in the acoustic database have all made for a substantial and valuable study of Mongolian phonetics. This study is also an essential contribution to the broader cross-linguistic study of the phonetic correlates of stress.

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NIGEL HEWLETT & JANET MACKENZIE BECK, *An Introduction to the Science of Phonetics*. Mahwah, NJ: Lawrence Erlbaum Associates, 2006. Pp. ix + 351. ISBN: 0-8058-3868-6.
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As the title suggests, Hewlett and Mackenzie Beck's *An Introduction to the Sciences of Phonetics* is a comprehensive introduction to acoustic, auditory, and articulatory phonetics. Its clarity and explicitness make it an ideal textbook for an introductory course in phonetics, and an excellent reference for those wanting basic information on various aspects of phonetics without being overwhelmed with technical details. In the following paragraphs, an overview of the book is presented, followed by a critical review.

The book is divided into four sections: Basic Principles, Acoustic Phonetics, Auditory Phonetics, and Speech Production. These sections are further divided into a total of 19 chapters. Within each chapter, 'practice' boxes are interleaved with the main body of the text, which allow readers to explore for themselves the material at hand. In addition, many of the chapters end with a set of exercises. The standard and extended sets of IPA symbols are provided in appendices A and B, respectively. Appendix C provides the answers to the exercises. The book ends with a glossary, a list of references for further reading, and an index (by author and by subject).

Part I, 'Basic principles', lays out the principles of phonetic analysis and transcription. It begins with a brief introduction to the discipline and its uses (chapter 1), and to the basic principles of phonetic analysis and transcription (chapter 2). Chapter 3 presents the vocal apparatus, from the lips to the respiratory system, including the nasal cavity. Chapter 4 focuses on consonant description, including airstream mechanism (glottalic only), phonation (modal only), and place and manner of articulation. Phonetic labeling conventions for describing the consonants of English are provided, as are the appropriate IPA symbols. Chapter 5 focuses on vowel description, beginning with a discussion of how to define vowels – phonetically and phonologically. The description of vowel articulation focuses on tongue and lip position. Vowel charts are introduced, and vowel transcription with IPA symbols and diacritics is discussed. Chapters 6 and 7 build on the preceding chapters: chapter 6 introduces additional

places of articulation, manners of articulation, and airstream mechanisms. Chapter 7 ends Part I with further discussion of secondary articulations (focusing on plosives), timing among multiple articulations, and long-term articulatory settings.

Part II, 'Acoustic phonetics', delves into the instrumental acoustic analysis of speech sounds. As a starting point, chapter 8 introduces the waveform as a visual representation of speech sounds, illustrating different types of waveform (periodic, random, quiescent and transient). This chapter also describes speech properties that are visible on the waveform, focusing primarily on durational differences between speech sounds. Chapter 9 focuses on fundamental frequency: how it can be measured from the waveform, what ranges are typical of the human voice, and how it can be used linguistically. Chapter 10 is similar to chapter 9, but deals with sound amplitude: how it is measured, what the typical range is for the human voice, and how speech sounds differ in intrinsic loudness. Chapter 11 builds on previous chapters with a discussion of the spectra associated with speech sounds, focusing primarily on vowels. The chapter begins with an introduction to simple and complex waves and goes on to describe spectra associated with the cardinal vowels [i u a], including different ways of obtaining spectra instrumentally. The spectra of vowels in different dialects of English are then described, and the chapter ends with a brief description of consonantal spectra. Chapter 12 introduces spectrograms. Examples are provided for vowels, liquids and glides, nasals, fricatives, and stops.

Part III, 'Auditory phonetics', deals with the ways in which we hear and perceive speech sounds. The hearing mechanism, including a detailed anatomical description of the ear, is described in chapter 13. Chapter 14 focuses on loudness: the hearing threshold across frequencies, and the range of magnitudes that can be comfortably heard. This chapter also compares conductive and sensorineural hearing loss. Chapter 15 delves into our perception of pitch and sound quality. The detection of pitch is discussed, and various scales for representing pitch are presented. The perception of quality is related to how component frequencies are perceived. Masking and the theory of auditory filters is then presented. The chapter ends with a brief discussion of hearing impairment involving the loss of frequency resolution. Chapter 16 provides an introduction to speech perception, focusing on the acoustic cues that we use and on categorical perception.

Part IV, 'Speech production', focuses on articulatory (and aero-dynamic) properties of speech. Chapter 17 introduces the source-filter model of speech, focusing particularly on vowel production. Tube models of the vocal tract are provided for [ə a i]; the formulae for calculating the resonating frequencies of these tubes are presented and applied, and the resulting frequencies are compared with observed formants of the three vowels. The chapter ends with a brief discussion of how the source-filter model applies to other speech sounds. Chapter 18 expands on the previous discussion of phonation (in chapter 4), including a discussion of the anatomy of the larynx. Techniques for analyzing and measuring phonation are presented, and illustrated by considering various phonation types: modal, falsetto, creak, whisper, harshness, and breathiness. The chapter ends with a brief outline of the sources of variation in phonation, focusing on organic (physical) vs. phonetic factors. Finally, chapter 19 focuses on the supra-laryngeal components of speech production, and includes a description of the different instrumental tools available for exploring supra-segmental articulation (e.g. ultrasound). The chapter ends with a discussion of the dynamic nature of speech, focusing on co-articulation.

