

Chapter 1

Introduction

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The standard view of the form-meaning interfaces, as embraced by the great majority of contemporary grammatical frameworks, consists in the assumption that meaning can be associated with grammatical form in a one-to-one correspondence. Under this view, composition is quite straightforward, involving concatenation of form, paired with functional application in meaning. In this book, we shall discuss linguistic phenomena across several grammatical sub-modules (morphology, syntax, semantics) that apparently pose a problem to the standard view, mapping out the potential for deviation from the ideal of one-to-one correspondences, and develop formal accounts of the range of phenomena. We shall argue that a constraint-based perspective is particularly apt to accommodate deviations from one-to-many correspondences, as it allows us to impose constraints on full structures (such as a complete word or the interpretation of a full sentence) instead of always deriving such structures step by step.

The book consists of a general introduction and seven topical contributions, ranging from morphology to syntax and semantics. In the introductory chapter, we shall give a general overview and typology of one-to-many correspondences. A number of papers in this volume are formulated in a particular constraint-based grammar framework, Head-driven Phrase Structure Grammar (Pollard & Sag 1994). These contributions investigate how the lexical and constructional aspects of this specific theory can be combined to provide an answer to the issue of one-to-many relations across different linguistic sub-theories.



1 One-to-many relations across modules

1.1 Many-to-many nature of morphology

Possibly the first module of grammar where the ideal of one-to-one correspondence has been challenged is *morphology*: classical challenges (Matthews 1972) include (i) cumulation, where several morphosyntactic properties are jointly expressed by a single exponent, (ii) extended (or multiple) exponence, where a morphosyntactic property is jointly expressed by several exponents, and (iii) overlapping exponence, i.e. the combination of cumulation and extended exponence. These deviations from the canon of a one-to-one correspondence pertain to the relation between form and function.

Cumulation, or fusion, is indeed a highly common property of inflectional systems, where one form $n = 1$ corresponds to $m > 1$ functions. In fact, fusion is considered as the property that distinguishes the broad typological class of inflectional languages from the agglutinative type. However, cumulation can even be attested in agglutinative languages, such as Swahili (Stump 1993) or Finnish (Spencer 2003). Taking German nominal inflection as an example, marking of number and case is often fused, illustrated by the paradigm of *Rechner* in Table 1.1.

Table 1.1: German nominal paradigms

(a) <i>Rechner</i> ‘computer’			(b) <i>Mensch</i> ‘human’		
	SINGULAR	PLURAL		SINGULAR	PLURAL
NOM	Rechner	Rechner	NOM	Mensch	Mensch-en
GEN	Rechner-s	Rechner	GEN	Mensch-en	Mensch-en
DAT	Rechner	Rechner-n	DAT	Mensch-en	Mensch-en
ACC	Rechner	Rechner	ACC	Mensch-en	Mensch-en

(c) <i>Hals</i> ‘neck’			(d) <i>Arm</i> ‘arm’		
	SINGULAR	PLURAL		SINGULAR	PLURAL
NOM	Hals	Häls-e	NOM	Arm	Arm-e
GEN	Hals-es	Häls-e	GEN	Arm-s	Arm-e
DAT	Hals	Häls-en	DAT	Arm	Arm-en
ACC	Hals	Häls-e	ACC	Arm	Arm-e

The mirror image of cumulation is *extended* or *multiple exponence*, where a single function $m = 1$ is expressed multiple times by $n > 1$ exponents (see Caballero & Harris 2012; Harris 2017 for a typological overview). In German nominal plurals, this is attested e.g. by the combination of affixation and *umlaut*, an instance of morphologically conditioned vowel fronting. In this volume, the chapter by Crysmann explores a particularly compelling case of extended exponence in Batsbi (Harris 2009), where identical class agreement markers may show up multiple times within a verb.

What is probably even more common than pure extended exponence is *overlapping exponence*, which can be pictured as a combination of extended exponence and cumulation: e.g. in the dative plural *Arm-e-n*, plural is jointly expressed by the suffixes *-e* and *-n* ($1 : n > 1$), while at the same time *-n* cumulates plural and dative marking ($m > 1 : 1$).

Perhaps the most common deviation from one-to-one correspondence is *zero exponence*, with $m > 0$ functions being expressed by $n = 0$ forms: e.g. in the paradigm of German *Rechner*, a substantial number of case and number combinations are expressed by the absence of any inflectional marker. What is peculiar about the zero-marked forms is that they do not form any natural class here, neither in terms of case, nor in terms of number, nor any combination of these two dimensions. Rather, they are interpreted in terms of paradigmatic opposition to overtly marked cells. A common way to capture this is in terms of Pāṇini's principle or the elsewhere condition (Kiparsky 1985), a notion embraced by almost every theory of inflection (cf. Halle & Marantz 1993; Prince & Smolensky 1993; Anderson 1992; Stump 2001; Crysmann & Bonami 2016). While zero exponence represents the default more often than not, zero exponence may sometimes exceptionally constitute an override in an otherwise overtly marked paradigm. Consider the German paradigm of *Mensch* 'human': here the only way to give a uniform interpretation for the overt marker *-en* is in terms of opposition to the zero-marked nominative singular cell. Thus, within this inflectional class, zero exponence constitutes the special case, contrasting with non-zero default marking (*-en*).

While inflectional morphology also witnesses one-to-one correspondences between form and function, almost all possible deviations are well attested: one-to-many (cumulation), many-to-one (extended exponence), many-to-many (overlapping exponence), and zero-to-one. The fact that these deviations from a one-to-one ideal can be found in practically every inflectional system makes them qualify as an indispensable property of this grammatical module.

One-to-many relations are not only pervasive in the correspondence between morphosyntactic properties and the exponents that express them, but they are

also characteristic of paradigm structure: a frequently attested phenomenon is *syncretism*, the systematic identity of forms in different cells of the paradigm. In a sense, syncretism constitutes an instance of (local) ambiguity. The nominal paradigms of German we cited above provide different patterns of syncretism, illustrating identity of forms for different cells in the paradigm of a single word, as well as identity of patterns of exponence across different inflectional paradigms (cf. e.g. the singular of *Rechner* and *Arm* in Table 1.1).

