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Edited by Vyvyan Evans and Stéphanie Pourcel

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Vyvyan Evans
Stéphanie Pourcel
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Partonomic structures in syntax

Edith A. Moravcsik

1. The utility of positing partonomic structures

How do linguists formulate terms for grammatical rules? For an example, consider a rule of syntax:

(1) The adjective precedes the noun.

This rule has two logical components: the predicate "precedes", and the terms "adjective" and "noun" for which this predicate is said to hold. The conceptual tools involved in creating these terms are *segmentation* and *classification* (or categorization). Starting with sentences as wholes, the labels adjective and noun are based on the assumption that sentences can be segmented into words, and that some words within and across sentences are alike in some ways so that they can be placed into categories. Term formation is thus based on invoking the syntagmatic relation of *partonomy* (whole-part relations) and the paradigmatic relation of *taxonomy* (type-token relations).

In this paper, the rationale for the first of these two relations will be discussed: what kinds of partonomic relations are posited in syntax and why? The paper is a study in cognitive metalinguistics. "Cognitive" because it has to do with interpretations that the human mind imposes on reality; and pertaining to metalinguistics because it is about interpretations that the analyst imposes on language rather than those that speakers of a language impose on extralinguistic reality (on the latter, see for example Moltmann 1997).[1]

Why is it useful to posit partonomic relations? The short answer is that it facilitates generalizations. Partonomic interpretation can proceed in two directions: either an entity is assumed as given and we posit parts within it, or a set of entities is assumed to be given and we posit a whole that subsumes them as parts. We will label the two conceptual moves as analysis and synthesis, respectively. Let us now see how these concepts facilitate generalizations.

Analysis – breaking entities into parts – allows us to pinpoint similarities among entities that would otherwise seem different.

1. On the still young and developing field of cognitive metalinguistics and, more broadly, the cognitive science of science, see Grier (1988), Kertész (2004a, 2004b), Kertész and Rákosi (2005), and Rákosi (2005).

(2) The utility of partonomic analysis: Different wholes may have similar parts.

This is so in all domains of inquiry. For example, two different animal groups, such as birds and insects, are similar in that both may have wings; and different substances can be brought to common denominators by chemists and physicists if they are analyzed into smaller and smaller elementary parts. In phonology, linguists segment words into sounds for the same reason; for example, the words *crave* and *spin* are similar in that both start with a consonant cluster. And in syntax, the two sentences *Should I call you?* and *Never has Jack slept better* turn out to be similar when we break them into words: both contain the auxiliary before the subject.

Recognizing parts of a whole may also illuminate the nature of that whole. A whole may be well-formed or ill-formed due to its parts. This is borne out by auto mechanics identifying a part of a broken-down car as responsible for the problem and by doctors looking at a sick body and finding the part that causes the disease. Similarly in syntax: the ungrammaticality of the sentence *Jack did slept better* is due to the joint occurrence of the parts *did* and *slept*. The assumption behind such analyses is compositionality: the nature of the whole is determined in some way by the nature of the parts and their relationships.

These examples illustrate the utility of breaking larger entities into smaller ones. As mentioned above, partonomic analysis may alternatively start with a set of entities which are then synthesized into a single whole. The motivation for doing so is that even though the components are different, the wholes they form may be similar.

(3) The utility of partonomic synthesis: Different parts may form similar wholes.

This is the recognition that astronomers appear to act on when they group certain sets of diverse heavenly bodies into solar systems; when different sets of pathological symptoms are identified as pointing to the same disease; when phonologists recognize groups of different sounds as forming syllables; and when syntacticians say that different words may form the same type of phrase. For example, in the sentences *The new employees are quitting* and *They have escaped*, the different words *the new employee* and *they* form the same type of whole: a plural subject.

All in all, in partonomic analysis, larger things are analyzed into parts or smaller things are synthesized into wholes. Either way, partonomic analysis legitimizes what would otherwise be a paradox: one thing declared to be several things and several things declared as one thing. "One" and "more than one" are contradictory notions: on the face of it, something cannot he both one and many. But partonomic analysis allows us to re-state the paradox so that it is not contradictory any more: "one" can be "more-than-one" and "more-than-one" can be "one" if a whole consists of more than one part.

In Sections 2–5, we will discuss some examples of partonomy as a problem-solving tool in syntax. In Section 6, similar uses of partonomy in other sciences and in everyday thought will be cited.

2. Synthesis: Positing wholes for parts

Syntacticians posit wholes for parts when they hypothesize that words form phrases, clauses, sentences, paragraphs, and discourses.[2] In what follows, we will focus on phrases and clauses.

Arguments for phrases and clauses are known as "constituency tests" (cf. for example Radford 1981:34–78; McCawley 1988:55–66; Croft 2001:185–195). Although the term "constituency test" suggests that the goal is to establish constituents, the ultimate goal is to state generalizations; constituents are of interest only to the extent that they support rules. Thus, each constituent test is actually an appeal to a generalization that is facilitated by the assumption of a constituent.

