

# The parts of the building: Meronymy in the discourse of construction engineering

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## ABSTRACT

Drawing on the assumption that professional practices as well as their writing practices condition the lexical choices of the construction engineering community, this paper aims at exploring the role of the semantic relation of meronymy (the part-whole relationship) in the discourse of the specialized textbooks of the discipline. The goal is to reach a wider understanding of the ontological meaning encapsulated in the concept building. For the semantic analysis of the meronyms of the noun *building*, the *Construction Engineering Corpus* (of approximately one million words) is contrasted with the WordNet lexical ontology in order to explore which parts of the building are relevant for this community. The analysis shows that meronyms fulfill a dual role in discourse, as lexical items on the one hand and as discourse organizers on the other. This duality is corroborated by the textual and contextual analysis of these meronyms in the some of the basic rhetorical techniques of specialized discourse: description, definition and classification; these closely connected to the instructional purpose of the construction engineering specialized textbook genre.

**Keywords:** building, meronymy, construction engineering, disciplinary community

## Las partes del edificio. La meronimia en el discurso de la ingeniería de la construcción

### RESUMEN

Partiendo del supuesto de que las prácticas profesionales así como sus prácticas discursivas condicionan la elección del léxico de la comunidad de la ingeniería de la construcción, este artículo pretende explorar el papel de la relación semántica de meronimia (la relación entre el todo y la parte) en el discurso de los libros de texto especializados de esa disciplina. El objetivo es alcanzar un mejor entendimiento del significado ontológico encapsulado en el concepto edificio. Para el análisis semántico de los merónimos del nombre *edificio*, el *Construction Engineering Corpus* (de aproximadamente un millón de palabras) se contrastó con la ontología léxica WordNet con el fin de explorar qué partes del edificio son relevantes para esta disciplina. El análisis demuestra que los merónimos cumplen un doble papel, como elementos léxicos por un lado y como organizadores del discurso por otro. Esta dualidad es corroborada por el análisis textual y contextual de esos merónimos en las técnicas retóricas básicas del discurso especializado: la descripción, la definición y la clasificación; especialmente relacionadas con la finalidad formativa del género de los libros de texto especializados de la ingeniería de la construcción.

**Palabras clave:** edificio, meronimia, ingeniería de la construcción, comunidad disciplinaria

**SUMMARY:** 1. Introduction. 2. Theoretical background. 3. The corpus and the methodological approach. 4. Meronymy in the CTC. 4.1. A WordNet of 'building' meronyms. 4.2. A word tree of the meronyms of 'building'. 4.3. The rhetorical function of meronymy. 5. Discussion of findings 6. References

## 1. INTRODUCTION

Reaching an understanding of the concept building is certainly a challenging task since it summarizes the ontological knowledge about the concepts, attributes, relations and instances of buildings shared by the construction engineering profession (cf. Montiel-Ponsoda & Aguado de Cea, 2008, p. 336). The starting point of this paper is the assumption that disciplinary knowledge is embedded, and at the same time constraint, by the discursal practices of a particular profession, in the case of this paper the construction engineering profession.

Taking this view, we can assume that specialized discourses structure the world in a different way and that the members of a particular speech community share a common understanding of disciplinary vocabulary. This understanding is grounded in the fact that vocabulary choice is intrinsically related to situation and context constraints, and therefore that lexical relations are specific to a particular community (Bloomer et al., 2005; Carter & McCarthy, 1988). This contention is important for the purpose of this paper since it sets the grounds to discover how semantic relations condition the choices which are available to the members of a particular discourse community to lexicalize their disciplinary world with the purpose of informing about it. The words may be the same but with a different use, Fairclough (2003) claims, and it is through the presupposed structuring of disciplinary lexical knowledge that discipline members can interpret the text successfully.

Given the predominance of *building* in the discourse of construction engineering, this paper seeks to shed light on what the building means for this discipline or, to paraphrase Bhatia (2002), why these professionals write the way they do about buildings. To do so, it is the goal of this paper to explore the semantic and rhetorical relation between the noun *building* and its parts, or meronyms.