An Introduction to the Science of Phonetics is an excellent introduction to the phonetic sciences, both because of the material covered and because of the way in which it is presented. In terms of content, its main innovation is the range of areas it covers, including many from the realm of clinical linguistics that are not often included in introductory phonetics books (e.g. the use of phonetograms).

Hewlett and Mackenzie Beck (H&MB) do very well at making difficult concepts seem simple. For example, their presentation of sound waves (simple and complex) and sound wave propagation (chapter 8) is extremely clear and easy to follow. When difficult issues do arise, H&MB acknowledge them as such, validating students' difficulties in these areas (e.g. the transcription of reduced vowels, presented in chapter 5).

Also consistently, the authors provide context for the material discussed, making even difficult concepts accessible to the reader. For example, chapters on the anatomy of the ear (chapter 13) and our auditory response to loudness and frequency (chapters 14 and 15) are made more concrete by a discussion of various types of hearing impairment. This discussion not only makes the material more accessible but is also useful for beginning phonetics students, many of whom are headed towards audiology and speech pathology.

Finally, H&MB are very explicit about any assumptions, theoretical approaches, and simplifications they make for expository purposes, referring the reader to additional sources where appropriate. This openness on the authors' behalf is much appreciated by the more advanced reader.

The layout of the textbook is well designed and easy to follow. Hewlett and Mackenzie Beck slowly ease the reader into the complexities of speech production and perception, starting with basic sound description and transcription – topics which are the most transparent and accessible to readers. Chapters are kept short and focused, providing very manageable chunks of material to process. The only drawback of this approach is that the reader must sometimes skip back and forth between chapters to gain a full understanding of a particular topic. For example, the spectra of different speech sounds are introduced in chapter 11 (Part II, on Acoustic Phonetics). However, to understand WHY spectra differ from one sound to another, the reader must wait until chapter 17 (Part IV, on Speech Production).

Most of the figures in the book are extremely clear and well-labeled, contributing much to the overall clarity of discussion. One or two figures illustrating human anatomy are difficult to follow: in the description of the ear, labeling differs between figures 13.6 and 13.7, such that it is not obvious how the two figures relate to one another. In the description of the larynx, some of the labels used in the prose do not seem to appear in the figures (e.g. 'ventricular folds' is mentioned on page 260 but not clearly labeled in figure 18.4). Figure 18.8 is not mentioned in the text (though it clearly belongs with the prose at the top of page 263).

The practice boxes are well-designed to encourage active learning on the part of the reader, again keeping the content of the chapters accessible. Many of the exercises, particularly in the later chapters, focus on reading graphs accurately, a skill that is important in all areas of phonetic analysis. Through cross-referencing across chapters, continuity is maintained throughout the book. For example, some of the exercises refer back to content covered in previous chapters, encouraging readers to see the links between various topics covered throughout the book. In general, the exercises are helpful for testing understanding, and provide useful models for homework and/or test questions for instructors.

In keeping with the introductory nature of the book, H&MB do not go into some of the more complex details of instrumental speech analysis. For example in chapter 11, a vowel chart plotting – in Hertz – F1 (y-axis) against F2 (x-axis) is used; there is no mention of other common vowel-plotting techniques, e.g. using the Bark scale or using F2–F1 on the x-axis. In chapter 12 on spectrograms, no discussion of bandwidth is provided, and no reference is made to narrow-band spectrograms at all. In chapter 18, spectral tilt is briefly mentioned as a cue to phonation but its connection to articulation is not discussed in detail, nor are measurement techniques provided. Also in chapter 18, no mention is made of the fact that creakiness is sometimes associated with irregularity in vocal fold vibration, obscuring the difference between harshness and creakiness (at least in a visual display).

Another area which would benefit from greater depth is speech perception: chapter 16 is quite short; it focuses on the most well-studied acoustic cues to speech sounds and limits its discussion to categorical perception of these cues. Very little literature is reviewed, no comparison is made between different hearing populations (e.g. first vs. second language acquisition), and no discussion is provided of existing models and theories of speech perception (e.g. Dispersion Theory, the Perceptual Magnet Effect).