Heteroclisys constitutes a particular case of cross-paradigm syncretism, where different parts of a lexeme’s paradigm adhere to different inflection classes (Stump 2006). Table 1.2 illustrates the phenomenon with data from Czech: in the neuter, we find two basic declension classes (hard and soft), where corresponding cells are marked with different exponents. Mixed declension neuter nouns like *kuře* ‘chicken’, on the other hand, inflect like soft declension nouns in the singular, but, in the plural, the case/number exponents are identical to those found in the hard declension.

Table 1.2: Overabundance and heteroclisys in Czech declension (Bonami & Crysmann 2018)

	MASCULINE			NEUTER		
	hard	mixed	soft	hard	mixed	soft
SG						
NOM	most	pramen	pokoj	měst-o	kuř-e	moř-e
GEN	most-u	pramen-u pramen-e	pokoj-e	měst-a	kuř-et-e	moř-e
DAT	most-u	pramen-u pramen-i	pokoj-i	měst-u	kuř-et-i	moř-i
ACC	most	pramen	pokoj	měst-o	kuř-e	moř-e
VOC	most-e	pramen-e pramen-i	pokoj-i	měst-o	kuř-e	moř-e
LOC	most-ě	pramen-u pramen-i	pokoj-i	měst-ě	kuř-et-i	moř-i
INS	most-em	pramen-em	pokoj-em	měst-em	kuř-et-em	moř-em
PL						
NOM	most-y	pramen-y	pokoj-e	měst-a	kuř-at-a	moř-e
GEN	most-ů	pramen-ů	pokoj-ů	měst	kuř-at	moř-í
DAT	most-ům	pramen-ům	pokoj-ům	měst-ům	kuř-at-ům	moř-ím
ACC	most-y	pramen-y	pokoj-e	měst-a	kuř-at-a	moř-e
VOC	most-y	pramen-y	pokoj-e	měst-a	kuř-at-a	moř-e
LOC	most-ech	pramen-ech	pokoj-ích	měst-ech	kuř-at-ech	moř-ích
INS	most-y	pramen-y	pokoji	měst-y	kuř-at-y	moř-i
	‘bridge’	‘spring’	‘room’	‘town’	‘chicken’	‘sea’

Syncretism, however, differs from most other cases of lexical ambiguity in being systematic, rather than accidental. While systematic attachment ambiguities in syntax are rooted in the geometrical properties of tree structure (Catalan numbers), the systematicity of syncretism patterns is of a different nature, combining underspecification in the case of natural splits with a specific type of default logic, in the case of Pāṇinian splits. By studying patterns of syncretism, morphologists try to understand *inter alia* how a small number of exponents are deployed to distinguish a much greater number of cells.

The opposite of syncretism is *overabundance* (Thornton 2011; 2012; 2019), which has been accepted only fairly recently in morphology. Overabundance is the inflectional equivalent of paraphrase, so its very existence should not come as too much of a surprise. However, with Pāṇinian competition as an organising principle of lexical and morphological knowledge, we should expect overabundance to be the exception rather than the rule in inflectional systems.

While heterocclisis, i.e. multiple inflection class membership can just give rise to mixed paradigms, where one set of cells adheres to one class and another set to a different class, multiple membership may even give rise to overabundance (Thornton 2011), as witnessed e.g. by English *dreamed/dreamt* where a function has more than one possible realisation.

The way in which heterocclisis and overabundance can interact is illustrated by the Czech masculine mixed declension given in Table 1.2: in the plural, *pramen* ‘spring’ uses the case/number exponents of the hard declension, entirely parallel to what we saw in the neuter mixed declension, whereas in the singular, we find the exponents of both hard and soft declensions. In essence, heterocclisis appears to be one of the contributing factors to overabundance.

Syncretism and overabundance can be thought of as the inflectional manifestations of two very general properties of language, namely ambiguity and paraphrases. However, within morphological theory, the situation where one form is identical across different functions is recognised to the extent that formal theories are optimised to describe syncretic patterns with minimal description length, typically using preemptive devices such as extrinsic rule ordering (Anderson 1992) or Pāṇinian competition (Kiparsky 2005; Stump 2001; Prince & Smolensky 1993; Embick & Noyer 2007). The resulting functional, as opposed to relational, perspective on the correspondence between inflectional meaning and form poses some challenge towards the integration of overabundance.

In his contribution to this volume, **Beniamine** presents an approach to computational induction of inflection classes and suggests that heterocclisis and overabundance are actually far more wide-spread than commonly assumed and that monotonic inheritance hierarchies, as used in HPSG lend themselves naturally towards modelling inflectional macro- and microclasses.

1.2 One-to-many phenomena beyond morphology

As shown in the previous section, one-to-many relations are well established in morphology. In this section, we list some example cases to which the morphological terminology can be applied, at least on a pretheoretical, descriptive level.

A key insight at the basis of modern formal semantics is the *principle of compositionality*, which we show in one of its standard versions in (1).

(1) Principle of compositionality:

The meaning of a complex expression is a function of the meaning of its component parts and the way in which they are combined.

This principle captures the insight that speakers of a language can understand utterances they have never heard if they understand the words and the structure of these utterances. Typical formulations of the principle of compositionality such as (1) make a number of implicit assumptions that point towards a one-to-one relation between form and meaning. We shall review two aspects and some problems with them: First, a function has a unique value for a given input, second, there is a single relevant level of “meaning”, or what Bach (1999) calls the dictum of *one sentence, one proposition*.

Turning to the first aspect, the very notion of a *function* suggests that there is a *unique* interpretation for any given word-structure combination. This is not immediately obvious once we look at ambiguities others than lexical and structural ambiguities. For example scope ambiguity, see (2a), or collective-distributive ambiguity, see (2b), are not straightforwardly related to different lexical items or syntactic structures.

