

# Syntax is Mereological

David Adger  
Queen Mary University of London

CRISSP Lectures Outline  
June 2022

## Abstract

This series of lectures explores a new way of conceptualizing phrase structure, replacing the set-theoretic view of phrase structure derived by Merge with a mereological one based on part-whole relations. I argue that the mereological perspective provides a more restrictive theory, though it is equally as simple in its basis. I explore consequences for the shape of derivations and the scope of multidominance, for locality and successive cyclicity, for quantifier scope and anaphoric binding, for feature-checking and for the possibility of the reduction of movement and Agreement to non-local parthood, arguing that the mereological approach as a whole is theoretically and empirically advantageous.

## 1 Syntactic Objects are not Sets

Minimalist syntax rests on an assumption that phrase structure is fundamentally set-theoretic: Merge builds sets. One motivation for this assumption is that linear order does not seem to be part of phrase-structure and sets, unlike strings, do not contain information about linear order. The other major motivation is conceptual: binary set formation has a claim on being simple, a minimal extension on the core set-theoretic notion of member-of. In these lectures I subject this cluster of assumptions to some critique, and propose, instead, that phrase structure is fundamentally mereological and that the basic operation that builds phrase structure creates part-whole structures (mereological objects), not sets. Like sets, mereological objects have no linear dimension, and the part-of relation is as capable of acting as a primitive as is the member-of relation, as shown many years ago by Goodman and others

(Coitnoir and Varzi 2021 for discussion). I suggest that taking part-of as the primitive relation opens up some new ways of looking at some basic issues in phrase structure theory that are an improvement over the set-theoretic approach.

I define a basic function of mereological object fusion (Fuse) that takes two objects  $x$  and  $y$  and creates a new object  $z$ :  $z$  is exactly like  $y$  except that it has  $x$  as a (proper) part (I use  $<$  here for (proper) part-of):

(1)  $\text{Fuse}(x,y) = \text{the object } z, \text{ exactly like } y, \text{ except } x < z.$

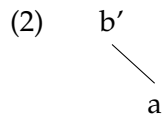
I show that Fuse is no more complex than Merge. Both are binary operations; both build a new object; both add one kind of relation (member-of vs part-of); neither involve linear order; Fuse creates an asymmetry between its arguments (one becomes part-of the other); Merge creates an asymmetry between the constructed object and its arguments (the 'contains' relation). Unlike member-of, however, part-of is transitive, so no special definition of 'term' is required over and above the core system. Although Fuse is at least as 'simple' as Merge, they result in quite different theories of phrase structure.

## 2 A Mereological Phrase Structure

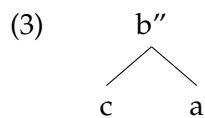
I show that Fuse generates Brody-style telescoped extended projections directly (as opposed to via set-theoretic means, as I did in Adger 2013). It also opens up a new way of understanding the structure of syntactic objects as involving parthood relations in mereological dimensions. Dimensions restrict transitivity of parthood: a heart is part of a person, and a person may be part of an orchestra, but that does not entail that a heart is part of an orchestra in the same way that it is part of a person. This is because the heart is part of the person in the dimension of body-parts, while a person is part of an orchestra in the dimension of role parts. A dimension, then, is some property by virtue of which something is understood to be part of something else, and transitivity holds within but not across dimensions (e.g. Rescher 1955). I will make use of this relativization of parthood to dimension for phrase-structure theory in the following way.

If  $x$  is the first object Fused into  $y$ , it is said to be a 1-part of  $y$  (a part of  $y$  in the 1st dimension); the 1st dimension, I will suggest, is to be interpreted syntactically as the extended projection complement relation. If  $z$  is Fused into  $y$ , where  $y$  already has a 1-part,  $z$  is then a 2-part of  $y$  (a part of  $y$  in the second dimension). The second dimension is interpreted syntactically as the

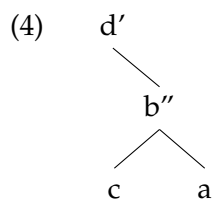
specifier relation. So taking a and b as basic objects, the fusion of a into b is a new object b', exactly like b except that it has a as a 1 part. If we slope the 1-part relation to the right, we have:



If we now fuse a new object c into b', we create a new object b'', exactly like b', except that it has c as a 2-part. If we slope 2-parts to the left, we have:

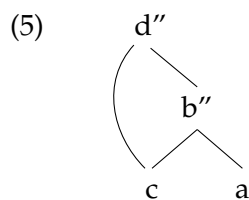


We can then, of course, recurse, so that b'' could fuse into a new basic object d, giving a new object d' with b'' as a 1-part:



Dimensionality is not independently stipulated: it is read off of the order of Fuse operations and is fixed at Fuse (so objects cannot change their dimensionality: if something is first Fused it cannot be second Fused and vice versa). This system forces DP and CP arguments to be introduced as 2-parts (specifiers) since the 1st dimension is reserved for extended projection relations.

Now, if x is a part of y in some dimension, that does not logically preclude it from being part of some z in that same dimension as well. In (4), c is a 2-part of b'', and b'' itself is a 1-part of d'. Nothing precludes Fusing c into d', giving an object d'' exactly like d', except that c is a 2-part of d'':



Parthood then can be non-local, and non-local syntactic dependencies like movement or Agree can be understood as parthood. This gives a system

which looks somewhat like multi-dominant approaches to syntax, such as Engdahl's (1986) Phrase Linking Grammars, or, at a further remove, the minimalist theories of Gärtner 1997, Citko 2005, etc.). However, the system is quite restricted compared to these approaches. Given that dimensionality is fixed, a specifier cannot move to become a complement within an extended projection (since a 2-part would then become a 1-part) and the complement within an extended projection cannot move to become a specifier (since a 1-part would become a 2-part, ruling out rollup derivations in a way quite different to that proposed in Adger 2013).