On a more specific level, certain sounds of the world's languages are omitted or misrepresented. In chapter 6, for example, no mention is made of epiglottal stop, which has been found to exist in Wakashan and other languages (Esling, Fraser & Harris 2005). On page 81, the authors

note that some North American languages have clicks; as far as I know this is not the case (no examples are provided). In chapter 7, it seems to be assumed that in affricated plosives, the place of articulation of the release is the same as that for the plosive, but this is not always the case, e.g. Navajo [tʰ]. In chapter 18, not much mention is made of the linguistic function of phonation (e.g. harshness or creakiness used phonemically); the focus is on sociolinguistic uses of phonation. Thus, there is no mention of, for example, phonemic laryngealization.

Although simplification of the subject matter is generally very effective, there are two cases in which it is perhaps a bit misleading. The first of these involves the larynx. Throughout the book (chapters 4, 18, and 19 particularly), the traditional model of the vocal tract is assumed, consisting of the larynx – responsible for phonation – and ‘everything above’ – responsible for articulation, i.e. place and manner of articulation. In addition, in the description of the larynx (chapter 18), only vocal fold activity is discussed in any detail. As illustrated for example in figure 18.16, all phonation types are assumed to result from vocal fold activity. While the traditional model assumed by H&MB is still very much accepted in the field and often referred to in teaching, recent laryngoscopic research has shown that, because of its simplicity, this model is unable to account for the range of observed laryngeal articulations. First, laryngeal sphinctering above the glottis is a crucial component of many non-modal phonation types – i.e. the vocal folds alone are not responsible for the range of attested phonation types (Esling & Harris, 2005). Second, laryngeal constriction can contribute to the articulation (place and manner) of individual segments, as well as to phonation (Catford & Esling, 2006). Therefore, the distinction between the larynx and the vocal tract above the larynx is much more blurred than is assumed by the traditional model, both in terms of contribution to phonation and to place and manner distinctions. Hewlett and Mackenzie Beck’s presentation of the larynx and phonation would have benefited from a discussion of the simplifications involved in the traditional model they assume and of the recent empirical evidence that has led some researchers to move away from this model.

The second topic is vowel production. In the description of vowels (chapters 5 and 19), it is assumed that the tongue is the primary active articulator responsible for vowel quality (height and backness). Again, recent articulatory research has shown that vowel production involves more than simply the tongue. For example vowel height, at least at the front of the mouth, can be achieved – and often is – through vertical movement of the jaw without any active movement of the tongue. Furthermore, laryngoscopic research suggests that vowel backness is not a result of tongue root retraction per se, but rather laryngeal sphinctering, which triggers (passive) tongue root retraction. As in the case of the larynx and phonation (see above), the presentation of vowel production would have benefited from a discussion of the shortcomings of the traditional model which, in its simplicity, does not reflect the observed articulatory facts in their entirety.

All in all, any shortcomings of Hewlett and Mackenzie Beck’s *An Introduction to the Science of Phonetics* are eclipsed by its overall clarity and conciseness. It is an excellent textbook for teaching and learning the basics of acoustic, auditory, and articulatory phonetics: it is well designed, easy to read, and innovating in its content. As a first introduction to the discipline, H&MB’s book would be difficult to improve upon.

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DAVID ODDEN, *Introducing Phonology*. Cambridge: Cambridge University Press, 2005. Pp. xiv + 348. ISBN 0 52153404 6 (hb), ISBN 0 52153404 6 (pb).
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The intention of this book is, as the title announces, to introduce phonological analysis to students with no previous knowledge of phonology nor of the concepts it deals with. It may seem just another book like others that are currently in the market (Durand 1990, Kenstowiz 1994, etc.) but this book bases all the process of learning on practical analysis and contains a suitable collection of tasks at the end of each chapter. Chapter 7 (169–223) is outstanding in this sense, as it deals exclusively with the phonological analysis of some features. It presents a collection of data and a long section of activities of varying difficulty.

A new feature in this Cambridge series is the preview which outlines, using a set of key terms, those concepts and aims which the writer is going to introduce. This approach makes this book not just a resource material for class, but also a guide and an invaluable help to the teacher and the student. Moreover, the remarks written in the margins of the text are well-chosen and pertinent.

In contrast with the theoretical explanations other works have chosen, Odden prefers to focus on what data tell us from a brief but approachable explanation of the elementary theoretical principles. His examples lead to the exposition of more complex matters, leading the student gently towards an understanding of theoretical issues.

This said, there are two factors that potentially create obstacles to the achievement of the aim of this book: (i) each theoretical point is illustrated by too many specific cases, so the student can feel overloaded, and (ii) it might be an advantage to start with languages known by the student, and even with English, because being introduced to brand new principles through an unknown language can be daunting. We must emphasise that this book uses the American Phonetic Alphabet (APA) and, although in appendix 1 of chapter 2 we are presented with its correspondence with the IPA, it may be annoying for teachers who are not familiar with the APA.

Phonological analysis of a single language could have been a starting point for the analysis of other languages, as is done by Roca & Johnson (1999), in which English data which are easily accessible for the reader serve as a base for the analysis of other languages. However, we readily admit that the use of many different languages helps one to better understand chapter 8, entitled ‘Phonological typology and naturalness’. Odden shows here his great knowledge not only of many of the African languages but also the European and American ones, using the data neatly and pointing out those cases in which there has been a reduction of data for practical reasons.