- (2) a. Most linguists speak at least two languages. (scope ambiguity)
Reading 1: For most linguists, there are at least two languages that they speak.
Reading 2: There are at least two languages such that most linguistics speak them.
- b. Two students lifted the box. (collective-distributive ambiguity)
Reading 1: Two students jointly lifted the box.
Reading 2: Two students lifted the box separately.

There have been numerous attempts to make the analysis of such data compatible with the principle of compositionality. There are three standard solution strategies. First, more syntactic structure can be postulated to subsume these cases under structural ambiguity, as done in *Montague Grammar* (Montague

1974), or through *quantifier raising*, starting from May (1977). Second, semantic shifting operations can be introduced in order to treat the problem as a (systematic) lexical ambiguity. Prominent examples of this include Link (1983), Partee & Rooth (1983) and *Flexible Montague Grammar* (Hendriks 1993). Third, attempts could be made to argue that there is no real ambiguity but rather a vagueness, i.e., that the apparent readings are just different scenarios that are compatible with the one, very general, interpretation of the clauses. This could be done in *underspecified semantics*, see Pinkal (1999) and Egg (2011) for an overview.

Let us turn to the second implicit one-to-one aspect of the principle of compositionality. It is usually interpreted as expressing the idea of *one sentence, one proposition*. Bach (1999) is widely quoted as explicitly challenging this assumption, in that whatever is “said” should be considered the relevant meaning in the sense of the principle of compositionality – in contrast to what is being communicated implicitly by a conversational implicature. The prime examples of sentences with more than one proposition involve *conventional implicatures* as in the classical example from Grice (1975) in (3).^{1,2}

- (3) He is an Englishman; he is, therefore, brave. (Grice 1975: 44)
- a. Proposition 1: ‘He is brave.’
 - b. Proposition 2: ‘His being brave is a consequence of his being an Englishman.’

We indicate the two propositions expressed in (3) below the example. Often, only the proposition in (3a) is considered what is being “said”, or asserted. The proposition in (3b) is considered non-asserted. Under the heading of *projective meaning*, it has been argued that the difference between asserted content, presupposition, conventional implicature, and, possibly other types, is not categorical (Tonhauser et al. 2013; AnderBois et al. 2015).

Formal approaches such as Potts (2005) and Liu (2012) show that the non-asserted meaning can be computed in parallel to and with the same techniques as the asserted content. Gutzmann (2013) provides examples of lexical items and constructions that contribute to the non-asserted content only (such as attributive *damn*) and to both asserted and non-asserted content – such as slurs like *kraut* with the asserted meaning ‘German’ and the non-asserted meaning of a

¹Grice’s example in (3) violates many of the LSA guidelines of linguistic examples, see <https://www.linguisticsociety.org/resource/lisa-guidelines-nonsexist-usage>, accessed 2020-03-04.

²Bach (1999) questions the notion of conventional implicature and rather intends to replace it by allowing more than one proposition.

speaker's negative attitude towards Germans. This shows that meaning computation itself is a one-to-many challenge, i.e., that not only a single, asserted, content needs to be computed, but potentially several, projective meaning contributions need to be computed in parallel.

There are, however, other constellations that are problematic for the one-to-one aspects of the principle of compositionality, some of which are also addressed in the contributions of Sailer & Richter and Bargmann, Gehrke & Richter of this volume.

When we reconsider the list of one-to-many phenomena in morphology, it is easy to find analogous cases for each of them at the morphology-syntax interface, in syntax, and at the syntax-semantics interface.

One obvious case is *periphrasis*, i.e., the marking of a morphosyntactic category (such as tense, number, or case) by means of several words. A simple example of this is past tense marking in Afrikaans: while a few verbs have a past tense form – such as *kan* 'can' with the form *kon* 'could' – most verbs form their past tense with the auxiliary *het* 'have' and a past participle, as in *ge-werk het* 'worked have'. Neither the verb *het* nor the past participle *ge-werk* express past tense when used on their own.

We find similar periphrastic behaviour at the syntax-semantics interface. Light verb constructions, complex predicates, particle verbs, or idiomatic expressions are all cases in which a single meaning is expressed through the use of more than one word, where none of the words may carry this meaning outside the combination. While there is a continuum of transparency in these cases, we find extreme examples such as the German particle verb *an-geben* 'brag' (lit.: on-give) or the English idiomatic expression *kick the bucket* 'die'.

There are many cases of *redundancy*, i.e., the same morphosyntactic or semantic property is marked on more than one word. This can be understood as the syntacto-semantic equivalent of extended exponence. A common pattern is to find the same category being marked on a substantive word and also by some function word. In some varieties of English, for example, we find both a morphological and a periphrastic marking of the comparative, as in (4).

- (4) But I found that in all area of my life where I live the most according my own rules, I feel more stronger. (GloWbE, South Africa)

This constellation also occurs in the second stage in the *Jespersen cycle* (Jespersen 1917), illustrated with a French example in (5). There, an original negation marker (*ne*) is strengthened through the occurrence of a further negative item (*pas*).

- (5) Je ne dis pas.
 I NE say not
 ‘I don’t say’ (Jespersen 1917: 7)

The Jespersen cycle has been applied to a number of grammaticalisation processes, see van Gelderen (2011; 2013) for an overview. Since the redundant step belongs to many of the grammaticalisation cycles, this particular one-to-many stage constitutes a standard case in the syntactic marking of grammatical categories.

Redundant marking outside morphology is also found in so-called *concord phenomena*. The most widely studied is negative concord, where more than one negative indefinite is used in a clause without expressing more than one negation (Jespersen 1917; den Besten 1986; Zeijlstra 2004). There is also modal concord as in (6), where we find two modal expressions, here a modal auxiliary and a modal adverb, expressing the same modality (Zeijlstra 2007; Huitink 2012). We expect that there may potentially be other concord phenomena at the syntax-semantics interface.

- (6) My eyes must certainly be deceiving me. (Huitink 2012: 404)
 = My eyes must be deceiving me.
 = Certainly, my eyes are deceiving me.

