

Review

Sharon Inkelas and Draga Zec (eds.) (1990). *The phonology–syntax connection*. Chicago: Chicago University Press. Pp. xv + 428.

Geert Booij*

Free University, Amsterdam

The internal organisation of phonology and its relation to other modules of grammar are two interrelated foci of present-day phonological research. The relation between phonology and morphology is being discussed in depth, in particular within the theoretical framework of Lexical Phonology (cf. *Phonology Yearbook 2* (1985)). The collection of papers reviewed here is a timely and interesting contribution to the research on the interface between phonology and syntax, and an important sequel to the thematic volume 4 of *Phonology Yearbook* (1987) on ‘Syntactic conditions on phonological rules’, edited by Ellen Kaisse and Arnold Zwicky. Most of the papers were presented at a workshop on this topic at the Center for the Study of Language and Information of Stanford University in May 1988.

It is impossible to discuss all the articles in this volume in detail, given the space allotted to me for this review, the more so because so many different languages are dealt with. Instead, I will try to give the reader some global information about the claims made in this volume with respect to the phonology–syntax interface, and I will relate these claims to the ongoing discussions on the organisation of phonology. Only in some cases will I make specific comments. Thus this will be more a survey article than a detailed critical review.

Before discussing the different issues broached in *The phonology–syntax connection* (henceforth *PSC*), I would like to point out that there seem to be a number of assumptions shared by almost all contributors to this book.

First, the relation between phonology and syntax is unidirectional: syntactic structure may play a role in the application of phonological rules, but not *vice versa*. This has been called ‘the principle of phonology-free syntax’ (Pullum & Zwicky 1988: 278). For instance, one would not expect a rule of syntax stating that only NPs that begin with an obstruent consonant can be moved to sentence-initial position. In his contribution to this volume, Zwicky provides a classification of the kinds of syntactic influence on phonology that an adequate theory has to account for.

Second, as Pullum & Zwicky (1988) also point out, it is S-structure rather than deeper levels of syntactic representation that plays a role in phonology. Moreover, empty positions, which do form part of S-structure, do not seem to influence the application of phrasal phonology (Nespor & Vogel 1986; Nespor 1990). In Nespor (1990: 391) this is explicitly taken into account by a convention of ‘empty elements deletion’, which applies before the mapping rules that map syntactic structure onto prosodic structure.

The central issue of *PSC* is ‘whether or not phonology needs to have direct access to syntax’ (Introduction, p. xiii). Kaisse (1985) defends the direct reference hypothesis, whereas Nespor & Vogel (1986) adduce evidence for the indirect reference hypothesis: syntactic structure is first mapped onto prosodic structure, and subsequently the rules of phrase phonology apply in prosodic domains.

An intermediate position is taken in Selkirk (1986): some rules of phrase phonology may apply in syntactically defined domains; after these rules have applied the mapping into prosodic structures takes place, and the rules with prosodically defined domains apply.

Note, however, that even in Nespor & Vogel (1986: 32) the position is taken that rules of phrase phonology may have to refer to syntactic information. For instance, Italian has a rule of vowel deletion that deletes the final vowel of a word if it is preceded by a coronal sonorant consonant and followed by another word starting with a consonant, but this rule (called *Troncamento* in Nespor 1990) only applies productively to verbs. Nevertheless, Nespor & Vogel’s (1986: 302) final model of the organisation of the grammar does not deal explicitly with the question of where such rules have to be located.

Almost all contributors to *PSC* (including Kaisse) seem to agree that some hierarchy of prosodic domains should be assumed as the proper means of defining the domain of at least a subset of the rules of phrase phonology. The main aim of some of the papers is to show that the domains of certain phonological processes can best be described in prosodic terms (e.g. Selkirk & Shen, ‘Prosodic domains in Shanghai Chinese’, Hyman, ‘Boundary tonology and the prosodic hierarchy’) or how a clause must be divided into phrasal domains (e.g. Kenstowicz & Kisseberth, ‘Chizigula tonology: the word and beyond’).