Introducing Phonology contains 10 chapters that we can organise around three questions captured by Goldsmith (1995: 1):

1. What constitutes a phonological word in a given language?
2. What is the nature of alternations?
3. What phonetic differences are contrastive in a given language?

In chapter 1 Odden discusses the definition of phonology as a discipline focused on the structure of sound as a cognitive, abstract system. He distinguishes it from phonetics – the realisation of sounds – while admitting that the boundaries between the two are not always clear. He briefly describes the acoustic and articulatory characteristics of sound and

the techniques used to analyze them. Next, he defines the cognitive representation of speech, which he contrasts with the orthographic representation and phonology as ‘the study of higher-level patterns of language sound, conceived in terms of discrete mental symbols’ (15) and ‘the goal [of phonology] is to understand the linguistic rules which operate on sounds mentally represented as symbols’ (16). He does not deal deeply with the concept ‘abstract cognitive system’ (cf. Zee & Nikanne 2000).

Chapter 2 is devoted to transcription, including that of secondary articulation and double articulation, manner of articulation, laryngeal properties, syllabicity and symmetry in consonants. When talking about consonants with double articulation he introduces only the stops and clicks. He does not make any reference to the double fricative articulations (Laver 1994: 316–318).

In chapter 3 he introduces essential elements for the structural analysis of sequences. From the practical analysis of English, he first demonstrates the allophonic relationship and complementary distribution, and then presents the minimal pair, contrastivity, etc. He does not use any familiar terms such as PARALLEL DISTRIBUTION or DISTRIBUTIONALLY EQUIVALENT (Lyons 1968:70). Finally, in the practical analysis of the allophonic variation of other languages, he prepares the ground for the notion ‘generative rule’ as well as explaining the concepts of ‘assimilation’ and ‘vocoid’.

The introduction of the concepts of classical generative theory continues in chapter 4, in which Odden analyses underlying and surface representations, the concept of neutralisation and the validity of using the morphological analysis for the discovery of underlying representations. The student will almost certainly appreciate both the examples in this chapter and the exercises in section 4.4.

Finally, in chapters 5 and 6, the author introduces the processes of rule formation for phonological derivations, the breaking down of problems and interacting processes like palatalisation, glide formation, assimilation, hardening, and others, as well as the importance of rule ordering. Chapter 6 focuses on feature theory and how segment classes are defined, establishing the definition of major class features as well as those derived from the place and manner of articulation, the laryngeal features and prosodic features. He shows how phonemes are represented and rules written using distinctive features and discusses the principles of simplicity in rule writing and the formalizability. Although he mentions, quoting Jakobson, Fant & Halle (1952), that some features can be related to acoustic and perceptual characteristics of sounds (136) he makes no further reference to this, not even to the relationship between the height of formants and articulatory characteristics such as height, backness or roundness of vowels.

Once the basic notions of classical generative analysis are in place, Odden starts the analysis of some phonological aspects of different languages (chapter 7). Following this approach, the student will be able to observe the analysis step by step. Using a broad-ranging collection of data, Odden familiarises the student with the generation of hypotheses, the application of rules and decision taking. Then, through detailed analysis of morphology, he establishes underlying representation and detects and explains phonological alternations, all the while formulating analyses and rule hypotheses. There are more activities at the end of this chapter than anywhere else in the book, and they present a challenge to the newly-acquired skills of the student, who experiences a thorough revision through doing these exercises.

Chapters 8 and 9 present very briefly and in little depth, because of the difficulty, phonological typology, naturalness and abstractness. From the concept of ‘typology’ and ‘universal’, the author shows the method of inventory comparison as well as the problems derived from its use: procuring a good-sized random sample, judging the phonetic values of segments in a language they do not know, and the validity of statistics. He presents the student with some of the typologically most usual processes, classifying them into segmental processes (such as assimilations and dissimilations) and prosodically-based processes (such as epenthesis, cluster reduction, and stress lengthening.) Through these means, he encourages the development of the concepts of Impossible Rule and Unlike Rule.

A chapter about abstractness and its limits could not be left out of a book on generative phonology. Odden uses Kiparsky's (1968) distinction between absolute and contextual neutralisation to explain this problem, taking into account the language acquisition processes and points out that 'underlying representations require motivation: they must be acquired by children learning the language' (297).

Chapter 10 briefly introduces autosegmental theory and shows how it solves some of the problems posed in the classical theory. It presents the concept of floating segment, delinking, and feature-geometric mechanisms.

To conclude on a note of puzzlement, it is striking that this book contains so little about the analysis of suprasegmental features: stress, syllable, tone and intonation, especially taking into account the importance that they have acquired since the 1980s. I am especially surprised that the author does not treat as basic the concept of SYLLABLE, considered by many linguists as a core element in modern phonology.