Cases of redundancy also involve pronouns, as witnessed, *inter alia*, by resumption. In many languages, the extraction site in an unbounded dependency, such as *wh*-fronting or relativisation can or must be marked by a pronominal in situ. For instance in Hausa, questioning the object of a preposition requires either pied-piping of the preposition, or else presence of a pronoun in situ, as illustrated by the example in (7).

- (7) a. *dà mèt kíkà zóo?*
 with what you.F.SG come
 ‘With what did you come?’ (Jaggar 2001: 521)
 b. *mèt kíkà zóo dà shii?*
 what you.F.SG come with him/it
 ‘What did you come with?’ (Jaggar 2001: 521)

In the case of pied-piping in (7a), we have a one-to-one correspondence between participants and their realisations. With resumption in (7b), however, one participant is actually realised twice, namely by the fronted *wh* expression *mèt* ‘what’ and by the in situ resumptive pronoun *shii* ‘him/it’. Unless one assumes

ambiguity between semantically potent ordinary pronouns and semantically vacuous resumptives, one is confronted with the problem that a single semantic role is simultaneously filled by two syntactic complements. However, as pointed out by McCloskey (2002), resumptive pronouns are non-distinct in shape from the ordinary pronouns of the language, casting doubts on an ambiguity approach.

We also find cases of doubling of *wh*-words. In Afrikaans long-distance extraction, there can be a copy of the extracted *wh*-phrase at the beginning of any intermediate clause. This is shown in (8). The construction is not restricted to Afrikaans. Höhle (2019) discusses analogous data in German, and Bruening (2006) in Passamaquoddy.

- (8) Waarvoor denk julle waarvoor werk ons?
wherefore think you wherefore work we
'What do you think we are working for?' (du Plessis 1977: 725)

We would like to mention a final group of redundancy phenomena that does not involve functional elements: predicate fronting and cognate objects. For many languages, we find a duplication of a fronted predicate, as in the Yiddish example in (9) from Källgren & Prince (1989). In this case, a non-finite form of the predicate occurs in the fronted position, and the same verb, though in a potentially different inflected form, occurs in the rest of the clause.

- (9) leynen leyent er dos bukh yetst.
read.INF reads he the book now
'As for reading, he's reading the book now.' (Källgren & Prince 1989: 48)

This phenomenon has been documented at least for Hebrew, Hungarian, Brazilian Portuguese, Russian, Spanish, Yiddish (Vicente 2009).

The cognate object construction is a further phenomenon showing redundancy. In the prototypical case of this construction, a usually intransitive verb combines with an NP complement that can be considered a nominalisation of the verb, see (10). As the example shows, the NP complement seems to be redundant. This is, again, a cross-linguistically very common construction (Jones 1988; Massam 1990; Mittwoch 1998).

- (10) Harry lived an uneventful life.
= Harry lived uneventfully. (Jones 1988: 89)

We can turn to a different type of one-to-many relations. In the following cases, several quantificational elements occur in a sentence but need to be interpreted as a single unit, a *polyadic quantifier*. This is illustrated in (11), from

Keenan (1992), with a paraphrase of the relevant reading. Keenan (1992) shows that certain uses of *different* cannot be accounted for with a combination of “ordinary”, i.e. monadic, quantifiers. This result presents an important challenge to systems of semantic combinatorics that assume compositionality.

(11) Different people like different things.

‘There are at least two people and for all distinct people x, y the things that x likes are not exactly the same as those that y likes.’

Various approaches have been proposed to solve this problem: Moltmann (1995) and Beck (2006) generate more general readings in a compositional way and assume context-sensitive mechanisms that will filter out undesired readings. Barker (2007) proposes an unusual syntactic structure that will guide the interpretation. Lahm (2016) uses data on *different* as additional motivation for the use of choice functions. Finally, Richter (2016) employs a non-standard mechanism of semantic combinatorics to arrive at an explicitly polyadic semantic representation. If one accepts a polyadic analysis, the configuration is similar to the one we found in complex predicates: several expressions form an inseparable unit together.

The last one-to-many relation that we would like to mention are elliptical phenomena. These include *gapping*, see (12a), and *argument cluster coordination*, as in (12b), both examples are taken from Kubota & Levine (2016).

(12) a. Leslie bought a CD, and Robin a book.

b. I told the same joke to Robin on Friday and to Leslie on Sunday.
(Kubota & Levine 2016)

Gapping is a one-to-many phenomenon in the sense that the verb is mentioned only in the first conjunct but present for interpretation in both conjuncts. There are numerous approaches to these phenomena. They can, basically, be divided into three groups: (i) phonological deletion approaches (Merchant 2001; Fox & Lasnik 2003); (ii) approaches assuming a copy at the level of Logical Form (Lobeck 1995; Chung et al. 1995); (iii) direct interpretation approaches (Ginzburg & Sag 2000; Culicover & Jackendoff 2005; Kubota & Levine 2016).

We hope to have shown in this section that we find one-to-many phenomena of various types in all modules of grammar and at their interfaces. It is common in formal linguistics to try to reduce these phenomena to one-to-one relations. The papers in this volume take a different approach, taking the one-to-many nature of the phenomena at face value.

2 Overview of the individual chapters

The chapters in this volume are grouped together according to the major linguistic sub-disciplines, starting with morphology, via the morphology-syntax interface towards syntax and semantics.

In the second chapter of the volume, **Beniamine** investigates the system of inflectional classes across a number of language, using a data-driven computational approach, which permits to assess the complexity of morphological systems without any bias from the analysing linguist.

Beniamine starts off with a comparison of different conceptualisations of inflection classes, going from simple, flat partitions, as characteristic of pedagogical grammars, via trees, as advocated in the theoretical literature, to lattices, i.e. multiple inheritance. In the discussion of tree-based approaches, he already notices deviations that would suggest a more general data structure.