The main arguments for the prosodic approach are the following:

(a) the domains of certain phrasal rules cannot be captured straightforwardly in syntactic terms, because the domains do not correspond to a syntactic constituent (cf. Cho, ‘Syntax and phrasing in Korean’);

(b) once the mapping rules have defined the prosodic structuring of sentences, all phrasal rules make use of the same set of prosodic domains, thus resulting in a more general description;

(c) in the prosodic approach, the relevance of syntax for phonology is restricted in a principled way; for instance, the mapping rules are defined cross-categorially, whereas a direct syntax approach allows for rules that, say, only apply to NPs, not to APs or VPs;

(d) in the syntactic approach, rules of phrasal phonology can only apply across word boundaries (where the relation between the two words is syntactically defined), whereas in the prosodic approach rules apply in a prosodic domain, and can thus apply both within words and across word boundaries, which is often the case (cf. again Cho, and Vogel & Kenesei, ‘Syntax and semantics in phonology’).

Argument (c) is not so strong as it may look, since in the direct syntax approach the relevance of syntactic structure for phrasal phonology can also be restricted. For instance, Kaisse (1985) argues that rules of external sandhi can only be applied to a sequence of words *a b* if *a* domain *c*-commands *b* or *vice versa*, where ‘domain *c*-command’ is defined as follows (Kaisse 1985: 159):

(1) *Domain c-command*

In the structure $[_{X^{\max}} \dots \alpha \dots]$, X^{\max} is defined as the domain of α . Then α c-commands any β in its domain.

Note that this definition of c-command is also cross-categorical, and thus imposes restrictions on the relevance of syntactic structure for phonology. However, as Poser points out in his contribution to *PSC*, the indirect reference hypothesis is more restricted, in that it claims that phrasal rules must all parse the utterance in the same way, whereas this is not the case in the direct reference approach.

Examples of rules that need to refer directly to syntactic structure are discussed in Selkirk (1986), Odden (1987) and Odden's 'Syntax, lexical rules and postlexical rules in Kimatuumbi' in *PSC*. Of course, one cannot deny that certain phonological alternations are conditioned by syntactic context. A classic example of such 'phrasal allomorphy' is the alternation of the English determiner *a/an* before the next vowel-initial word. This alternation only applies to the indefinite determiner, and such alternations do not require a rule: both allomorphs can be listed in the lexicon, with a specification of the context in which they can be inserted. The well-known Celtic mutations (alternations in the first consonant of the noun conditioned by lexical, morphological and syntactic conditions) can be dealt with in the same way. The crucial point, however, is that Odden shows that there are productive rules that are directly conditioned by syntax.

The issue is also broached by Hayes, in 'Precompiled phrasal phonology'. Hayes acknowledges the existence of productive syntactically conditioned rules. For instance, in Hausa the final long vowels of verbs appear as short when the verb precedes a full NP direct object. Hayes now proposes generating both allomorphs of the verb in the lexicon, with the allomorph with the short vowel having a specification for the syntactic context in which it can be inserted. The other allomorph, with the long final vowel, is the default allomorph, to be inserted elsewhere. This move makes it possible to maintain that all postlexical phonology applies in prosodically defined domains.

Hayes argues that this proposal is not just a trick to avoid direct reference to syntax in postlexical phonology, but is supported by independent evidence. First, this analysis correctly predicts that syntactically conditioned rules are structure preserving, since they are lexical. Moreover, it predicts that such rules, being lexical, can be ordered before lexical rules that only apply word-internally, and Hayes presents an example of this kind of ordering. Finally, this hypothesis also predicts that precompiled phrasal rules always precede the phrasal rules that apply in prosodically defined domains.