The point of constituent tests is that certain assemblages of words act in concert: they act as if they were one. This "acting like one" is borne out in two basic ways: dependence among the words of the phrase and independence of the words of one phrase from the words of other phrases. Internal dependence within a syntactic phrase and external independence among syntactic phrases are manifested in various ways as shown in (4).[3]

(4) a. Internal dependence:
  (i) joint recurrence within and across sentences;
  (ii) joint non-occurrence (through replacement or omission) in a sentence;
  (iii) contiguity.
 b. External independence: joint occurrence as a sentence

These criteria and how the constituents they define facilitate syntactic rules are illustrated for the noun phrase in (5)–(9).

(5) Joint recurrence within and across sentences
Subject and object
 a. Rule with noun phrase not assumed:
  "What may serve as subject and object is *article and adjective and noun.*"
 b. Rule with noun phrase assumed:
  "What may serve as subject and object is *a noun phrase.*"

For example:
[The new students]$_{NP}$ *bought [an interesting book]*$_{NP}$.
[A large spider]$_{NP}$ *was crawling on [the newly-painted wall]*$_{NP}$.

2. For discussions of constituent structure in syntax and how they emerge in the course of language use, see Jakobson (1963), Lakoff (1987:283–285), Speas (ed.) (1990), Leffel and Bouchard (ed.) (1991), Langacker (1997, 1999), Bybee and Scheibman (1999), and the papers in Bybee and Hopper (ed.) (2001), especially those on pages 1–24, 229–428, and 449–470. For a brief overview, see Moravcsik, to appear. For the usefulness of partonomic analysis in understanding historical change in language and culture, see Enfield (2005:194–197).

3. In addition to syntactic criteria for phrasehood, there are also semantic, morphological, and phonological ones, the last including words forming a single stress or pitch group and manifesting phonological interaction other than those that occur across phrases. On the role of prosodic cues for grouping, see Hunyadi, to appear.

(6) Joint non-occurrence through replacement
   a. Rule with noun phrase not assumed:
      "What may be replaced by a pronoun is *article and adjective and noun.*"
   b. Rule with noun phrase assumed:
      "What may be replaced by a pronoun is *a noun phrase.*"

   For example:
   [The out-of-town guests]$_{NP}$ arrived and they left immediately.

(7) Joint non-occurrence through omission
   a. Rule with noun phrase not assumed:
      "What may be omitted under referential identity is *article and adjective and noun.*"
   b. Rule with noun phrase assumed:
      "What may be omitted under referential identity is *a noun phrase.*"

   For example:
   [The out-of-town guests]$_{NP}$ arrived and ___ left immediately.

(8) Contiguity
   a. Rule with noun phrase not assumed:
      "Words that must be contiguous are *article and adjective and noun.*"
   b. Rule with noun phrase assumed:
      "Words that must be contiguous are those belonging to *a noun phrase.*"

   For example:
   [The out-of-town guests]$_{NP}$ arrived.
   *The *arrived out-of-town guests.*

(9) Joint occurrence as a sentence
   a. Rule with noun phrase not assumed:
      "What may be an answer sentence to a question is *article and adjective and noun.*"
   b. Rule with noun phrase assumed:
      "What may be an answer sentence to a question is *a noun phrase.*"

   For example:
   Question: *Who arrived last night?*
   Answer: *[The out-of-town guests]$_{NP}$*

3. Problems with synthesis

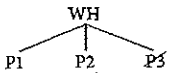
3.1 Complexity

While, as seen above, the assumption of phrases facilitates generalizations, it can also create problems. Two of these problems are complexity and inconsistency: phrases may turn out to be *complex*; and evidence for phrasehood may be *contradictory*.

Let us first consider complexity. A partonomy is simple if it involves minimal structure. In the diagrams of (10), WH stands for 'whole', P1, P2 etc. stand for parts; lines trace partonomic relations; complexities are crossed out.

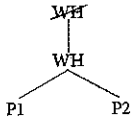
(10) Minimal partonomic structure:

(A) ONLY TWO PARTS
Each whole cootains only two sister-parts.



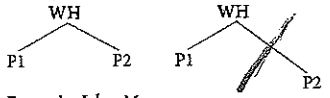
Example: *John and Mary*

(B) ONLY TWO LEVELS
Parts do not contain further parts.



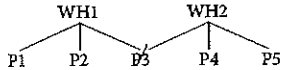
Example: *the dog*

(C) PARTS ARE EQUAL
Sister-parts are of equal rank.



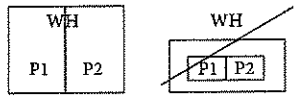
Example: *John, Mary*

(D) PARTS ARE UNIQUELY ASSIGNED TO WHOLES
Every part belongs to one and only one directly superordinate whole.