The main theoretical question addressed in Beniamine's chapter is the extent to which inflection class systems can be regarded as trees or rather multiple inheritance hierarchies. Or, put in more linguistic terms, to what extent inflectional class systems are characterised by heterocclisis.

Beniamine's method takes as a starting point an ideally complete lexicon of morphological word forms, paired with the morphosyntactic features that are expressed. From these, he automatically extracts morphophonological alternation patterns that relate a lexeme's word form in one cell to that in another. These patterns then represent a lexeme's paradigm as the set of alternations. Full (or partial) identity of these alternations across lexemes provides the basis for an empirical notion of inflection class.

Using concept analysis, Beniamine automatically constructs more general superclasses corresponding to the sharing of patterns across lexemes. If a number of lexemes share all patterns, they form a microclass, which corresponds to a tree. More abstract classes are built from microclasses on the basis of partial identity.

Beniamine evaluates the complexity of the concept hierarchies of six different languages (Arabic, English, French, Russian, Portuguese, Chatino) using three metrics: (i) the number of concepts, (ii) the depth of the hierarchy, and (iii) the number of immediately dominating nodes for each concept, which is an indicator of multiple inheritance.

The results are highly interesting: in all six languages, the number of concepts clearly surpasses the number of microclasses, disconfirming the idea of a flat partitioning. The most spectacular finding, though, is that all systems witness an elevated degree of multiple inheritance, an average of almost two dominating nodes for English, and higher for all other languages. Beniamine concludes that

heteroclysis permeates the system and should be considered the norm rather than the exception. Thus, it seems that inflection class systems observe a many-to-many organisation that can be captured by multiple inheritance hierarchies, but neither partitions nor trees.

The contribution by Crysmann addresses a classical challenge in inflectional morphology, namely an extreme case of extended (or multiple) exponence in Batsbi (Tsova-Tush), called exuberant exponence (Harris 2009). In this language, the same set of class (=gender/number) markers can appear multiple times within a word, as shown in example (13).

- (13) y-ox-y-Ø-o-y-anǒ
 CM-rip-CM-TR-PRS-CM-EVID1
 ‘Evidently she ripped it.’ (Harris 2009: 277)

What distinguishes exuberant exponence as found in Batsbi from more common cases of multiple exponence is not just a matter of quantity, or the fact that multiple marking is alliterative. These are important properties, yet the most central observation relates to its variable nature: because only certain stems take the marker, and only certain affixes (e.g. transitive/intransitive and evidential), we may find anything between zero and four identical exponents.

The formal analysis Crysmann proposes is carried out in the framework of Information-based Morphology (=IbM; Crysmann & Bonami 2016) and exploits the fact that this theory incorporates $m : n$ relations at the most basic level of organisation, namely realisational rules, extracting partial generalisations over rules by means of inheritance in typed feature structures. The analysis capitalises on the dependent nature of exuberant exponence in Batsbi and shows how IbM permits to improve over the holistic word-based baseline proposed in Harris (2009). There is an interesting twist as to how the one-to-many relation between the morphosyntactic property of class agreement and its zero to many exponents is captured in the formal analysis: because both the number and the position of markers depend on the presence of a particular stem or some other suffixal marker, multiple exponence is indirect, and so is the locus of the one-to-many relation: in essence, exponence rules for class markers compose with those for the stems and markers they depend on, forming many-to-many rules of exponence that introduce more than one marker corresponding to more than one function. Technically, this is done by systematic cross-classification of agreement marking rules for stems and exponents they depend on. This cross-classification in turn constitutes another instance of a one-to-many relation, namely at the level of the formalism (cf. the semi-lattices in Beniamine’s chapter).

Thus, the availability of one-to-many relationships at the level of the underlying logic, as is the case with multiple inheritance hierarchies, appears to provide a solid foundation to approach one-to-many relations at the level of descriptions.

The chapter by **Bonami & Webelhuth** crosses the boundary between morphology and syntax by investigating periphrastic tenses in Czech. Periphrastic realisation describes the situation where syntactically independent words analytically fill cells in a paradigm for which there is typically no synthetic realisation. Periphrasis in itself already constitutes a one-to-many relationship, where more than one lexeme is involved in the inflectional realisation of a morphological word.

The particular phenomenon under investigation concerns the past and conditional, both of which are realised analytically by a participial form combined with the (clitic) copula in the present or past, respectively. While the copula is always overtly realised in predicative constructions, both in its present and past forms, and it is equally present in all cells of the periphrastic conditional, third person cells of the past paradigm are characterised by the significant absence of the ancillary element, an instance of what the authors call *zero periphrasis*, in analogy with the well-known phenomenon of zero exponence.

Bonami & Webelhuth argue that these particular non-periphrastic cells in otherwise periphrastic paradigms need to be accounted for in morphological terms, rather than in terms of a covert copula. Extending their previous theory of periphrasis (Bonami 2015; Bonami et al. 2016; Bonami & Webelhuth 2013), they propose that zero periphrasis should be captured at the morphology-syntax interface, treating third person past as exceptionally non-periphrastic cells. This mirrors quite neatly the case of non-default zero-exponence, as found in synthetic inflectional morphology.

Complex predicates provide one of the classical challenges for the view that the interface between syntax and the lexicon constitutes a straightforward one-to-one correspondence. In their chapter, **Faghiri & Samvelian** investigate the syntactic separability of complex predicates in Persian and explore to what extent complex predicate status correlates with linearisation properties. The authors report the results of two acceptability judgement studies that test word-order variation. In (14), the complex predicate *vāks zadan* ‘to polish’ (lit: polish hit) is used. As can be seen, the nominal and the verbal part of the complex predicate are adjacent in (14a), but can be separated by a prepositional phrase, see (14b).

- (14) a. ali be kafš-hā vāks zad
Ali to shoe-PL polish hit.PST.3SG
‘Ali polished the shoes.’

- b. ali behtarin vāks=rā be kafš-hā zad
 Ali best polish=RA to shoe-PL polish hit.PST.3SG
 ‘Ali polished the shoes with the best polish.’