To sum up, I would say that, although some aspects of the field have been more or less ignored, it is evident that this introduction to phonology by David Odden will be of great help for the students beginning their studies in generative phonological analysis. The bibliography at the end of each chapter as well as the one at the end of the book are very useful for those who wish to study some aspects in greater depth. This book contains all the key concepts for performing a segmental phonological analysis and has a high pedagogical value because it bases the acquisition of the key concepts on practical exercises.

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MONIKA STRIDFELDT, *La perception du français oral par des apprenants suédois* (Skrifter från moderna språk nr 19, Umeå universitet). Umeå: University of Umeå, 2005. Pp. 239. ISSN: 1650-304X, ISBN: 91-7305-875-0.
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Monika Stridfeldt's dissertation from the northern Swedish university of Umeå deals with auditory aspects of a spoken text, liaison and schwa in French. In addition to perception tests, there are some acoustic measurements. The testees are Swedish learners and native speakers of French.

Chapter 1 is an introduction which gives a good summary of the content.

Chapter 2 deals with how speakers perceive the sounds of a foreign language.

Chapter 3 presents features of Swedish and French pronunciation. On page 42, the five Swedish retroflex consonants are said to be allophones of non-retroflex consonants when they appear after /r/. However, when the retroflex is used by speakers in central and northern Sweden, there is no [r]. For instance, the retroflex [d] in a word such as *hård* ‘hard’ is a realisation of the sequence /rd/. Such a solution is particularly suitable for the genitive of words ending in /r/. A word such as *mor* [mu:r] ‘mother’ is in the genitive *mors* [mu:ʂ] ‘mother’s’. Phonemically, the first form ends in /r/ and the second ends in /rs/.

I am pleased to read (on page 60) that in my *Fransk fonetik* (Hammarström 1960), I say that a Swede should not use stresses so strong that a native speaker of French feels them as ‘ett klubbslag i huvudet’. This is translated by Stridfelt as ‘un coup de marteau sur la tête’, which gives me the chance of recognising more than half a century after the fact that in my book I was quoting Pierre Fouché, who in his teaching of French to foreign students in the summer of 1948 corrected offenders using the expression ‘pas de coups de marteau’. Stridfelt says that stress is realised by ‘augmentation de durée, d’intensité ou de hauteur mélodique’ (54). As is common, the terminology is mixed: the third component should be ‘fréquence fondamentale’. As is also common, the spectrum is ignored. Clear vowel quality is a fairly efficient cue for stress in Swedish and English, but less so in French. The word ‘ou’ (‘or’) in the quotation seems unfortunate: stress is not realised by a single component.

Chapter 4 mentions the difficulty Swedes have in pronouncing /z/ and /ʒ/ correctly because they do not exist in Swedish. She has missed my detailed error analysis of this problem (Hammarström 1954). Generally, the chapter deals with previous studies, which is useful.

The four introductory chapters are, on the whole, well-written, but they could have been shortened if the author had followed the principle of only including things that can be used in the main part of a paper or book, in this case, the experiments.

Chapter 5 begins the second part of the dissertation, the author’s experimental studies. The first one concerns Swedish students’ understanding of a short text in which a French author goes to a pub to get ideas for his next novel. We are told that the testees are in their first year of French at university after having studied it at high school for three to six years. We would have liked to know what this means in terms of hours of study. Despite being allowed to listen as many times as they want, the students do not really understand what the text is about. Since, I believe, the teaching of foreign languages is good in Sweden, this disappointing result must be due to the very high number of hours of study needed for the understanding of a fluently spoken foreign language. The errors of the students are dealt with in great detail.

Chapters 6 and 7 deal with the second type of the problem tested, liaison, the absence of schwa, and the syllable in spontaneous spoken French and in test words. The concepts SCHWA and SYLLABLE are problematic (cf. Hammarström 1965, 1998), but they are taken for granted by Stridfelt.

These chapters contain a wealth of results and several differences are tested for statistical significance. Unfortunately, the author’s interpretation of statistics is idiosyncratic. She equates statistical significance at $p < 0.05$ with perceived difference. Her first statistical conclusion is that a certain difference really exists: ‘Notre analyse statistique confirme qu’il existe un effet d’effacement [du schwa]’ (141). This might be an acceptable conclusion, although this kind of statistics concerns probabilities rather than certainties. There is a more serious problem in that she seems to equate NON-SIGNIFICANT with NON-EXISTENT. The author’s poor understanding of significance testing is confirmed when three samples are called three populations.