Example: *He left town.*

(E) THE WHOLE IS COMPOSITIONAL
The whole is compositional: its characteristics are predictable from the characteristics of the parts and their relations.



Example: *Bill was born in Chicago.*

Actual partonomic structures in syntax often deviate from one or more of these desiderata of simplicity. Here follow some examples of complex partonomies.

(11) Complex partonomic structures
(A) MORE THAN TWO PARTS
Example: *John, Mary, and Sue*

(B) MORE THAN TWO LEVELS
Example: *[two old [Japanese cars]] and [a new [one]]*

(C) PARTS ARE NOT EQUAL
Example: *walk fast*

(D) PARTS ARE NON-UNIQUELY ASSIGNED TO WHOLES
Example: *I expect him to leave town.*

(E) THE WHOLE IS NOT COMPOSITIONAL
Example: *Mary was born in London and Bill, in Chicago.*

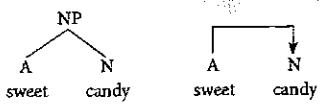
For example, while in He *left town* (10D), each word belongs to only one part of the sentence (a noun phrase, a verb, and a second noun phrase), in *I expect him to leave town* (11D), the word *him* seems to belong both to the main clause and to the subordinate clause. In (10E), *Bill was born in Chicago*, the meaning of the sentence is the sum of the meanings of the parts and their relations but in (11E) *Mary was born in London and Bill, in Chicago*, the verbal meaning 'was born' has no overt expression in the second clause.

Let us expand on one of the best-documented types of complexity in partonomic structure: the asymmetry of parts (C) in (11). Other than in coordinate structure, the parts of a syntactic phrase are never fully equal by token of the very fact that they bear different category labels, such as Adjective and Noun, or Verb and Adverb. But beyond this, there are also cross-categorial asymmetries within phrases: for example, nouns of noun phrases and verbs of verb phrases show similar behavior even though they belong to different categories: noun and verb (cf. Corbett et al. 1993; Croft 2001: 241–280).

Such cross-categorial asymmetries are borne out both by the selection and the ordering of syntactic constituents. First, given a phrase, one of its components may be able to stand by itself in the same context where the phrase occurs but other components cannot. Thus, in the noun phrase *brown dogs*, the noun is syntactically obligatory but the adjective is optional; and in verb phrases such as *run fast*, the verb is obligatory but the adverb is dispensable. Second, there is a crosslinguistic tendency for a language to morphologically mark (such as for case or agreement) either heads or dependants across different kinds of phrases (Nichols 1986). Third, languages show some tendency toward the uniform ordering of different kinds of constituents whose classes cut across word and phrase types. This fact has been interpreted differently, with the division being heads versus dependants (Vennemann 1973), or branching versus non-branching constituents (Dryer 1992), or mother-node-constructing versus non-mother-node-constructing constituents (Hawkins 1994). But whatever the common denominators posited for constituents that tend to be uniformly ordered in any one language, they highlight an asymmetry within phrases.

The recognition of the non-equality of phrase structure has given rise to dependency grammars which explicitly represent this asymmetry. In Richard Hudson's word grammar (1984, 1990), dependency relations among words are primary and the concept of wholes – phrases – is derivative. In this framework, the whole is implicit, defined as a head along with its dependants. The difference between the two representations is shown in (12).

(12) Phrases in constituent structure and in dependency grammar



The examples seen so far (cf. (11)) illustrated one of the two types of problems that arise when wholes are posited: complexity. A second problem that arises is contradictory evidence, which we turn to next.

3.2 Inconsistency

A partonomic structure is consistent if its parts act as a whole by all the relevant criteria listed in (4) above. An example is *running races:* as shown in (13), this is a phrase by all four criteria.

(13) a. joint recurrence in and across sentences
Example: *Running races is exciting but Joel dislikes running races.*
Running races is difficult.

b. joint non-occurrence through replacement or omission
Example: *Running races is exciting but Joel dislikes it.*
Running races is exciting but ___ difficult.

c. contiguity
Example: *Running races is exciting.*
**Running is exciting races.*

d. occurrence as a sentence
Example: Question: *What is Joel's favorite activity?*
Answer: *Running races.*

In contrast, a partonomic structure will be said to be inconsistent if its parts act as a whole by some criteria but not by others.[4] This is frequently so in syntax (cf. Croft 2001: 185–197). Here are two examples.

(14) a. A set of words makes a phrase by joint replaceability but not by contiguity:
The man is a friend of yaurs who came to see me.
He is from Chicago.
**He is a friend of yaurs who came to see me.*

b. A set of words makes a phrase by joint replaceability but cannot stand as a sentence:
Bill bought an old Japanese car and Jill bought a new one.
Question: *What did Jill buy?*
Answer: **Japanese car.*

In the two parts of Section 3, we have seen instances of complex and inconsistent partonomies. Let us now turn to the question of how they are addressed in syntactic description.

