In search of building blocks of nominal denotations

Marcin Wągiel, Masaryk University in Brno

Introduction. Since at least Link (1983), it is commonly assumed that the denotations of concrete count nouns consist of atoms, i.e., mereological objects without proper parts (often relative to a property). The main aim of this paper is to contribute to our understanding of quantification in natural language by exploring the so far neglected domain of subatomic quantification, i.e., quantification over parts of building blocks of the denotations of singular count nouns. Since standard approaches to nominal semantics are grounded in mereology, they model entities as being equivalent to mere sums of their parts, i.e., neglect the arrangement of parts. This contrasts with an old ontological intuition that entities are often made up of smaller entities, i.e., parts, related to each other in a particular manner (Varzi 2016). In addition, humans conceive objects simultaneously as complete wholes and collections of parts (e.g., Elkind et al. 1964). The vital question is to what extent these facts are relevant for natural language. In this paper, I present new evidence in favor of a mereotopological approach to nominal semantics where building blocks of nominals' denotations are modeled as integrated wholes rather than simply as atoms (Grimm 2012). I argue that certain quantificational expressions are sensitive to subatomic part-whole structures and indicate topological relations such as integrity.

Data. The evidence comes from properties of partitives involving proportional quantifiers. Such constructions remain understudied (but see Ionin et al. 2006) despite their great relevance for understanding part-whole structures. In particular, Polish distinguishes lexically between what I refer to as TOPOLOGY-NEUTRAL and TOPOLOGY-SENSITIVE proportional quantifiers. For instance, let us consider the three HALF-words *połowa*, *pół* and *połówka* (all 'half'). At first sight, they seem synonymous but closer examination reveals some non-trivial distributional and interpretative contrasts. Specifically, *połowa* simply designates approximately 50% of an entity. If it is a singularity, it quantifies in terms of volume, whereas in the case of a plurality, it quantifies over singularities making it up and as such it is compatible with count singulars, plurals and mass terms. On the other hand, *pół* and *połówka* are sensitive to whether the referent of the c-commanded DP comes in one piece or constitutes a discontinuous entity. While *pół* yields a measure only of an integrated object, *połówka* has even a stronger meaning, i.e., it also requires a resulting part to constitute an integrated object in its own right. These properties are reflected in the distribution since both *pół* and *połówka* can only combine with singular count nouns and are incompatible with expressions denoting arbitrary sums and scattered entities, i.e., plurals and mass terms, see (1) for the contrasts. Furthermore, since partitives involving *połowa* and *pół* in (2) denote an arbitrary half, they are felicitous in both scenarios illustrated in Figure 1 and 2. On the other hand, *połówka* has to denote a contiguous subdivision, and thus it is inadequate in a scenario illustrated in Figure 2. A similar pattern arises in other proportional quantifiers, e.g., *ćwierć* ∼ *ćwiartka* ('quarter') and *część* ∼ *cząstka* ('part').

(1) a. połowa / pół / połówka jabłka
half$_1$ / half$_2$ / half$_3$ of-the-apple
b. połowa / #pół / #połówka jabłek
half$_1$ / half$_2$ / half$_3$ of-the-apples
c. połowa / #pół / #połówka wody
half$_1$ / half$_2$ / half$_3$ of-the-water

Figure 1:

Figure 2:

(2) Połowa / Pół / #Połówka jabłka jest zgniła/-e/-a.
half$_1$ / half$_2$ / half$_3$ of-the-apple is rotten$_{F/N/F}$
'A half of the apple is rotten.'