The paper investigates the conditions under which such a separation is possible and contrasts this with the word order preferences of syntactic combinations that are not complex predicates. The studies show that complex predicates behave largely as one would expect given their syntactically complex form, not given their semantic or lexicographic unit-like nature. A certain preference for non-separate occurrence is, however, attested.

In the second chapter on syntax, **Pozniak, Abeillé & Hemforth** explore the use of inverted vs. non-inverted subjects with object relatives in French, as illustrated by the examples in (15). They start off by observing that inversion is standardly considered optional and possibly dispreferred and note that current competence and performance models alike make conflicting predictions regarding a preference for or against subject inversion in this context.

- (15) a. Le médecin [que l’avocat connaît] aime courir.
 the physician that the lawyer knows likes run
 ‘The physician [that the lawyer knows] likes running.’
 b. Le médecin [que connaît l’avocat] aime courir.
 the physician that knows the lawyer likes run
 ‘The physician [that the lawyer knows] likes running.’

The main aim of their contribution is to assess not only the relative acceptability of inversion with object relatives, but also what the specific use conditions for each of the two variants are that favour one realisation over the other. They report on three empirical studies they have conducted to shed light on this issue: a corpus study, an acceptability judgement task, and a self-paced reading experiment.

In the corpus study they annotated object relatives from the French Treebank with properties pertaining to the subject, the verb, and the relativised object, as well as global properties, such as length of the subject or the relative clause. The data were analysed using logistic regression. Among the significant factors favouring inversion they found two subject-related properties, namely intentionality and length. These were tested in two subsequent experiments: while the acceptability judgement task confirmed the basic corpus findings regarding the equal acceptability of inverted and non-inverted subjects in this construction,

the self-paced reading experiments revealed improved performance with combined factors (length and intentionality), from which the authors conclude that a proper understanding needs to acknowledge both distance-oriented processing constraints and semantic factors, which can be seen as an instance of one-to-many relations at the level of performance.

The final two chapters of this volume explore one-to-many aspects of semantics. **Sailer & Richter** look at the syntax-semantics interface and **Bargmann, Gehrke & Richter** study the simultaneous availability of different levels of interpretation.

Sailer & Richter combine two constellations that give rise to one-to-many correspondences: negative concord (NC) and coordination. In NC languages, two negative indefinites may co-occur in the same clause while a single negation is expressed semantically. Thus, we observe a one-to-many correspondence in the sense of a double marking of negation in syntax and a single negation in the interpretation. In coordination, we can find the opposite situation: what appears to be a constituent negation in syntax can, and sometimes must, be interpreted as a coordination of two clauses, i.e., the part of the sentence outside the coordinated constituent occurs only once, but is interpreted several times, once for each conjunct.

Sailer & Richter study cases in which two negative indefinite noun phrases are coordinated in a non-NC language, Standard German, as in example (16).

- (16) Alex hat keine Milch und keinen Zucker verrührt.
Alex has no milk and no sugar stirred
Bi-propositional reading: 'Alex didn't stir milk and Alex didn't stir sugar.'
Mono-propositional readings: 'Alex didn't stir milk and sugar together.'

They show that there are, in principle, two readings of such sentences: a bi-propositional reading and a mono-propositional reading, i.e., the sentence can be logically characterised by a conjunction of two negated sentences or by a single negated sentence that contains the union of the two conjuncts in the scope of negation. In the mono-propositional reading, we find the first type of one-to-many correspondence, in the bi-propositional reading, we find the second type.

In the last chapter of this volume, **Bargmann, Gehrke & Richter** consider a case of a one-to-many correspondence that relates a single syntactic form to various levels of interpretation at the same time. They discuss data with idioms expressing the idea of dying in English and German in which the idiom occurs with a modifier that seems to be interpreted literally rather than idiomatically. One of their examples is (17). Here, the idiom *kick the bucket* 'die' is used, but the

noun phrase *the bucket* contains a modifier, *golden*, which is incompatible with the idiomatic meaning of the expression.

- (17) Venezuela's Friend of the Working Class, Hugo Chávez, kicked the golden bucket with an estimated net worth of 2 billion dollars.

The authors argue that the sentence receives two types of interpretation simultaneously: an idiomatic interpretation (*Hugo Chávez died*) and a literal interpretation of part of the idiom (*Hugo Chávez had a golden bucket*). To make the two parts of interpretation fit together, the literal interpretation of the idiom part gives rise to an inference Hugo Chávez was rich. Taken together, sentence (17) expresses the idea that Hugo Chávez died and was very rich. **Bargmann et al.** provide a detailed discussion of naturally occurring examples of this type of intricate uses of idioms, in which an expression is used in its idiomatic meaning and, at the same time, part of the idiom is interpreted literally, like *the bucket* in (17).

It is the central aim of this book to make a strong case for accepting one-to-many correspondences as an essential property of the interfaces of natural language grammar. The individual chapters provide detailed studies of exemplary phenomena to see whether the analytic tools developed for handling them in one module of grammar are transferable to other modules, and to work on an integrated approach within a constraint-based grammar framework.

Abbreviations

Examples in this chapter follow the Leipzig glossing rules. We use the following additional abbreviations, in order of appearance: NE (French negative particle *ne*), CM (class marker), EVID1 (evidential 1), and RA (Persian particle *ra*).