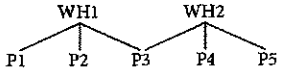
4. The concepts of complexity and inconsistency are not fully distinct: complexities may be viewed as inconsistencies relative to the requirement of simple partonomies.

4. Solving problems of synthesis with analysis: Positing parts for wholes

4.1 Eliminating complexity

As noted above (cf. (11) (D)), one example of complex partonomic structures involves overlapping constituents. The problem is schematized in (15).

(15) Overlapping constituents

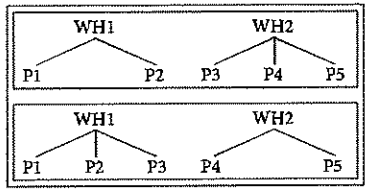


For example, in *I expect him to leave home*, P3 is *him*.

One solution involves teasing out two separate levels, or layers, of this structure so that each is free of overlapping constituency: on each level, every part belongs to only one whole. We will term this kind of partonomic analysis *layering*.

Layering is based on the idea that things can be viewed from different angles and depending on the point of view, their structure may be different. Partonomic structure appears complex only as long as the different aspects of the construction are not separated; when they are, each of the resulting structures is simple. Layering is schematized in (16), where each boxed structure represents a separate layer.

(16) Eliminating overlapping constituents by layering



The layering of complex syntactic structures has taken various forms in the literature (cf. Moravcsik 2006, especially Chapters 1 and 2). Minimal layering involves a partonomic diagram with *two faces*. It is illustrated by the example of long-distance verb-object agreement in Hungarian (É. Kiss 1987: 224–273).

In this language, transitive verbs agree not only with the subject (in person and number) but also with the direct object (in definiteness and person). Consider the main verb in (17).

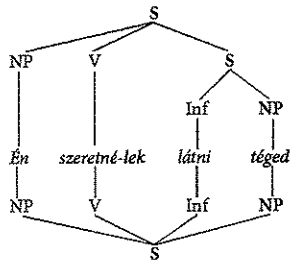
(17) *Én szeretné-lek látni téged.*
I would:like-$S1_S$:$S2_O$ to:see you_s
'I would like to see you.'

First, it shows agreement in number and person with the subject as expected. Second, it also shows object agreement but there is a problem here: the main verb agrees not with its own object – which would be the clause 'to see you' – but with the object of that clause: 'you'. Agreement is thus non-local, or long-distance: agreement controller and agreement target are not clause-mates as they usually are.

This agreement pattern indicates overlapping constituency: the main clause and the subordinate clause overlap in the subordinate object 'you'. On the one hand, this constituent is part of the subordinate clause as shown by the fact that it is selected and case-marked by the subordinate verb and ordered relative to it. On the other hand, this constituent is also part of the main clause in that the main verb agrees with it and in that it may alternatively be ordered into focus position preceding the main verb, as in *Én téged szeretnélek látni*.

Considering the contradictory evidence, É. Kiss proposes a bifacial tree. The lower face shows the sentence as biclausal with the object belonging to the subordinate clause. The upper face shows the sentence as monoclausal, thus legitimizing the agreement of the verb with the object, with locality of agreement upheld. A simplified form of the proposed tree structure is shown in (18).

(18) Layering into two faces of a structure



In this account, a single sentence structure is layered into two structures, both of which are simultaneously present in the syntactic derivation. Other varieties of layering assume multiple levels where one level is an input to a rule creating another level. ~~In some accounts, the levels are in the same grammatical component.~~ ~~The first kind~~ is documented in the long history of transformational generative grammar where different levels of syntactic structure have been assumed. For an example of multiple syntactic levels resolving complex partonomies, consider another instance of overlapping constituency known as raising constructions. The sentence mentioned earlier – *I expect **him** to leave home* – is an example and so is (19).

(19) *Bill expects her to pass the exam.*

Just as in the Hungarian case, a noun phrase seems to be part of both the main clause and the subordinate clause. Evidence for *her* being part of the subordinate clause is the selectional relations it bears to the subordinate verb. Evidence for it belonging to the main clause is case marking: the objective case of *her* is assigned by the main verb *expects*. The solution consists in the sentence representation layered into two levels: deep structure and surface structure. On each level, the noun phrase is part of only one clause (Postal 1974).

(20) Layering into two syntactic structures
Surface structure:
[Bill expects her to pass the exam.]$_S$

Underlying structure:
[Bill expects [that she passes the exam.]$_S$*]*$_S$

The above examples show how layering a complex structure into two simple structures can resolve some *complexities* of partonomic structure – in particular, that of overlapping parts. Of the two anomalies noted in Section 3 – complexity and inconsistency – complexity is less of a problem: the scientific criterion that it violates is simplicity, which is basically an esthetic criterion. The larger problem is inconsistency since it conflicts with the requirement that scientific accounts be free of contradictions.

