

## Parts, wholes and clusters: Italian irregular plurals and a unified notion of parthood

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**Introduction.** In standard lattice-theoretic approaches to natural language (e.g., Link 1983, Landman 2000, Champollion 2017) singularities and pluralities are assumed to involve two distinct mereological structures and it is supposed that compositional semantics is not sensitive to the manner how parts of a whole are arranged. In this paper, I argue that in fact the part-whole structures of both singularities and pluralities encode the same notion of parthood but differ with respect to topological relations holding between their constituent parts. I present new evidence in favor of a mereotopological approach to nominal semantics (Grimm 2012) and novel data concerning the interaction between quantification and part-whole relations. The core data come from so called irregular plurals in Italian.

**Unified parthood.** Moltmann (1997) observes an analogy between partitives involving proportional quantifiers such as *part* and singular and plural terms which suggests a unified part-whole structure for both singular and plural entities, see (1) for German (cross-linguistically, the pattern is robust with English *part* being a rare exception). Moreover, partitives with number-neutral nominals such as object mass nouns and pluralia tantum are ambiguous between a part-of-a-singularity and part-of-a-plurality reading, see (2) for Polish (Wągiel 2018). A similar effect is reported in languages with general number, see (3) for Japanese (Watanabe 2013). (1)–(3) suggest a unified mereology.

- (1) Teil des Apfels/der Äpfel (2) część obuwia/nożyczek  
 part of-the apple/of-the apples part of-the-footwear/scissors  
 ‘part of the apple/some of the apples’ ‘part/some of the footwear/scissors’
- (3) Ringo-no ichibu-ga kusatteiru.  
 apple-GEN part-NOM is.rotten  
 ‘Part of the apple is rotten/Some of the apples are rotten.’

**Challenge.** However, the fact that *part* words modifying plurals are uncountable (on a part-of-a-plurality reading) has been claimed to be a counterargument for a unified mereology (Schwarzschild 1996). While (4) denotes 3 subdivisions of the relevant wall, (5) cannot refer to 3 subsets of the walls.

- (4) tre parti del muro (5) #tre parti dei muri  
 three parts of-the wall three parts of-the walls  
 ‘three parts of the wall’ Intended: ‘three subsets of the walls’

**Italian irregular plurals.** A set of nouns in Italian forms an irregular inflectional class whose defining characteristic is that they shift their grammatical gender in the plural, see (6)–(7) (Hall 1956). Interestingly, a subset of those nouns has both irregular and regular plural forms. In such cases, the meanings of irregular forms differ in that in addition to a regular plurality inference they also encode a sense of cohesion, see Table below (Ojeda 1995, Corbett 2000, Acquaviva 2008, Kučerová 2015).

(6)	il tuo dito	SINGULAR	REGULAR PLURAL	IRREGULAR PLURAL
	the <sub>M.SG</sub> your <sub>M.SG</sub> finger <sub>SG</sub>	muro ‘wall’ osso ‘bone’	muri ‘walls’ ossi ‘bones’	mura ‘walls (in a complex)’ ossa ‘bones (in a skeleton)’
(7)	le tue dita	filo ‘thread’ fondamento ‘basis’ dito ‘fingers’	fili ‘threads’ fondamenti ‘bases’ diti ‘finger’	fila ‘threads (in a fabric)’ fondamenta ‘foundations’ dita ‘fingers (in a hand)’

Forms such as *mura* and *ossa* appear to encode an aggregate meaning, i.e., they typically indicate a particular topological configuration. Consider the interaction with verbs of separation, i.e., predicates expressing disintegration of the arrangement of parts within a part-whole structure. For instance, if (8) is true, then there is no wall any more, just a pile of stones. Similarly, uttering (9) implies that

there are no walls any more, just a number of piles of stones. However, (10) can also mean that the walls are not fully ruined themselves but rather that they are no longer connected, i.e., there is no complex of walls anymore and what is left is only a discontinuous collection of dissociated walls.