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References

- AnderBois, Scott, Adrian Brasoveanu & Robert Henderson. 2015. At-issue proposals and appositive impositions in discourse. *Journal of Semantics* 32(1). 93–138. DOI: 10.1093/jos/fft014.
- Anderson, Stephen R. 1992. *A-morphous morphology*. Cambridge: Cambridge University Press.
- Bach, Kent. 1999. The myth of conventional implicature. *Linguistics and Philosophy* 22. 327–366.
- Barker, Chris. 2007. Parasitic scope. *Linguistics and Philosophy* 30(4). 407–444.
- Beck, Sigrid. 2006. Intervention effects follow from focus interpretation. *Natural Language Semantics* 14. 1–56.
- Bonami, Olivier. 2015. Periphrasis as collocation. *Morphology* 25. 63–110.
- Bonami, Olivier, Robert D. Borsley & Maggie Tallerman. 2016. On pseudo-non-finite clauses in Welsh. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the joint 2016 conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar*, 104–124.
- Bonami, Olivier & Berthold Crysmann. 2018. Lexeme and flexeme in a formal theory of grammar. In Olivier Bonami, Gilles Boyé, Georgette Dal, Hélène Giraudou & Fiammetta Namer (eds.), *The lexeme in descriptive and theoretical morphology* (Empirically Oriented Theoretical Morphology and Syntax), 175–202. Berlin: Language Science Press. DOI: 10.5281/zenodo.1402520.
- Bonami, Olivier & Gert Webelhuth. 2013. The phrase-structural diversity of periphrasis: A lexicalist account. In Marina Chumakina & Greville G. Corbett (eds.), *Periphrasis: The role of syntax and morphology in paradigms*, 141–167. Oxford: Oxford University Press.
- Bruening, Benjamin. 2006. Differences between the *wh*-scope-marking and *wh*-copy constructions in Passamaquoddy. *Linguistic Inquiry* 37(1). 25–49.
- Caballero, Gabriela & Alice C. Harris. 2012. A working typology of multiple exponence. In Ferenc Kiefer, Mária Ladányi & Péter Siptár (eds.), *Current issues in morphological theory. (Ir)regularity, analogy and frequency*, 163–188. John Benjamins.
- Chung, Sandra, William A. Ladusaw & James McCloskey. 1995. Sluicing and Logical Form. *Natural Language Semantics* 3(3). 239–282.

- Crysmann, Berthold & Olivier Bonami. 2016. Variable morphotactics in Information-based Morphology. *Journal of Linguistics* 52(2). 311–374. DOI: 10.1017/S0022226715000018.
- Culicover, Peter W. & Ray Jackendoff. 2005. *Simpler syntax*. Oxford University Press.
- den Besten, Hans. 1986. Double negation and the genesis of Afrikaans. In Pieter Muysken & Norval Smith (eds.), *Substrata versus universals in creole languages: Papers from the Amsterdam Creole Workshop*, 185–230. Amsterdam: John Benjamins.
- du Plessis, Hans. 1977. *Wh*-movement in Afrikaans. *Linguistic Inquiry* 8(4). 723–726.
- Egg, Markus. 2011. Underspecification. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An international handbook of natural language meaning*, 533–572. Berlin: de Gruyter.
- Embick, David & Rolf Noyer. 2007. Distributed Morphology and the syntax-morphology interface. In Gillian Ramchand & Charles Reiss (eds.), *The Oxford handbook of linguistic interfaces*, 289–324. Oxford: Oxford University Press.
- Fox, Danny & Howard Lasnik. 2003. Successive-cyclic movement and island repair: The difference between Sluicing and VP-ellipsis. *Linguistic Inquiry* 34(1). 143–154.
- Ginzburg, Jonathan & Ivan A. Sag. 2000. *Interrogative investigations. The form, meaning, and use of English interrogatives*. Stanford: CSLI Publications.
- Grice, Paul. 1975. Logic and conversation. In Peter Cole & Jerry L. Morgan (eds.), *Syntax and semantics*, vol. 3, 41–58. New York: Academic Press.
- Gutzmann, Daniel. 2013. Expressives and beyond: An introduction to varieties of use-conditional meaning. In Daniel Gutzmann & Hans-Martin Gärtner (eds.), *Beyond expressives: Explorations in use-conditional meaning* (Current Research in the Semantics Pragmatics-Interface (CRiSPI) 28), 1–58. Leiden: Brill. DOI: 10.1163/9789004183988_002.
- Halle, Morris & Alex Marantz. 1993. Distributed Morphology and the pieces of inflection. In Kenneth Hale & Samuel Jay Keyser (eds.), *The view from Building 20*, 111–176. Cambridge: MIT Press.
- Harris, Alice C. 2009. Exuberant exponence in Batsbi. *Natural Language and Linguistic Theory* 27. 267–303. DOI: 10.1007/s11049-009-9070-8.
- Harris, Alice C. 2017. *Multiple exponence*. Oxford: Oxford University Press.
- Hendriks, Herman. 1993. *Studied flexibility* (ILLC Dissertation Series 1995-5). Institute for Logic, Language & Computation, Amsterdam.

- Höhle, Tilman N. 2019. The *w- ...w*-construction. In Stefan Müller, Marga Reis & Frank Richter (eds.), *Beiträge zur deutschen Grammatik. Gesammelte Schriften von Tilman N. Höhle*, 2nd (Classics in Linguistics), 435–460. Originally published 2000. Berlin: Language Science Press. DOI: 10.5281/zenodo.2588369.
- Huitink, Janneke. 2012. Modal concord: A case study of Dutch. *Journal of Semantics* 29(3). 403–437. DOI: 10.1093/jos/ffr012.
- Jaggar, Philip. 2001. *Hausa*. Amsterdam: John Benjamins.
- Jespersen, Otto. 1917. *Negation in English and other languages*. Copenhagen: A.F. Høst & Søn.
- Jones, Michael Allen. 1988. Cognate objects and the Case-filter. *Journal of Linguistics* 24. 89–111.
- Källgren, Gunnel & Ellen F. Prince. 1989. Swedish VP-topicalization and Yiddish verb-topicalization. *Nordic Journal of Linguistics* 12(1). 47–58.
- Keenan, Edward L. 1992. Beyond the Frege boundary. *Linguistics and Philosophy* 15. 199–221.
- Kiparsky, Paul. 1985. Some consequences of lexical phonology. *Phonology Yearbook* 2. 83–136.
- Kiparsky, Paul. 2005. Blocking and periphrasis in inflectional paradigms. In Geert Booij & Jaap van Marle (eds.), *Yearbook of morphology 2004*, 113–135. Dordrecht: Springer.
- Kubota, Yusuke & Robert D. Levine. 2016. Gapping as hypothetical reasoning. *Natural Language and Linguistic Theory* 34(1). 107–156. DOI: 10.1007/s11049-015-9298-4.
- Lahm, David. 2016. Refining the semantics of lexical rules in HPSG. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the joint 2016 conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar, Polish Academy of Sciences, Warsaw, Poland*, 360–379. Stanford, CA: CSLI Publications.
- Link, Godehard. 1983. The logical analysis of plural and mass terms: A lattice-theoretical approach. In Rainer Bäuerle, Christoph Schwarze & Arnim von Stechow (eds.), *Meaning, use and interpretation of language*, 302–323. Berlin: de Gruyter.
- Liu, Mingya. 2012. *Multidimensional semantics of evaluative adverbs*. Vol. 26 (Current Research in the Semantics-Pragmatics Interface (CRiSPI)). Leiden: Brill.
- Lobeck, Anne C. 1995. *Ellipsis: Functional heads, licensing and identification*. New York: Oxford University Press.
- Massam, Diane. 1990. Cognate objects as thematic objects. *Canadian Journal of Linguistics* 35. 161–190.