Hayes suggests that the French rule of liaison is to be considered as a case of precompiled phrasal phonology. He reformulates Selkirk's (1972) rule of liaison in colloquial style ('liaison occurs between adjectives and quantifiers and a following noun, but not between an adverb and a following verb or adjective', p.96) as follows:

$$(2) C \rightarrow [+extrasyllabic] / [_{\{A, Q\}} \dots _]_{[Frame 1]}$$

Frame 1 : $[_{X^0} \dots]$

This rule states that adjectives and quantifiers have allomorphs with an extrasyllabic word-final consonant which is to be inserted in the pre-head

position of a phrase. Hayes refers to Clements & Keyser (1983) for a motivation of the analysis of liaison in terms of extrasyllabicity. Their analysis presupposes that extrasyllabic consonants are syllabified as onsets of the first syllable of the next word through the normal process of syllabification. Note, however, that Clements & Keyser do not assume a rule of extrasyllabicity: extrasyllabicity is a diacritic property of lexical items, since many French words (including adjectives and numerals) end in fixed consonants that always surface. These critical comments on Hayes' reformulation of liaison do not affect or weaken his proposal, however, since the domains of liaison can be accounted for completely in prosodic terms, as shown by de Jong (1990).

A substantial number of contributions to *PSC* deal with a more specific issue, the proper definition of the algorithm that maps syntactic structure into prosodic structure. Nespor & Vogel's (1986) algorithm makes use of the hierarchical syntactic relations between constituents (the 'relation-based theory'), whereas Selkirk defends the 'end-based' theory: a prosodic domain 'will have as its terminal string the stretch of the surface syntactic structure that is demarcated by the right or left ends of selected [syntactic] constituents' (Selkirk 1986: 385). Prosodic domains are demarcated by the left or the right edge of either a lexical head or a maximal projection. The two algorithms also differ in the number of prosodic domains that they assume: prosodic word, clitic group, phonological phrase, intonational phrase, utterance (Nespor & Vogel) *vs.* prosodic word, small phonological phrase, (major) phonological phrase (Selkirk). A number of articles in *PSC* discuss these issues and make specific proposals.

Bickmore, in 'Branching nodes and prosodic categories: evidence from Kinyambo', argues that the parameters of phrase construction must include branchingness. In 'What must phonology know about syntax?' Chen claims that the relation-based and the end-based approaches to prosodic domains may have to coexist. In particular, the relational difference between adjuncts and arguments appears to play a role in the proper application of tone sandhi rules in certain Chinese dialects. Condoravdi, in 'Sandhi rules of Greek and prosodic theory', claims that the domains of a number of Greek sandhi rules are easily expressible in the end-based approach and that Greek requires the assumption of the 'minimal phrase', which is smaller than the phonological phrase. Cho argues that the proper definition of the phonological phrase in Korean requires a relation-based approach, and Kidima, in 'Tone and syntax in Kiyaka', also proposes a definition of the phonological phrase in Kiyaka which makes use of the hierarchical syntactic structure.

It is argued in two papers that semantic properties also play a role in the delimitation of prosodic domains. Kanerva's article, 'Focusing on phonological phrases in Chicheŵa', deals with the influence of focus on domain delimitation, and also argues for an extra domain between phonological and intonational phrase: the focal phrase. Vogel & Kenesei investigated the role of scope relations on the formation of intonational phrases in Hungarian, and they conclude that the definition of the intonational phrase has to refer to scope relations.

A basic question in relation to the mapping of syntactic structure into prosodic structure is the following: at this stage of the derivation, is the syntactic structuring of a sentence replaced with a prosodic structuring, or is the prosodic structuring added? In the latter case we have two structural tiers, a

syntactic tier and a prosodic tier, i.e. simultaneity of syntactic and prosodic structure. This also implies that rules or conditions can in principle refer to both tiers simultaneously.