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| (8)  | Garibaldi ha smantellato il muro.<br>Garibaldi has dismantled the wall<br>'Garibaldi has dismantled the wall.'                             | (11) | tre parti delle mura<br>three parts of-the walls <sub>IRREG</sub><br>'three parts of the walled complex' |
| (9)  | Garibaldi ha smantellato i muri.<br>Garibaldi has dismantled the walls<br>'Garibaldi has dismantled the walls.'                            | (12) | tre parti delle ossa<br>three parts of-the bones <sub>IRREG</sub><br>'three parts of the skeleton'       |
| (10) | Garibaldi ha smantellato le mura.<br>Garibaldi has dismantled the walls <sub>IRREG</sub><br>'Garibaldi has dismantled the walled complex.' |      |  |

**The significance of cohesion.** Interestingly, (11) and (12), unlike (5), can refer to 3 subsets of the walls and bones, respectively. Crucially, however, the relevant pluralities need to constitute cohesive subdivisions, e.g., contiguous sections of the walled complex or connected bones of the skeleton (e.g., femur + knee, ulna + radius and skull + neck). This behavior shows that the infelicity of (5) does not provide evidence against a unified part-whole structure of singular and plural entities. Rather, it results from an independent phenomenon, namely the fact that regular plurals refer to scattered entities and numerals in partitive constructions quantify over objects conceptualized as cohesive integrated wholes. Since Italian irregular plurals resemble singulars in that they employ the notion of integrity or cohesion, counting parts of a plurality in partitives such as (11)–(12) is possible.

**Proposal.** I model singular individuals in terms of mereotopology where topological relations between parts such as connectedness are specified, whereas pluralities are modeled in terms of mereology, and thus bear not topological commitments. Specifically, count singulars incorporate the notion of maximally strongly self-connected (MSSC; Casati & Varzi 1999) which guarantees that an entity is an integrated whole, see (13). On the other hand, plurals denote arbitrary sums of MSSC entities, see (14), whereas Italian irregular plurals refer to clusters (Grimm 2012), i.e., pluralities formed by connected singular parts, see (15) (CLSTR forms a cohesive plurality). To account for the partitive constraint (de Hoop 1997), I assume that definite articles introduce the standard maximization operator. A *part* word is modeled in terms of proper parthood (Barker 1998). In addition, I posit a partitioning function  $\pi$  which selects a set of entities  $P$  and yields its subset  $\pi(P)$  such that it is a set of those elements in  $P$  that do not overlap. Application of MSSC to  $\pi(P)$  would then yield a contiguous part forming an integrated object, see (18). Finally, I assume that counting is mapping of entities to numbers via the measure function  $\#(P)$  (Krifka 1989) and argue that it is only possible to count entities or parts that are conceptualized as integrated objects, see (19). The LF structure in (20) explains the data in (4)–(5) and (11) since arbitrary sums are not integrated objects, i.e., cannot be counted. Thus, singulars and plurals share a unified part-whole structure but differ wrt topology.

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| (13) | $\llbracket \text{muro} \rrbracket = \lambda x [\text{MSSC}(\text{WALL})(x)]$                        | (17) | $\llbracket \text{PART} \rrbracket = \lambda y \lambda x [x \sqsubset y]$                               |
| (14) | $\llbracket \text{muri} \rrbracket = \lambda x [^* \llbracket \text{muro} \rrbracket (x)]$           | (18) | $\llbracket \text{IND} \rrbracket = \lambda P \lambda x [\text{MSSC}(\pi(P))(x)]$                       |
| (15) | $\llbracket \text{mura} \rrbracket = \lambda x [\text{CLSTR}(\llbracket \text{muro} \rrbracket)(x)]$ | (19) | $\llbracket \text{tre} \rrbracket = \lambda P. P_{\text{MSSC}} \lambda x [^* P(x) \wedge \#(P)(x) = 3]$ |
| (16) | $\llbracket \text{DEF} \rrbracket = \lambda P [\text{MAX}(P)]$                                       | (20) | $\llbracket \text{Numeral} [\text{IND} [\text{PART} [\text{DEF} \text{NP}]]] \rrbracket$                |

**References.** Acquaviva (2008) *Lexical plurals* • Barker (1998) *Partitives, double genitives and anti-uniqueness* • Champollion (2017) *Parts of a whole* • Casati & Varzi (1999) *Parts and places* • Corbett (2000) *Number* • de Hoop (1997) *A semantic reanalysis of the partitive constraint* • Grimm (2012) *Number and individuation* • Ionin et al. (2006) *Parts of speech* • Krifka (1989) *Nominal reference, temporal constitution and quantification in event semantics* • Kučerová (2015) *On two sources of  $\phi$ -feature valuation* • Landman (2000) *Events and plurality* • Link (1983) *The logical analysis of plural and mass nouns* • Moltmann (1997) *Parts and wholes in semantics* • Ojeda (1995) *The semantics of the Italian double plural* • Schwarzschild

(1996) *Pluralities* • Watanabe (2013) *Count syntax and the partitivity* • Wągiel (2018) *Subatomic Quantification*