Chapter 8 studies non-words in pairs such as *un avas* versus *un navas*. She asks whether one can hear a difference between word-initial and word-final consonants (such as in the real sequences *son oeuf* and *son neuf*), the consonants involved being /n, z, r, t/. The results for /z/ and /r/ cannot be interpreted sensibly. For /z/, French native speakers respond ‘liaison’ in both conditions, which can be explained by the fact that liaison with /z/ is frequent, but words beginning with /z/ are infrequent. Neither can /r/ be used for testing this difference because there is another strong cue for perceiving it: vowel quality. In a word such as *dernier*, the

second vowel changes from [e] to [ɛ] when the /r/ is linked to the next syllable. Not until two pages later does the author find this explanation, when discussing acoustic measurements. Thus, /n/ and /t/ remain to provide data for evaluating the differences. Testees again give too many 'liaison' responses, probably because they were aware they were being tested on liaison. Including the response 'Don't know' might have given a better result.

Chapter 9 is a conclusion. The following bibliography is useful. The French is appropriate: the style has been checked by Jérôme Josserand, who has expert knowledge of the problems involved. There is a strange but unimportant error (51) when *tåg-ångare* is translated as 'steam train' ('train à vapeur'). The word means 'train steamer', i.e. a 'steamship carrying trains'. Another minor error is that the French word for a speaker of Swedish is *suécophone*, not *suédophone*, as suggested by Stridfeldt (151 et passim).

In summary, I have found some weaknesses: the syllable and schwa are not discussed whether in general or in French, and significance testing is not properly understood. A great many detailed comments on the data are presented, but there are few conclusions of real interest.

The auditory tests seem to be well carried out and the account of the results allows other researchers to use them in further discussions. One can believe that the dissertation will make a contribution to the interest in an area of phonetics which has been insufficiently investigated.

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The Phonology of Catalan (henceforth *TPC*) by Max W. Wheeler presents an Optimality Theory (OT) account of Catalan phonology. The book has eleven chapters: ten chapters preceded by a short introductory chapter. The second and the third chapters constitute the core chapters in the book, where the vocalic and consonantal systems and the syllabic structure of Catalan are described. Chapters 4–11 describe and analyse the major lexical and postlexical phonological phenomena, including prosodic phenomena (in chapter 9).

The first chapter describes the territorial distribution of Catalan, a Romance language which is spoken in parts of Spain (Catalonia, Valencia and neighbouring territories), the Balearic Islands, Andorra, parts of France, and in Italy. The main dialectal division into Eastern and Western Catalan is also described, a division based on the presence (Eastern Catalan) versus the absence (Western Catalan) of phonemic vowel reduction in unstressed position.

Chapter two describes the consonantal and vocalic systems of Catalan. The consonant system has between 30 and 32 consonants (32 in Majorcan Catalan, including the voiced and unvoiced dorso-palatal palatal stops). The status of affricates /tʃ, ts/ and the issue of rhotic

alternation, that is, the use of a tap or a trill depending on the context, are discussed in this chapter. Catalan vocalic system has between five and eight vowels, depending on dialect. The two most extreme dialects are Balearic Catalan, with eight vowels, and north Catalan, with five vowels. Vowel reduction is analysed with reference to Central Catalan, the variety of the Eastern dialect spoken in and around Barcelona that has seven peripheral vowels in stressed position, /i, e, ε, a, ɔ, o, u/, and five in unstressed position, /i, ε, ə, a, o, u/. This pattern of vowel reduction is similar to that found in Portuguese and Italian, and involves the merging of pairs of mid-vowels of different heights (/e, ε/ > /ə/; /e, a/ > /ə/; /o, u/ > /u/), which in the process lose their height contrast. This and other patterns of neutralization, such as Mascaró's law,¹ are explained on perceptual grounds, invoking principles of dispersion of contrast (Ní Chiosán & Padgett 2001, Padgett 2001) and principles of perceptual dissimilation.

Chapter 3 deals with syllabic structure, especially with phonotactic restrictions on the well-formedness of syllabic onsets, with the syllabification of vocoids (that is, with diphthongs and hiatus), and with post-lexical resyllabification. In Catalan, well-formed syllabic onsets are formed by a consonant or by a high vocoid, that is /j/. Consonant clusters can be formed by any consonant plus a high vocoid, or an obstruent plus a liquid (/pr, br, tr, kr, gr, fr, pl, bl, kl, gl, fl/). Wheeler argues that most of restrictions on onset formation follow from general sonority constraints,² and from specific constraints on sonority distance based on the sonority hierarchy proposed for Catalan.³

Chapter 4 deals with vocalic contact at the phrasal level. This chapter is fundamentally an OT analysis of the data presented in Recasens (1993). The possible resolutions of the contact between word-initial and word-final vowels (that is, if the vowels in contact are identical, the result is elision; if one of them is a high vowel, the outcome is a diphthong) are analysed as the outcome of the competition between constraints that favour syllabic reduction and constraints that penalize it.