This question has also been discussed with respect to the relation between prosodic structure and morphological structure in Booij (1988a, b) and Booij & Lieber (to appear). It appears that these two types of structuring have to be present simultaneously because morphological rules may have to refer to both morphosyntactic and prosodic properties of their input words. A similar conclusion has been reached by Inkelas (1989).

Interestingly, the relevant analyses in *PSC* point in the same direction. Condoravdi points out that certain phrasal allomorphs of Greek must be subcategorised for a prosodic domain, i.e. not for a syntactic domain, as in Hayes' precompiled phrasal phonology. For instance, *olonón*, a contextually restricted allomorph of *olon* 'all' (GEN PL), only appears at the end of the Greek minimal phrase. This implies that at the stage of lexical insertion, the prosodic structuring of the tree must be available.

A similar conclusion has been reached by Nespor (1990) in relation to the Italian rule of *Troncamento* discussed above. This rule of vowel deletion only applies to verbs, and hence it is a candidate for precompiled phrasal phonology, not being purely prosodic. On the other hand, the domain of the rule is clearly prosodic: the rule applies obligatorily within the Clitic Group, and optionally in a larger domain, the Intonational Phrase. Hence the truncated allomorphs of the verbs have to be generated in the lexicon with a prosodically defined insertion frame, and lexical insertion must be able to see the prosodic structure.

In their article, 'Prosodically constrained syntax', the editors of *PSC*, Zec & Inkelas, argue that to a certain extent syntax is not phonology-free after all. They point out, for instance, that the distribution of Serbo-Croatian clitics follows from the requirement that they always have to lean on a preceding word which forms a phonological word of its own, i.e. cannot follow a clitic. Thus their distribution is not only determined by the rules of syntax, but also by prosodic subcategorisation. A similar case is the weak personal pronoun *ie* 'he' in Dutch, which also requires a preceding phonological word on which it can lean (cf. Booij & Lieber to appear). In the Dutch case, the fact that the clitic fuses with the preceding phonological word can also be established from its syllabification behaviour: this vowel-initial clitic induces obligatory resyllabification of the preceding word, as in *heeft ie* 'has he' with the syllabification pattern ([hef]) ([ti]).

As far as these clitics are concerned, prosodic structure up to the prosodic word level seems to be sufficient to comply with the subcategorisation frames. Since prosodic structure up to this point can be assumed to be generated in the lexicon, it does not show that larger prosodic constituents are also relevant for lexical insertion. Interestingly, Zec & Inkelas also present an example of a word that is dependent on a larger prosodic frame: the discourse particle *fa* in Hausa, which expresses emphasis, must be lexically subcategorised to appear after a phonological phrase.

In sum, although syntactic rules are usually phonology-free, there seems to be a restricted kind of interaction between prosody and syntax, in that prosodic requirements may be imposed on lexical insertion. This implies the simultaneous representation of the syntactic structure and the prosodic structure of sentences.

Poser's contribution, 'Word-internal phrase boundary in Japanese', also relates to this issue. Poser assumes that in Japanese the minimal phrase is the domain of tone assignment. Although he does not define this notion explicitly in this paper, we may assume on the basis of Poser (1984) that the Japanese minimal phrase is formed by a word and all following function words. Poser shows that a certain set of Japanese prefixes behave as minimal phrases of their own, since they clearly form a separate domain of tone assignment. Such observations on the prosodic independence of prefixes are well known from the literature (cf. Booij & Rubach 1984), in which it is argued that prefixes form prosodic words of their own (see also Jakobson 1949). The remarkable thing is that these Japanese prefixes form minimal phrases rather than prosodic words.

Poser wants to account for this behaviour in terms of prosodic subcategorisation: these prefixes are prosodically subcategorised for a minimal phrase. However, I do not think that this should be interpreted as a case of prosodic subcategorisation. The point is rather that these prefixes must be marked in such a way that the prosodic structure algorithm will map them into minimal phrases. Note that the Serbo-Croatian clitics discussed above are indeed cases of prosodic subcategorisation: they do not form a prosodic word of their own, and therefore require a prosodic host, a completely different situation, since the Japanese prefixes do form minimal phrases of their own.