## 2. THEORETICAL BACKGROUND

To enquire into the semantics of construction engineering discourse necessarily requires the analysis of its lexical profile. As studies of lexis, both from the perspective of discourse analysis (Carter & McCarthy, 1988; Carter, Goddard, Reah, Sanger, & Bowering, 2001; McCarthy, 1991; Nation, 2001; Trimble, 1985) or of semantics (cf., Bloomer, Griffiths, & Merrison, 2005; Cruse, 1986, 2000, 2002, 2003, 2006; Jackson & Amvela, 2000; Kearns, 2006; Kempson, 1977; Kreidler, 1998; Lyons, 1968, 1977, 1995; Saeed, 1997; Salkie, 1995; Saeed, 1997; Yule, 2001) have consistently argued, words do not appear in isolation, as lists of words

scattered randomly in a semantic space. Rather, vocabularies are structured and have, to some extent, an internal organization that goes beyond the clause boundaries and which allows for words to acquire their full meaning in the complex relations of a linguistic system.

Following the above mentioned semantics theorists, this paper understands semantics as the study of the meaning of words in a language. As Wierzbicka puts it, “language is an instrument for conveying meaning” (1996: 3). Linguistic semantics thus represents a lexical block-building framework—“the words, phrases and sentences of natural languages have meaning, that sentences are composed of words (and phrases), and that the meaning of a sentence is the product of the words (and phrases) of which it is composed” (Lyons, 1995: 46). As Cruse (1986: 1) explains it, “words are not the bearers of messages; they do not, of themselves, ‘make sense’” but rather the word is “a container of meaning” (Yule, 2001: 118). The meaning of a word thus contributes to the meaning of a sentence, which entails, as Lyons sensibly argues, that the study of vocabulary cannot be separated from the analysis of the context in which words occur on the one hand, and from the study of its grammatical structure since

to study language without reference to meaning is like studying road signs from the point of view of their physical properties (how much they weigh, what kind of paint are they painted with, and so on), or like studying the structure of the eye without any reference to seeing (Wierzbicka, 1996: 3).

Cruse (2003) argues that vocabulary is structured by recurrent sense relations. Sense is defined by Lyons (1995: 80) as “the set, or network, of sense-relations that hold between it and other expressions of the same language”. Words acquire their meaning in the network of semantic relations established with other words in the language. Cruse (1986, p. 87) identifies four basic sense relations: identity (class A and class B have the same members); inclusion (class B is wholly included in class A); overlap (class A and class B have members in common but each has members not found in the other); and disjunction (class A and class B have no members in common). Identity and inclusion relations are hyponymy (*building* → *skyscraper*), meronymy (*building* → *corner*) and synonymy (*building* → *edifice*), whereas incompatibility (*hotel* → *hospital*), co-meronymy (*roof* → *floor*) and opposites (*erect* → *demolish*) are relations of opposition and exclusion.

Croft and Cruse (2004) assume that semantic relations apply to contextual relations of words as well as to single lexical items. Hence, the “semantic well-formedness” (p. 141) of a linguistic expression such as *the windows of the buildings* would depend on the semantic power of the meronymic relation. This approach to semantics is particularly relevant for the present work since only expert members of the construction profession can interpret the contextual relations of their discourse, and consequently of its ‘well-formedness’.

The key role of the semantic relation of meronymy (the part-whole relation) in labeling the parts of bodies, objects and artifacts has attracted the attention from

researchers in such fields as ontology engineering (van Hage, Kolb, & Schreiber, 2006; Ruiz-Casado, Alfonseca, & Castells, 2007) or terminology (Feliú, Solé, & Tebé, 2000). Considered the second most important semantic relation (after hyponymy), meronymy, or paronymy, is the “semantic relation between a lexical item denoting a part and that denoting the corresponding whole” (Cruse, 1986: 159). In *The room is part of the house*, the *room* (the meronym or paronym) is part of the whole *house* (the holonym); in *The building has an elevator*, the holonym *elevator* is a part of the meronym *building*; and in *the church roof* the holonym *roof* is part of the whole *church*. The mention of a holonym includes an implicit reference to its meronyms; in other words, when we refer to a *house* we implicitly understand that the house might have *walls*, a *roof*, a number of *rooms* or a *door*.