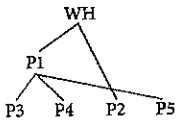
The same idea of layering problematic structures into two non-problematic ones that has been evoked to resolve complexities has been resorted to for resolving *inconsistencies* in constituent structures. A prime example is discontinuous constituents.

4.2 Eliminating inconsistency

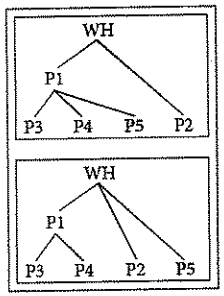
The term discontinuous constituency refers to an assemblage of words that form a constituent by some criteria but not by the criterion of contiguity (Huck and Ojeda (ed.) 1987; Bunt and Horck (ed.) 1996; Croft 2001: 186–188). An example was seen in (14) (a) above: in the sentence *The man is a friend of yours who came to see me*, the words *the man ... who came to see me* form a whole by the criterion of replacement but they are discontinuous.

Discontinuity has been a central problem in generative grammar, with the solution being distinct levels of syntactic representation connected by movement rules. An example of discontinuity and its solution by layering is schematized in (21).

(21) a. Discontinuity



b. Eliminating discontinuity by layering



For example, the sentence *The letter came that you were waiting for* can be analyzed as in (22).

(22) Layering into two syntactic structures
Surface structure:
The letter came that you were waiting for.

Underlying structure:
The letter that you were waiting for came.

5. Layering in cognitive grammar

In approaches that assume multiple syntactic representation to eliminate complex or inconsistent partonomic structures, there has been a continuing concern to motivate the two syntactic levels into which such structures are sliced. Several mechanisms were designed to address this issue.

One type of attempt has been aimed at *reducing the differences* between the two levels. This is the thrust of Joseph Emonds' Structure Preserving Constraint; of Noam Chomsky's Projection Principle; and of the requirement posited in some versions of generative grammar that derivations be monotonic – i.e. allowing additions to a structure but not diminishing it or replacing it.

The other type of attempt has been to *independently motivate* the two structures. Multiple syntactic levels have been recognized in several frameworks – including the Minimalist Program proposed by Noam Chomsky – as arbitrary. A layering that is, however, multiply-motivated is one where the layers are meaning and syntactic form. In Sadock's Autolexical Grammar (1991) and in Langacker's Cognitive Grammar (e.g. 1997, 1999), discontinuity is accounted for by slicing sentence representations into a meaning level and a form level; or, in Langacker's framework, into a conceptual level and a phonological level.

(23) Layering into form structure and meaning structure:
Form:
The letter came that you were waiting for.

Meaning:
The letter that you were waiting for came.
(Langacker 1997: 25)

In these frameworks, overlapping phrases and discontinuous phrases are re-analyzed as regular rather than exceptional: their apparent complexity or inconsistency is the result of the analyst failing to discern two distinct aspects of them: form and meaning. Mismatches between these two are expected since meaning and form are independently known to be distinct kinds of entities. The same conceptual distinction is seminal in Croft's Radical Cognitive Grammar as well: semantics and syntax are seen as independent entities (e.g. Croft 2001: 108).

In such approaches, the conflict of a single entity – syntactic structure – being complex or outright self-contradictory simply does not arise. In fact, the notion of syntactic constituent structure as an autonomous layer is explicitly eliminated by Langacker (2005: 103–112). In his framework, partonomic structures exist only in pronunciation and in conceptualization. Whether phonological and conceptual partonomies are entirely free of complexities and inconsistencies of the sort surveyed above remains to be seen as studies in cognitive grammar continue to evolve.

6. Partonomy as a ubiquitous cognitive tool

As noted in Section 1, the paradoxical relationship between 'one' and 'more than one' has been a central issue not only in linguistics but in science in general, in philosophy, and even in theology. Are the Father, the Son, and the Holy Ghost one or more than one? The concept of the Trinity, first conceived by Tertullian around 200 AD, has been accepted by some theologians as consistent with monotheism while rejected by others as a sign of leaning towards polytheism. Tertullian's own analysis is *"tres personae, una substantia"*, which may perhaps be interpreted as invoking partonomic structure for solving the paradox: three persons being parts of the single substance.

Some examples of partonomic structure in science have already been cited in Section 1.[5] The most prominent use of partonomy in science is analysis of wholes into parts – a basic tool in physics, biology, sociology, and other fields. Although segmenting things into parts is a dominant methodology in science, the opposite also occurs: positing larger wholes for sets of individual objects. As mentioned earlier, this is what happens when individual astronomical objects are subsumed under larger wholes such as solar systems and galaxies; or when individual symptoms are identified as parts of a single disease.