### 3 Locality

The new system has a range of consequences for how phrase structure is organised, many of which turn on the idea that the part-of relation is transitive within, but not across dimensions. The main implications I'll explore in the lectures involve a simplification of the general theory of locality, which can be stated as a condition on the computation which determines which objects from previous computations are available as arguments of Fuse. I define this in terms of workspaces as part of the 'memory capacity' of Fuse, but it has the following consequence:

(6) Locality: a 2-part of  $x$  can be a 2-part of  $y$  just in case  $x$  is a 1-part of  $y$ .

In other words, non-local syntactic dependencies like movement or Agree are possible only between specifiers in an extended projection. This has the effect of restricting the kinds of structures Fuse can build, including when non-local part-of relations (movement/Agree) are possible.

As stated, Locality seems too strict. However, it turns out that transitivity of parthood loosens this strictness in just the right cases to allow dependencies like movement: if  $x$  is a 2-part of a 2-part of  $y$ , then, given that parthood is transitive within a dimension,  $x$  is a 2-part of  $y$ . That will then allow  $x$  to be a 2-part of some  $z$ , as long as  $z$  is a 1-part of  $y$ , satisfying Locality. The upshot is that it is possible to move from the specifier of a specifier.

This theory of locality delivers a purely geometric view of 'edges', since if some  $x$  is not a 2-part of  $y$ , it cannot be a 2-part of anything  $y$  is 2-part of, and hence cannot, given Locality, enter into any higher dependency. So the system will allow 'extraction' (non-local parthood) from the specifier of a DP or CP which is itself a specifier, but will not allow extraction from a position inside the DP or CP, since such a position will not, by transitivity, be a 2-part of the DP/CP. The standard versions of successive cyclicity follow with no

appeal to phases.

Fusion constrained by Locality also rules out sideways movement/parallel merge in quite a different way to either that proposed in Adger (2017) or in Chomsky (2022). Parallel Merge involves Merge to some non-c-commanding object, but c-command is a side effect of Locality (since non-local parthood is between specifiers of an extended projection), so Fusion of ‘unconnected’ objects is impossible. The system also opens up some new ways of thinking about a number of empirical locality facts, especially extraction from subjects and from specifiers of CP. These are usually assumed to be impossible but the mereological system will allow them and I argue that what goes wrong in these cases is not the syntax per se, but the mechanisms that calculate the spellout of the complex object. I explore whether it is possible to reinterpret Kayne’s (1984) connectedness analysis of parasitic gaps in this way too.

## 4 Further Explorations

The transitivity of parthood also has implications for scope and for what is usually thought of as feature checking.

In terms of scope, it’s well known that quantifiers in specifiers of specifiers can have wide scope over their domain (*every author<sub>1</sub>’s agent despises her<sub>1</sub>*), which, in this system, follows rather directly from the transitivity of 2-parthood, but requires the development of a notion of scope in terms of parthood rather than c-command.

The ‘wh-checking’ relation between a high C and the phrase x that it Agrees with involves, in the mereological approach, an element embedded in the specifier of x, again determinable by the transitivity of 2-parthood. This predicts that it is the edge of a specifier that contains the element responsible for feature matching (the ‘goal’) and I argue that conditions on the spell-out of parts which are distributed across the structure can provide some traction on issues of pied-piping (since the system forces something like the approach of Cable 2010). I explore what this consequence would mean for Agree dependencies more generally, given that in the mereological system Agree and movement reduce to the same thing (cf. Kayne 2005, Hornstein 2009).

## References

- Adger, David. 2013. *A Syntax of Substance*. Cambridge, MA: MIT Press.
- Adger, David. 2017. A memory architecture for Merge, <http://ling.auf.net/lingbuzz/003440>.

- Cable, Seth. 2010. *The grammar of Q: Q-particles, wh-movement, and pied-piping*. Oxford: Oxford University Press.
- Chomsky, Noam. 2022. Minimalism: where are we now and where can we hope to go? *Genko Kenkyu* 160.
- Citko, Barbara. 2005. On the nature of merge: External merge, internal merge, and parallel merge. *Linguistic Inquiry* 36:475–496.
- Coitnoir, A. J. and Varzi, Achille C. 2021. *Mereology*. Oxford, UK: Oxford University Press.
- Engdahl, Elisabet. 1986. *Constituent Questions*. Dordrecht, The Netherlands: D. Reidel Publishing Company.
- Gärtner, Hans-Martin. 1997. Generalized transformations and beyond. Ph.D. thesis, University of Frankfurt/Main.
- Hornstein, Norbert. 2009. *A Theory of Syntax*. Cambridge, UK: Cambridge University Press.
- Kayne, Richard. 1984. *Connectedness and Binary Branching*. Dordrecht: Foris.
- Kayne, Richard. 2005. Pronouns and their antecedents. In *Movement and Silence*, 105–135, Oxford: Oxford University Press.
- Rescher, N. 1955. Axioms for the part relation. *Philosophical Studies* 6:8–11.