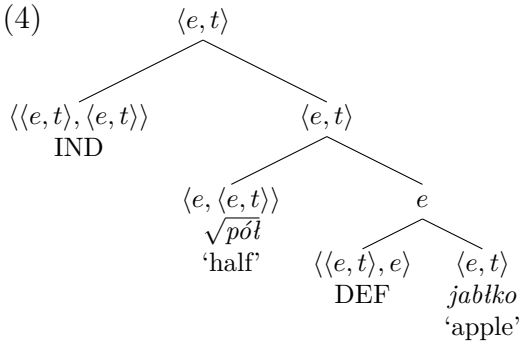
SCENARIO: Figure 2

Cross-linguistic support. The contrasts in (1) and (2) are not a Polish idiosyncrasy. In the talk, I will discuss novel data from several other languages demonstrating that various formal means may be employed in order to differentiate between topology-neutral and topology-sensitive partitives. For instance, while Portuguese and Dutch distinguish lexically between the two types of proportional quantifiers, German marks an obligatory contiguous part reading with a special marker and Mandarin and English use different constructions in order to indicate the discussed flavors, cf. *half the* NP $\sim$ *a half of the* NP.

Analysis. Building on Grimm (2012), I develop a mereotopological approach to nominal expressions. I assume mereology augmented with topological notions such as connectedness (Casati & Varzi 1999). First, I model singular individuals in terms of mereotopology where topological relations between parts are specified, whereas pluralities are modeled in terms of mereology, and thus bear not topological commitments. Next, I assume that singular count nouns are semantically more complex than mass nouns since they specify their referents as integrated object (cf. natural units in Krifka 1989; also Quine 1960). For instance, the difference between count *apple* and mass *apple-stuff* is that the first is a predicate of integrated wholes as opposed to scattered substances or arbitrary sums. This distinction can be captured by the mereotopological notion of maximally strongly self-connected, thus MSSC, which guarantees than an entity is an integrated whole, see (3-a) (for details see Casati & Varzi 1999). Furthermore, in order to account for the partitive constraint (de Hoop 1997) I assume a null definite article which introduces the standard maximization operator and selects the unique member of a singleton set (its indefinite counterpart introduces a choice function). As a result, in a context in which there is one relevant apple DEF turns the $\langle e,t\rangle$ denotation of *jabłko* into type e. In addition, I posit a partitioning function π which is an operation of type $\langle\langle e,t\rangle,\langle e,t\rangle\rangle$ which selects a set of entities, i.e., a predicate P, and yields its subset $\pi(P)$ such that it is a set of those elements in P that do not overlap (relative to a context; Scontras 2014). Application of MSSC to $\pi(P)$ would then yield a contiguous part (3-b). In *połówka*, IND is introduced by a suffix but it can also have other exponents. Finally, I employ a contextually conditioned measure function μ which returns different measures for different DPs, e.g., number or volume (Bale & Barner 2009). The denotations of Polish HALF-words are given in (3-c)–(3-e) and the structure for *połówka jabłka* in (4). The proposed semantics explains the contrasts in (1)–(2) and proves more advantageous than atomicity-based theories.

(3) a. $[\![\text{jabłko}]\!] = \lambda x[\text{MSSC}(\text{APPLE})(x)]$
b. $[\![\text{IND}]\!] = \lambda P\lambda x[\text{MSSC}\big(\pi(P)\big)(x)]$
c. $[\![\text{połowa}]\!] = \lambda y\lambda x[x \sqsubset y \wedge \mu(x) \approx \mu(y) \times 0.5]$
d. $[\![\text{pół}]\!] = \lambda y\ .\ y_{\text{MSSC}}\ \lambda x[x \sqsubset y \wedge \mu(x) \approx \mu(y) \times 0.5]$
e. $[\![\text{połówka}]\!] = [\![\text{IND}]\!]([\![\text{pół DP}]\!])$

(4)



References. Bale & Barner (2009) *The interpretation of functional heads* • Casati & Varzi (1999) *Parts and places* • de Hoop (1997) *A semantic reanalysis of the partitive constraint* • Elkind et al. (1964) *The part-whole perception* • Grimm (2012) *Number and individuation* • Ionin et al. (2006) *Parts of speech: Toward a unified semantics for partitives* • Krifka (1989) *Nominal reference, temporal constitution and quantification in event semantics* • Link (1983) *The logical analysis of plural and mass nouns* • Quine (1960) *Word and object* • Scontras (2014) *The semantics of measurement* • Varzi (2016) *Mereology*