Analysis of wholes into parts is also fundamental to ordinary people's perception and interpretation of the world. It is present when a child takes apart a toy car. The relation between a whole and a part is known by children very early – earlier than the somewhat parallel relation between type and token (Markman 1989: 161–233). For example, children learn that oak is part of the forest before they learn that it is a subtype of trees.

The reverse – creating wholes for parts, called chunking in the psychological literature (cf. MacWhinney 2005: 91–92) – is similarly ubiquitous as a general human tool of dealing with complexity. Individual digits of telephone numbers, credit card numbers, and social security numbers are commonly re-interpreted as sequences of larger units. Gleitman (1981) shows how chunking is an aid in verbal memory and in problem solving (288–289, 319–324). In their classic study, William Bryan and Noble Harter (1899) demonstrated how the acquisition of the skills of a telegrapher decoding incoming messages was based

5. For general analyses of part-whole relations and how they figure in scientific and everyday arguments, see Lerner (ed.) (1963), Husserl (1970) (especially Volume II, Investigation III), Winston, Chaffin and Herrmann (1987), Kertész and Rákosi (2005), Varzi no date, and Burkhardt, Seibt and Imaguire (eds) (to appear).

on what they called "a hierarchy of habits": first learning to decode syllables, then words, then phrases, then sentences. Herbert Simon provides an evolutionary explanation for the hierarchic – part-whole – structure of the world and/or for the fact that humans analyze it in this manner (Simon 1996: 183–216).

The criteria that are used for wholes in science and in everyday thinking – internal dependence and external independence – are similar to those used in syntactic description. As we saw above, one criterion for parts forming a whole is contiguity. The general expectation that parts of a whole be adjacent is borne out in human perception in general. For example, Max Wertheimer (1938) points out that one factor involved in the natural grouping of both visual and auditory stimuli is proximity: people tend to unite things that are proximate more than those that are not. He calls it the Law of Proximity (cf. also Hunyadi, to appear). Another, related principle of Wertheimer's is "the Factor of Uniform Destiny": elements that cohere are shifted together. This criterion evokes generative grammar's criterion of joint movability for constituents. The zoologist Jacob von Uexhuell (1921: 7) similarly states: "Ein Gegenstand ist was sich zusammen bewegt." ('An object is made up of whatever moves together.')

Let us now turn to partonomic complexities and inconsistencies. Complex and inconsistent partonomic patterns are frequent in scientific thinking and in everyday thought. Two examples of rampant complexity are the asymmetry of parts and the lack of compositionality.

Things are commonly perceived as having *asymmetric parts*. As Richard Hudson has pointed out in some of his writings (e.g. 1984: 38) and has been amply documented by Barbara Tversky (1990), people perceive wholes as consisting of more representative and less representative components, such as house and garage, or head and trunk.

Scientists, just as syntacticians, struggle with complex partonomic structures, such as *lack of compositionality*. In systems thinking, it is recognized that wholes may be more than the sum of their parts and relations (cf. Hookway 2000). Physicist Fritjof Capra provides a concrete illustration of non-compositionality in the physical world in the following passage (Capra 1996: 28–29):

> At each level of complexity, the observed phenomena exhibit properties that do not exist at the lower level. For example, the concept of temperature, which is central to thermodynamics, is meaningless at the level of individual atoms, where the laws of quantum theory operate. Similarly, the taste of sugar is not present in the carbon, hydrogen, and oxygen atoms that constitute its components. In the early 1920s, the philosopher C. D. Broad coined the term 'emergent properties' for those properties that emerge at a certain level of complexity but do not exist at lower levels.

In everyday thinking, too, the concept of non-compositionality is a recurrent theme; the phrase "the whole is more than the sum of its parts" is frequently used in everyday parlance.

As we saw above, partonomic analysis – splitting things into parts – can be a tool of conflict resolution in syntactic description. It has a similar role in how we come to terms with the world's complexities and contradictions in general. This is borne out in the ways people and societies deal with conflict: countries that have internal incongruities are split

into two and so are political parties, dissenting religions, and conflicted marriages. In each case, conflict within a single entity is solved by splitting that entity so that each of the resulting units is itself free of conflicts (cf. Husserl 1970: 754–759).

How partonomic analysis is used in everyday thinking for resolving contradictions is well illustrated in a study by Sharpe, Eakin, Saragovi and Macnamara 1996. The purpose of this research was to see how people come to grips with contradictions. The subjects were 40 undergraduates; they were instructed to provide a free response to a question in half a page or less. The question had to do with the following situation. A student asks her professor whether her term paper is good. The professor pauses and says "Yes and no" – a contradictory response. The question posed to the subjects was this: "Can you make sense of this answer? If so, please explain how." The results showed that appealing to partonomic structure was the dominant strategy: 97.5% of the subjects said that part of the paper must have been good and part of it bad. A similar experiment with 24 children between 3;1 and 4;2 showed similar results. This study illustrates that people resolve a contradiction by splitting the conflicted object into two parts, each internally consistent.