The question to be answered is which portions of an artifact or object can be considered parts. For Cruse (1986: 158) three characteristics distinguish a part: autonomy, non-arbitrary boundaries and determinate function with respect to the whole. An *elevator* is a clearly separate part of a building which moves independently of the building and has the function of moving people from one floor to another in a building. Cruse (1986: 169) uses the house as an example to clarify his distinction of segmental and systemic parts. *Brickwork, joinery, plasterwork, plumbing* or *wiring* are systemic parts whereas *living-room, dining-room* or *kitchen* are segmental parts. These segmental parts are usually sequenced along a spatial axis or they can have a structural functionality of defining spaces such as the *wall* or the *roof*. It is easier to discern a *court* as a part of a building than a *frame*. The reason, Cruse (2000) suggests, is that the *frame* is an integral part of a building, not easily separated from the whole. Parts can be optional or necessary. However, applying Cruse’s argumentation to the language of construction, the wide range of buildings (from a *palace* to a *ruin*) makes it difficult to determine which parts are necessary, perhaps only *walls* and a *roof* could be said to be “canonically present” in all buildings (Cruse, 1986: 164). *Stairs* are a canonical meronym in *skyscrapers* but facultative in *sheds*; *windows* are a canonical meronym in *schools* but not in *cinemas*. Parts are thus prototypical, but rather than prototypical of the whole category of buildings, prototypical of each type of building. A well-formed *house* is expected to have a *bathroom*, a *kitchen*, a *living room* and some *bedrooms*.

The principle of transitivity does not always hold between holonyms and meronyms because, as Lyons explains (1977: 312), “the fact that one entity may be described as a part of another entity does not imply, however, that there is a part-whole relation holding in the vocabulary between the lexemes used in expressions which refer to these entities”. The relationship of transitivity holds for points in physical space: if ‘the ceiling is part of the room’ and ‘the room is part of the house’, it follows that ‘the ceiling is part of the house’. ‘A sash is part of a window’ and ‘a window is part of a building’ but ‘a sash is part of a building’ is unacceptable. Cruse (1986: 165) explains this in terms of functional domains: the *sash* is used to hold the panes of a *window* but this functional meaning cannot be transferred to the *house*.

Along similar lines, Iris, Litowitz, and Evens (1988), explain that meronymy is not a single relation but a collection of four different part-whole relations with different transitivity behavior. These four schemata of meronymic relations (p. 272–275) express the functional component (i.e., the part is a functioning unit of the whole), the segmented whole (i.e., the whole is divided into pieces), the collection member (i.e., a physical collection or aggregate of objects), and the set-subset aspects of part-whole (i.e., a set is a subset of another set B). Transitivity does not hold in general for functional parts nor for the collection-element model but it does for the subset model and for the segmented whole model. Taking a cognitive approach, Winston, Chaffin, & Herrmann (1987: 420) analyze the psycholinguistic connections underlying meronymic relations, and assuming that ‘part’ is just one of the terms for a meronymic relation, they identify six types of relations: component-integral object: (*pedal-bicycle*); member-collection (*ship-fleet*); portion-mass (*slice-pie*); stuff-object (*steel-car*); feature-activity (*paying-shopping*); and place-area (*Everglades-Florida*).

These theoretical premises will also set suitable grounds for the study of meronymy carried in the subsequent sections of this paper. The analysis of meronymy will explore the textual relations established between meronyms and *building* and then interpreted in the light of the discipline context in which the text is created.

### 3. THE CORPUS AND THE METHODOLOGICAL APPROACH

For the analysis of meronymy I resorted to the Construction Textbooks Corpus (CTC), a ca. 1m-word corpus with 176 samples of textbooks for architecture, construction and civil engineering. The concordancing analysis of the corpus, carried out with the help of *WordSmith Tools 4.0* (Scott, 1999), showed the prevalence of the lemma *build*, and particularly of the noun *building(s)* in the corpus. With 4,847 occurrences, *building* is the most frequent content word and also the most frequent key word (those whose frequency is unusually high in comparison with a reference corpus—the BNC<sup>1</sup> in the case of the present study).