Another issue brought up in this book is whether the domains of phonological rules can be predicted. In the variant of Lexical Phonology defended in Kiparsky (1985), the domains of rules are claimed to follow from three hypothesis: Strict Cyclicity, Structure Preservation and the Strong Domain Hypothesis. Strict Cyclicity blocks rules from applying in a feature-changing way in underived environments, Structure Preservation implies that allophonic rules must be postlexical and the Strong Domain Hypothesis says that rules apply as early as possible, but can be turned off at a later level. In 'Predicting rule domains in the phrasal phonology', Rice aims at showing that these principles of rule application hold for both word and phrase phonology. One of the cases she discusses is the Turkish rule of syllable-final devoicing of stops. According to Kaisse this rule is postlexical since it may be bleb by a rule of phrasal resyllabification that shifts word-final consonants to the first onset of the following vowel-initial word; compare *şarab aldı* 'wine take, he took wine' with *şarap verdi* 'wine gave, he gave wine'. Rice wants to avoid the extrinsic ordering of the rule of syllable-final devoicing after the phrasal rule of resyllabification. She assumes a universal convention of extraprosodicity which states that universally final consonants are extraprosodic (Borowsky 1986). Moreover, extraprosodicity is switched off at a certain level, usually the word level, but in Turkish, it is switched off at a later level, after the application of the rules of syllabification on the phrasal level. Consequently, word-internal syllable-final plosives will be devoiced earlier, but word-final plosives will only devoice if they end up as syllable-final after the rule of syllabification across words has applied. Thus, this analysis lends support to the Strong Domain Hypothesis.

The advantage of extraprosodicity is that resyllabification (in particular coda erasure, a mechanism argued for in e.g. Rubach & Booij 1990), which will otherwise be necessary after the addition of a vowel-initial suffix, or across words of which the second is vowel-initial, can be avoided.

However, the theory of extraprosodicity implies that the final consonant of a word is not relevant for the application of cyclic lexical rules, because it is

invisible. This is not universally the case. For instance, the Dutch rule of word stress is cyclic, and crucially has to know whether the word to be stressed ends in a consonant or not, because word-final syllables ending in a long vowel plus consonant always bear the main stress of the word, whereas words ending in a long vowel have penultimate stress (Kager 1989: 230ff). Generally, universal extraprosodicity of consonants will be a problem for languages with cyclic stress and stress assignment rules that are sensitive to the segmental composition of the syllable, and it may therefore be doubted whether this analysis can be maintained in its present form. Minimally, it seems, extraprosodicity of final consonants must be considered as a language-specific choice.

Kaisse and Odden deal with the division of rules into different types and their ordering. Odden argues that there are rules that are lexical in the sense that they have lexical exceptions, are structure preserving, etc., but yet apply across word boundaries. That is, the basic division is not that between word-internal and phrasal rules, but that between lexical rules (applying within or between words) and postlexical rules, which are blind to non-phonological information. In a similar vein, Kaisse takes the position that although what she called P1 rules in Kaisse (1985) may have prosodically defined rather than syntactically defined domains, there remains a distinction between P1 rules, which share many properties with lexical (in the sense of word-internal) rules, and P2 rules, which are automatic phonological rules. However, she now doubts whether P1 rules are always ordered before P2 rules.

Two papers in *PSC* deal with more technical issues concerning prosodic phonology. McHugh argues in 'The phrasal cycle in Kivunjo Chaga tonology' that there is also cyclicity in phrasal phonology: rules first apply in the smallest prosodic domain, then the next larger domain is created, and then the rules apply in the newly formed domain, etc. Condoravdi concludes that the proper parsing of a string into prosodic domains requires both bottom-up and top-down parsing. The latter possibility has to be allowed for because 'the way a string is parsed with respect to a given prosodic category *may* depend on the way it is parsed with respect to a higher prosodic category' (p. 77).