All in all, partonomic analysis is a basic conceptual tool in how people perceive and interpret the world and it forms a common link between linguistics, general scientific theorizing and everyday human thinking.

7. Conclusions

This paper argued that partonomic analysis – the assumption of wholes and parts – is a useful device in syntactic description for two reasons. First, "vertical" partonomy – building wholes out of the words of a sentence – facilitates generalizations but often at the price of creating complexities and inconsistencies. Second, another application of partonomy, layering – i.e. "horizontal" slicing – helps accommodate these problems. As was seen, complexities such as overlapping constituents may be solved by layering sentence representations into two simultaneous faces or into representations on different levels in syntax or in different components. Similarly, partonomic inconsistencies such as discontinuous constituency may be solved by assuming different levels of representation. The case studies revealed that several of the well-known central theoretical constructs posited in syntactic description boil down to various applications of partonomy.

Furthermore, we have seen that partonomic synthesis and analysis are ubiquitous conflict-resolving conceptual tools in science and in everyday thinking.

Contemplating the essence of categorization, Cecil Brown defines a category as resulting from "the treatment of two or more distinguishable entities *as if they were the same*" (emphasis added; Brown 1990: 17). An analogous description holds for creating partonomies: it is treating two or more entities *as if they were one*; or, conversely, treating a single entity *as if it were more than one*. Both taxonomy (categorization) and partonomy legitimize what would otherwise appear to be self-contradictory notions. Taxonomy tackles an apparent qualitative inconsistency: that two things can be both the same and different.

Partonomy tackles a quantitative conflict: that two things can be both many and one.[6] Both relations thus serve as crucial conceptual tools in interpreting the world, including, as this paper attempted to show for partonomy, syntacticians interpreting langnage structure.

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References

Brown, C. H. 1990. A survey of category types in natural language. In *Meanings and Prototypes*, S. L. Tsohatzidis (ed.), 17–47. London: Routledge.
Bryan, W. L. & Harter, N. 1899. Studies on the telegraphic language. The acquisition of a hierarchy of habits. *The Psychological Review* VI (4): 345–375.
Bunt, H. & van Horck, A. (eds). 1996. *Discontinuous Constituency*. Berlin: Mouton de Gruyter.
Burkhardt, H., Seibt, J. & Imaguire, G. (eds). To appear. *The Handbook of Mereology*.
Bybee, J. & Hopper, P. (eds). 2001. *Frequency and the Emergence of Linguistic Structure*. Amsterdam: John Benjamins.
Bybee, J. & Scheibman, J. 1999. The effect of usage on degrees of constituency: The reduction of *don't* in English. *Linguistics* 37 (4): 575–596.
Capra, F. 1996. *The Web of Life*. New York: Doubleday.
Corbett, G. G., Fraser, N. M. & McGlashan, S. (eds). 1993. *Heads in Grammatical Theory*. Cambridge: Cambridge University Press.
Croft, W. 2001. *Radical Construction Grammar. Syntactic Theory in Typological Perspective*. Oxford: Oxford University Press.
Dryer, M. 1992. The Greenbergian word order correlations. *Language* 68: 81–138.
É. Kiss, K. 1987. *Configurationality in Hungarian*. Budapest: Akadémiai Kiadó.
Enfield, N .J. 2005. Areal linguistics and Mainland Southeast Asia. *Annual Review of Anthropology* 34: 181–206.
Gleitman, H. 1981. *Psychology*. New York: Norton.
Grier, R. N. 1988. *Explaining Science. A Cognitive Approach*. Chicago: University of Chicago Press.
Hawkins, J. A. 1994. *A Performance Theory of Order and Constituency*. Cambridge: Cambridge University Press.
Hookway, C. 2000. Holism. In *A Companion to the Philosophy of Science*, W. H. Newton-Smith (ed.), 162–164. Oxford: Blackwell.
Huck, G. J. & Ojeda, A. E. (eds). 1987. *Discontinuous Constituency. Syntax and Semantics*, Volume 20. Orlando: Academic Press.
Hudson, R. 1984. *Word Grammar*. Oxford: Blackwell.
Hudson, R. 1990. *English Word Grammar*. Oxford: Blackwell.
Hunyadi, L. To Appear. Grouping, the cognitive basis of recursion in language.
Husserl, E. 1970. *Logical Investigations*. New York: Humanities Press.