For the analysis I found it useful to rely on the WordNet lexical database (Fellbaum, 1998), developed by Princeton University under the direction of George Miller and available on line at <http://www.princeton.edu/wordnet>. In this database, words are grouped into sets of cognitive synonyms (synsets), interlinked by means of conceptual-semantic and lexical relations. Unlike the traditional alphabetical organization of dictionaries in terms of form, WordNet, inspired by psycholinguistics, organizes the lexicon in terms of meaning and can thus be searched conceptually. Adopting a list of

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<sup>1</sup> 1. The *British National Corpus*, version 3 (BNC XML Edition) (2007). Distributed by Oxford University Computing Services on behalf of the BNC Consortium. Retrieved from: <http://www.natcorp.ox.ac.uk/>

25 semantic primes (beginners of a hierarchy<sup>2</sup>), WordNet maps a complex network of semantic hierarchies linked by the semantic relations of synonymy, antonymy, hyponymy and meronymy, and organized in hyponym/hypernym and meronym/holonym trails. My decisions were also supported by dictionaries, glosses, and native English scholars.

Relying on the assumption that semantic relations help to structure discourse, as posed by semantics theory, the corpus was contrasted with the lexical database to discover which meronyms appear in the corpus. Using the WordNet database, I then tried to confirm the hypothesis that the semantic relation of meronymy could reveal which parts of buildings are relevant for the discipline. With this information I developed the word tree of those meronyms which can reflect how construction writers structure professional knowledge of buildings. Taking a discourse analysis perspective, I also deemed it necessary to study the rhetorical function of meronymy in the specialized lexis of construction engineering textbooks.

#### 4. MERONYMY IN THE DISCOURSE OF CONSTRUCTION ENGINEERING

##### 4.1. A WORDNET OF 'BUILDING' MERONYMS

The WordNet database contains 49 meronyms of *building*, of which 35 appear in the CTC corpus. The subsequent meronymy levels were excluded from the analysis because they referred to 'parts' of 'parts', which as explained, could not be assumed to be parts of the *building*. However, the three hyponymy levels of these meronyms were included in the analysis assuming their being more specific terms of the same holonym/part relation. The general criterion was to include only those hyponyms that are relevant for buildings and, consequently, such nautical terms as *sickbay*, *sick berth*, *galley*, *ship's galley*, *caboose*, *cookhouse*, *head* or *companionway* were excluded from the analysis. It must be pointed out that I identified several deviations, which could explain the high frequency of *quoin/corner*, *compartment*, *stairs*, *toilet* and *solarium* since all instances of these words come from just one sample on the topic.

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<sup>2</sup> .{act, action, activity} - {animal, fauna} - {artifact} - {attribute, property} - {body, corpus} - {cognition, knowledge} - {communication} - {event, happening} - {feeling, emotion} - {food} - {group, collection} - {location, place} - {motive} - {natural object} - {natural phenomenon} - {person, human being} - {plant, flora} - {possession} - {process} - {quantity, amount} - {relation} - {shape} - {state, condition} - {substance} - {time}

Level	WordNet	CTC	%
1 <sup>st</sup> meronymy level	49	35	71.43
1 <sup>st</sup> hyponymy level	265	95	35.85
2 <sup>nd</sup> hyponymy level	125	36	28.80
3 <sup>rd</sup> hyponymy level	17	1	5.88
<b>Total</b>	<b>456</b>	<b>167</b>	<b>36.62</b>

Table 1: WordNet / CTC meronyms of 'building'

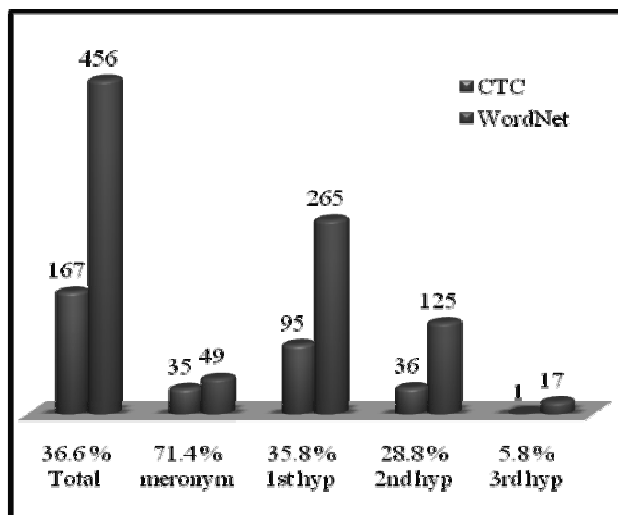


Figure 1: WordNet / CTC meronyms of 'building'

The frequency of use of the 167 meronyms of *building* reaches 3,364 occurrences (approximately 20.1 per meronym). More than two thirds of these are occurrences of the first level of meronymy, with a ratio of 68 per meronym. The more general meronyms are more frequent than the more specific ones.