Chapter 5 deals with voice neutralization and assimilation in coda position, a phenomenon that has been widely discussed in phonetic and phonological studies. In short, coda obstruents agree in voicing with a following onset consonant, as for instance, in *ètnic* [ɛdnik] 'ethnic'. Similar patterns of voicing assimilation are also observed across words. Voiced sibilant liaison, whereby word-final sibilants are voiced before a vowel, such as in *pots ajudar* [tʒ] '(you) can help', is also discussed here. Wheeler argues that the origin of this process is diachronic lenition, since is also historically documented in Portuguese, in Occitan, and in French, and therefore proposes that the relevant constraints originate in lenition. Other processes involve approximants, which trigger voicing in a following coda stop (*sap riure* [br] 'can (knows how to) laugh') (155).

Chapter 6 deals with place and manner assimilation and neutralization in coda position. The data presented here is mostly based on Recasens (1993). Special attention is given to

¹ 'Mascaró's law' is the morphophonemic process in Catalan whereby half-closed vowels in stems become half-open (/ɛ/ and /ɔ/ are lowered respectively to /e/ and /o/) when followed by another syllable involving an unstressed derivational (that is, not the subjunctive suffix) suffix containing the closed front vowel /i/ (41).

² These constraints follow from the so-called 'sonority hierarchy' (see review in Clements 1990; see also Parker 2002), whereby different segment types, following from the different degrees of oral constriction required in their production, have different inherent levels of sonority, which are reflected acoustically in their duration, amplitude, and pitch.

³ The relevant constraints are: the Sonority Sequence Principle, the Minimum Sonority Distance, and Syllable Contact. The Sonority Sequence Principle establishes that syllabification must be such that sonority increases from the onset to the nucleus and decreases from the nucleus to the end of the syllable. The Sonority Sequence in Catalan is: non-sibilant obstruents, sibilant obstruents, nasals, liquids, and vocoids. The 'Minimum Sonority Distance' ensures that the sonority gradient from the start of an onset is sufficiently steep. This constraint correctly allows onsets such as fr, fl, stop and liquid, and rules out onset of nasal and liquid. Syllable Contact ensures that the final element of a syllable is not less sonorous than the initial element of an immediately preceding syllable.

coronal clusters, to dialectal variation (Majorca Catalan), and to stylistic variation. One of the author's examples of stylistic variation is casual speech, in which stops tend to become nasals before a nasal.

Chapter 7 deals with homorganic cluster simplification, a phonological process whereby C2 in /lt, st, rd, nt/ clusters in word-final position is not pronounced, so *pont* 'bridge' is pronounced [pɔn]. Wheeler argues here that, generally, simplification is almost categorical (some exceptions include: *vint-i-cinc*, *cent anys* and *Sant Antoni*), except if C1 is a lateral. In these cases simplification tends to be lexically conditioned: high frequency words display categorical reduction (*alt*, *molt*, *salt*), while for low frequency words this phenomenon only tends to occur with more casual speaking styles (and the same holds for /st/ clusters).

Chapter 8 deals with vowel epenthesis and also explores voiced stop gemination, that is, the reduplication of voiced stops before [l], as in *doble* [dob.blə] 'double'. The author argues that epenthetic vowels are inserted to repair violations of the sonority sequence principle (whereby sonority increases from onset to nucleus and decreases from nucleus to the end of the syllable). Also, this chapter presents the final version of Catalan sonority hierarchy (glides, tap, laterals and trills, nasals, sibilant continuants, non-strident continuant obstruents, non-sibilant stops/strident continuants), which was first sketched in chapter three.

Chapter 9 deals with stress and rhythm. Catalan has contrastive lexical stress in a number of minimal pairs, mostly involving verbal forms (*mira*, present of 'to look' and *mirà*, past of 'to look'). Every prosodic word has one stress. Although the default location is the rightmost metrically prominent syllable (that is, the basic rhythm is iambic, or 'weak-strong'), words can receive stress on the ultimate, penultimate, or antepenultimate syllable. Primary stress before the antepenultimate syllable is not allowed, although longer words can receive a secondary stress (Oliva 1992). Stress on the antepenultimate syllable is dependent upon the penultimate syllable being light. Compound words retain the stress location of their components, and the main stress falls on the last element. It is proposed that the prosodic hierarchy of Catalan also includes feet and cola. Feet are maximally disyllabic (after Hyde 2001) and iambic, and cola are groups of two feet.

Chapter 10 looks at intervocalic weakening of voiced bilabial, dental, and dorsal obstruents (/b, d, g/ > /β, ð, γ/). Wheeler follows Kirchner (1998) in proposing that lenition is caused by a constraint on the minimizing of articulatory effort⁴ (LAZY), so that 'lenition is favoured by openness of adjacent segments, by rapid speech rate, and by a casual style' (315). Language-specific output differences would arise from different rankings of effort minimizing and faithfulness constraints.

Chapter eleven deals with the syllabification of pronominal clitics. Pronominal clitics are monosyllabic and unstressed function words. Catalan has a complex clitic system, with up to fourteen elements, and has been studied by Bonet & Lloret (2001, 2002).