6. For parallels between taxonomy and partonomy, see Tversky (1990).

Jakobson, R. 1963. Parts and wholes in language. In *Parts and Wholes, The Hayden Colloquium on Scientific Method and Concept*, D. Lerner (ed.) 157–162. New York: The Free Press of Glencoe.
Kertész, A. 2004a. *Cognitive Semantics and Scientific Knowledge. Case Studies in the Cognitive Science of Science*. Amsterdam: John Benjamins.
Kertész, A. 2004b. *Philosophie der Linguistik. Studien zur naturalisierten Wissenschaftstheorie*. Tübingen: Gunter Narr.
Kertész, A. & Rákosi, C. 2005. Whole-part and part-whole inferences in generative and cognitive linguistics. *Acta Linguistica* 52 (2–3): 221–280.
Lakoff, G. 1987. *Women, Fire, and Dangerous Things. What Categories Reveal about the Mind*. Chicago: University of Chicago Press.
Langacker, R. W. 1997. Constituency, dependency, and conceptual grouping. *Cognitive Linguistics* 8 (1): 1–32.
Langacker, R. W. 1999. Conceptual grouping and constituency. In *Grammar and Conceptualization*, R. W. Langacker (ed.), 147–170. Berlin: Mouton de Gruyter.
Langacker, R. W. 2005. Construction Grammars: cognitive, radical, and less so. In *Cognitive Linguistics: Internal Dynamics and Interdisciplinary Interaction*, F. J. Ruiz de Mendoza Ibanez & M. Sandra Pena Cervel (eds), 101–159. Berlin: Mouton de Gruyter.
Leffel, K. & Bouchard, D. (eds). 1991. *Views on Phrase Structure*. Dordrecht: Kluwer.
Lerner, D. (ed.). 1963. *Parts and Wholes, The Hayden Colloquium on Scientific Method and Concept*. New York: The Free Press of Glencoe.
MacWhinney, B. 2005. New directions in the competition model. In *Beyond Nature-Nurture. Essays in honor of Elizabeth Bates*, M. Tomasello & D. I. Slobin (eds), 81–110. Mahwah, NJ: Erlbaum.
Markman, E. M. 1989. *Categorization and Naming in Children. Problems of Induction*. Cambridge, MA: MIT Press.
McCawley, J. D. 1988. *The Syntactic Phenomena of English*. Volume I. Chicago: University of Chicago Press.
Moltmann, F. 1997. *Parts and Wholes in Semantics*. New York: Oxford University Press.
Moravcsik, E. A. 2006. *An Introduction to Syntactic Theory*. London: Continuum.
Moravcsik, E. To Appear. Part-whole relations in syntax. In *The Handbook of Mereology*. H. Burkhardt, J. Seibt & G. Imaguire (eds).
Nichols, J. 1986. Head-marking and dependent-marking languages. *Language* 62 (1): 56–119.
Postal, P. 1974. *On Raising. One Rule of English and Its Theoretical Implications*. Cambridge, MA: MIT Press.
Radford, A. 1981. *Transformational Syntax. A Student's Guide to Chomsky's Extended Standard Theory*. Cambridge: Cambridge University Press.
Rákosi, C. 2005. *Nyelvészet és Argumentációelmélet*. [Linguistics and Argumentation Theory]. Debrecen: DE Kossuth Egyetemi Kiadó.
Sadock, J. M. 1991. *Autolexical Grammar. A Theory of Parallel Grammatical Representations*. Chicago: University of Chicago Press.
Sharpe, D., Eakin, L., Saragovi, C. & Macnamara, J. 1996. Resolving apparent contradictions: Adults' and preschoolers' ability to cope with non-classical negation. *Journal of Child Language* 23: 675–691.
Simon, H. A. 1996. *The Sciences of the Artificial*. Cambridge, MA: MIT Press.
Speas, M. (ed.) 1990. *Phrase Structure in Natural Language*. Dordrecht: Kluwer.
Tsohatzidis, S. L. (ed.) 1990. *Meanings and Prototypes*. London: Routledge.
Tversky, B. 1990. Where partonomies and taxonomies meet. In *Meanings and Prototypes*, S. L. Tsohatzidis (ed.), 334–344. London: Routledge.
Uexhuell, J. von. 1921. *Umwelt und Innenleben der Tiere*. Berlin: Springer.
Varzi, A. C. No Date. Mereology. In *Stanford Encyclopedia of Philosophy*. (internet).

Vennemann, T. & Nierfeld, G. 1973. Explanation in syntax. In *Syntax and Semantics*, Volume 2, J. P. Kimball (ed.), 1–50. New York: Seminar Press.
Wertheimer, M. 1938. Laws of organization in perceptual forms. In *A Source Book of Gestalt Psychology*, W. D. Ellis (ed.), 71–87. New York: Harcourt, Brace and Company.
Winston, M. E., Chaffin, R. & Herrmann, D. 1987. A taxonomy of part-whole relations. *Cognitive Science* 11: 417–444.