- Matthews, Peter H. 1972. *Inflectional morphology. A theoretical study based on aspects of Latin verb conjugation*. Cambridge: Cambridge University Press.
- May, Robert. 1977. *The grammar of quantification*. MIT. (Doctoral dissertation).
- McCloskey, James. 2002. Resumptives, successive cyclicity, and the locality of operations. In Samuel David Epstein & T. Daniel Seely (eds.), *Derivation and explanation in the Minimalist Program*, 184–226. Oxford: Blackwell.
- Merchant, Jason. 2001. *The syntax of silence: Sluicing, islands, and the theory of ellipsis*. Oxford: Oxford University Press.
- Mittwoch, Anita. 1998. Cognate objects as reflections of Davidsonian event arguments. In Susan Rothstein (ed.), *Events and grammar*, 309–332. Dordrecht, Boston, London: Kluwer Academic Publishers.
- Moltmann, Friederike. 1995. Exception sentences and polyadic quantification. *Linguistics and Philosophy* 18(3). 223–280.
- Montague, Richard. 1974. The proper treatment of quantification in ordinary English. In Richmond H. Thomason (ed.), *Formal philosophy. Selected papers of Richard Montague*, 247–270. Yale: Yale University Press.
- Partee, Barbara H. & Mats Rooth. 1983. Generalized conjunction and type ambiguity. In Rainer Bäuerle, Christoph Schwarze & Arnim von Stechow (eds.), *Meaning, use and interpretation of language*, 361–383. Berlin: Walter de Gruyter.
- Pinkal, Manfred. 1999. On semantic underspecification. In Harry Bunt & Reinhard Muskens (eds.), *Computing meaning* (Studies in Linguistics and Philosophy), 33–55. Dordrecht: Kluwer Academic Publishers.
- Pollard, Carl & Ivan A. Sag. 1994. *Head-driven phrase structure grammar*. Stanford: CSLI Publications; The University of Chicago Press.
- Potts, Christopher. 2005. *The logic of conventional implicatures* (Oxford Studies in Theoretical Linguistics). Oxford: Oxford University Press.
- Prince, Alan & Paul Smolensky. 1993. Optimality theory: Constraint interaction in Generative Grammar.
- Richter, Frank. 2016. Cateogrematic unreducible polyadic quantifiers in Lexical Resource Semantics. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the joint 2016 conference on Head-Driven Phrase Structure Grammar and Lexical Functional Grammar, Polish Academy of Sciences, Warsaw, Poland*, 599–619. Stanford, CA: CSLI Publications. <http://csli-publications.stanford.edu/HPSG/2016/headlex2016-richter.pdf>.
- Spencer, Andrew. 2003. Morphology. In Mark Aronoff & Janie Rens-Miller (eds.), *The handbook of linguistics*, 213–237. Oxford: Blackwell.

- Stump, Gregory T. 1993. Position classes and morphological theory. In Geert E. Booij & Jaap van Marle (eds.), *Yearbook of morphology 1992*, 129–180. Dordrecht: Kluwer.
- Stump, Gregory T. 2001. *Inflectional morphology. A theory of paradigm structure* (Cambridge Studies in Linguistics 93). Cambridge: Cambridge University Press.
- Stump, Gregory T. 2006. Heterocclisis and paradigm linkage. *Language* 82(2). 279–322. DOI: 10.1353/lan.2006.0110.
- Thornton, Anna M. 2011. Overabundance (multiple forms realizing the same cell): A non-canonical phenomenon in Italian verb morphology. In *Morphological autonomy: Perspectives from Romance inflectional morphology*, 358–381. Oxford University Press. DOI: 10.1093/acprof:oso/9780199589982.003.0017.
- Thornton, Anna M. 2012. Reduction and maintenance of overabundance. A case study on Italian verb paradigms. *Word Structure* 5. 183–207.
- Thornton, Anna M. 2019. Overabundance in morphology. In *Oxford research encyclopedia of linguistics*. Oxford University Press.
- Tonhauser, Judith, David Beaver, Craig Roberts & Mandy Simons. 2013. Toward a taxonomy of projective content. *Language* 89(1). 66–109.
- van Gelderen, Elly. 2011. *The linguistic cycle: Language change and the language faculty*. Oxford: Oxford University Press.
- van Gelderen, Elly. 2013. The linguistic cycle and the language faculty. *Language and Linguistics Compass* 7. 233–250.
- Vicente, Luis. 2009. An alternative to remnant movement for partial predicate fronting. *Syntax* 12(2). 158–191. DOI: 10.1111/j.1467-9612.2009.00126.x.
- Zeijlstra, Hedde. 2004. *Sentential negation and negative concord*. Utrecht: LOT.
- Zeijlstra, Hedde. 2007. Modal concord. In *Proceedings of SALT 17*, 317–332. DOI: 10.3765/salt.v17i0.2961.