TPC fully succeeds in presenting a theoretically sound description of the phonological patterns of contemporary Catalan, while being faithful to the body of data under discussion. The book also succeeds in engaging the interest of the target audience, which is to say, the phonologist who may or may not have previous knowledge of Catalan. It certainly presupposes an advanced knowledge of mainstream OT and familiarity with the different strands currently under debate, and although some key works on OT are referenced, a brief introduction would have been appreciated by those who do not have a background in OT.

One of the major strengths of *TPC* is that all throughout the book, perceptual and articulatory considerations guide the search for functional explanation of the different processes involved, and this is equally appealing to those with a background in phonetics and to those with a background in phonology.

⁴ Articulatory effort (or relative articulatory effort) is taken to be a function of mass, velocity, and precision required for articulating a given gesture, and is taken to be universal and quantifiable (see models in Boersma 1998 and Kirchner 1998). However direct quantification of effort has proved difficult.

We can say that, overall, *TPC* implicitly endorses⁵ a phonetically based approach to phonology (Hayes & Steriade 2004), namely, an approach which is driven by the hypothesis that phonological constraints can be rooted in phonetic knowledge. Phonetic knowledge, on the other hand, refers to knowledge about phonological representations as well as phonetic constraints, and is very closely connected to the phonology of the language, since it is by means of this knowledge that ‘phonological strings are transformed into articulations or are recognized into the acoustic signal’ (Kingston & Diehl, 2004: 7). The implications of such an approach for OT are twofold: it both raises functional questions such as ‘Why does a phonological . . . process exist? Why does it occur in certain contexts and not in others? Why does it result in a particular type of input and not in others?’ (321) and also guides the search for the right constraint.

Another strength of *TPC* is that, even though it mostly adheres to a phonetically based approach, this approach is carefully examined on a case-by-case basis. For instance, take the issue of rhotic alternation, which is discussed in chapter 2 (26–31), and which has been the object of long debate in Catalan (and Spanish) phonology.⁶ After a discussion of two competing views, a generativist proposal (Wheeler 1975/9: 191–194; Bonet & Lloret 1998: 83–93) and a phonetically inspired set of constraints (Bradley 2001), *TPC* opts for a combination of both. A similar example is found in chapter 5 (161), where two competing views on voice assimilation/neutralization: ‘licensing-by-cue’ (a phonetically based approach) and ‘licensing-by-prosody’ are described and discussed in relation to direction of voicing assimilation (which is regressive in Catalan). The licensing-by-prosody approach wins.

TPC is, in general, impeccably written and edited, the discussions are easy to follow, and there are very few typographical errors and mistakes. There are, however, some instances where the linear arrangement of information does not facilitate the reading. For instance, the concepts of ‘licensing-by-prosody’ and ‘licensing-by-cue’ are referred to for the first time on chapter 2 (30), but they are not fully explained until chapter 5 (151–158). A pointer to chapter 5 would have been useful.

On a general note, one of the central tenets in the book, the concept of a universal scale of markedness constraints on articulatory effort (such that an obstruent flanked by open vowels requires more effort and speakers might choose to undershoot the target to minimize this effort (Lindblom 1990, Boersma 1998, Kirchner 1998)) raises some questions for the phonetically oriented audience. For one thing, the direct quantification of effort has proved elusive and, for another thing, the concept of articulatory effort cannot account for certain patterns which have been phonologized in a given language but not in closely related languages, such as, for instance, the regressive voicing of sibilants in Catalan, but not Spanish.

On a minor note, there is a questionable assertion in chapter 7 (236). It says that *on* ‘where’, may retain the /t/ before frequently collocated verb forms (*on estava?* ‘where was it/he/she’, but this is arguably a case of epenthetic insertion, rather than of retaining an underlying /t/ (see the analysis of *on* and *quan* ‘when’ in Recasens 1991: 230).

⁵ ‘[OT] drives researchers to address functional questions. . . . Functional answers are typically given in terms of physiological or psychological explanations. Physiological explanations bring in aspects of articulatory phonetics or aerodynamics.’ (312).

⁶ Generative phonology has traditionally treated the tap [r] as a single segment and the trill [r] as a geminate (Wheeler 1975/9: 191–194; Bonet & Lloret 1998: 83–93), with their phonotactic distribution following from this basic difference. Other accounts argue that it obeys to perceptual-articulatory constraints (Bradley 2000, using Spanish data), since ‘cross-linguistically, taps tend to prefer intervocalic position and tend to avoid word edges, in order to maintain voicing and enhance perceptibility’ (Bradley 2001: 8f.; quoted in 30), and for this reason, taps are the unmarked option in intervocalic position. Wheeler follows the phonetically based proposal but this is combined with the generativist insight that the crucial difference between taps and trills is one of duration.

TPC constitutes a very valuable contribution to both Catalan studies and Optimality Theory, since it succeeds in engaging the audience in a theoretically interesting debate while offering a faithful description of the main phonological processes of Catalan.

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