Another well-known issue in prosodic/metrical phonology is the relation between trees and grids. Nespors argues that both prosodic structure and grids are necessary: grids are constructed on the basis of prosodic structure, and it is to these grids that rhythm rules apply, a position also taken in Nespors & Vogel (1989).

In sum, *PSC* is an impressive volume of papers on the phonology–syntax interface. Although there are opposing views, the different papers still form a unity in that they deal with a number of intertwined problems in the study of the phonology–syntax interface and prosodic structure. This is also clear from the fact that some of the authors explicitly react to each other's proposals, something which is regrettably quite often lacking in collections of papers.

Moreover, *PSC* is well edited and printed, and also contains a subject and a language index.

NOTE

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REFERENCES

- Booij, G. E. (1988a). On the relation between lexical and prosodic phonology. In P. M. Bertinetto & M. Loporcaro (eds.) *Certamen Phonologicum: papers from the 1987 Cortona Phonology Meeting*. Turin: Rosenberg & Selier. 63–75.
- Booij, G. E. (1988b). Review of Nespors & Vogel (1986). *JL* 24. 515–525.
- Booij, G. E. & R. Lieber (to appear). On the simultaneity of morphological and prosodic structure. In E. Kaisse and S. Hargus (eds.) *Principles and implications of Lexical Phonology*. New York: Academic Press.
- Booij, G. E. & J. Rubach (1984). Morphological and prosodic domains in Lexical Phonology. *Phonology Yearbook* 1. 1–28.
- Borowsky, T. (1986). *Topics in English phonology*. PhD dissertation, University of Massachusetts, Amherst.
- Clements, G. N. & S. J. Keyser (1983). *CV phonology*. Cambridge, Mass.: MIT Press.
- Inkelas, S. (1989). *Prosodic constituency in the lexicon*. PhD dissertation, Stanford University.
- Jakobson, Roman (1949). The phonemic and grammatical aspects of language in their interrelations. In *Actes du 6e congrès international des linguistes*. Also in *Selected writings*, Vol. 2. (1971). The Hague: Mouton. 103–114.
- Jong, D. de (1990). The syntax–phonology interface and French liaison. *Linguistics* 28. 57–88.
- Kager, R. W. J. (1989). *A metrical theory of stress and destressing in English and Dutch*. Dordrecht: Foris.
- Kaisse, E. (1985). *Connected speech: the interaction of syntax and phonology*. Orlando, FL: Academic Press.
- Kiparsky, P. (1985). Some consequences of Lexical Phonology. *Phonology Yearbook* 2. 85–138.
- Nespor, M. (1990). Vowel deletion in Italian: the organization of the phonological component. *The Linguistic Review* 7. 375–398.
- Nespor, M. & I. Vogel (1986). *Prosodic phonology*. Dordrecht: Foris.
- Nespor, M. & I. Vogel (1989). On clashes and lapses. *Phonology* 6. 69–116.
- Odden, D. (1987). Kimatuumbi phrasal phonology. *Phonology Yearbook* 4. 13–36.
- Poser, W. J. (1984). *The phonetics and phonology of tone and intonation in Japanese*. PhD dissertation, MIT.
- Pullum, G. & A. Zwicky (1988). The syntax–phonology interface. In F. J. Newmeyer (ed.) *Linguistics: the Cambridge survey. Vol. 1: Linguistic theory: foundations*. Cambridge: Cambridge University Press. 255–280.
- Rubach, J. & G. E. Booij (1990). Syllable structure assignment in Polish. *Phonology* 7. 121–158.
- Selkirk, E. O. (1972). *The phrase phonology of English and French*. PhD dissertation, MIT.
- Selkirk, E. O. (1986). On derived domains in sentence phonology. *Phonology Yearbook* 3. 371–405.