Level	Total Different Meronyms	Total Frequency
1 <sup>st</sup> meronymy level	35	2,379
1 <sup>st</sup> hyponymy level	95	838
2 <sup>nd</sup> hyponymy level	36	146
3 <sup>rd</sup> hyponymy level	1	1
<b>Total</b>	<b>167</b>	<b>3,364</b>

Table 2: Total meronyms

	1 <sup>st</sup> Level of Meronymy	Freq.		1 <sup>st</sup> Level of Hyponymy	Freq.
1	wall	697		toilet	88
2	window	405		stairs	78
3	roof	320		kitchen	45
4	room	271		atrium	42
5	frame	116		solarium	38
6	storey	85		bedroom	31
7	floor	75		ground level	29
8	extension	48		ground floor	28
9	heating	43		basement	27
10	courtyard	35		dome	25
	2nd Level of Hyponymy	Freq.		3rd Level of Hyponymy	Freq.
1	public toilet	41		nursery	1
2	concert hall	25			
3	master bedroom	11			
4	W.C.	5			
5	cubicle	5			
6	closet	4			
7	kiosk	4			
8	barrel vault	3			
9	common room	3			
10	convenience	3			

Table 3: Most frequent meronyms per level

Although a first logical guess for ‘part’ of the building might have suggested *room* to be the most common part, the CTC analysis indicated that it is the structural elements of the building (e.g., *wall, window, roof, floor, frame*) that are the most common meronyms of *building*. Yet, if we include the hyponyms of *room* we can see that *room*, with a total of 794 occurrences (Figure 2), is the most frequent meronym of *building*. *Room* is certainly the most productive meronym of *building* and the only one with three levels of hyponymy (271 occurrences of *room* and 389, 133 and 1 occurrences of the subsequent levels of hyponymy).

37.72% of the 167 WordNet meronyms of *building* which appear in the CTC are used less than five times, and 18.56% of them only once. Particularly frequent are first level meronyms (only 8.57% are used only once and the rest are found more than seven times). In this, findings agree with previous studies of specialized lexis (cf. Chung & Nation, 2003, 2004; Cowie, 1988; Coxhead, 2000; Coxhead &



Nation, 2001), which have shown that, contrary to what can be expected, the main core of the terminology of a technical corpus is not composed of strictly technical terms. Rather, a high percentage of the vocabulary consists of semi-technical or sub-technical vocabulary on the one hand and of polysemous words from general registers on the other.

Level	Less than 5		Only once		Total WordNet
1 <sup>st</sup> meronymy level	3	8.57%	3	8.57%	35
1 <sup>st</sup> hyponymy level	39	41.05%	17	17.89%	95
2 <sup>nd</sup> hyponymy level	20	55.56%	10	27.78%	36
3 <sup>rd</sup> hyponymy level	1	100.00%	1	100.00%	1
<b>Total</b>	<b>63</b>	<b>37.72%</b>	<b>31</b>	<b>18.56%</b>	<b>167</b>

Table 4: Meronyms used less than five times

The meronymic relations of the noun *building* in the CTC all fall into the component-integral object category, in which the part is a functional component of the whole (Winston et al., 1987). According to (Iris et al., 1988, p. 272), objects, whether physical objects or assemblies, are “built up out of the logical and systematic assemblage of its parts”, and the patterned organization or structure of parts in wholes “contributes to the whole, not just as a structural unit but as essential to the purposeful activity of the whole”. The building can be considered an assembly of parts arranged with a clear structural and functional sequence. The parts of the building might exist independently of being part of the building (e.g., *elevator, heating, windows, doors*) or be indivisible parts whose meaning is acquired in reference to the whole in which it is included (e.g., *frames, walls, floors, roof*). These parts establish relationships to one another, whether structural (the *roof* cannot be laid before the *walls* have been erected, and therefore would not exist without it) or functional (a *shaft* is needed so that a *lift* can be installed).

An important issue was the difficulty in classifying words such as *café, restaurant* or *garage*, which can be considered both as types of building, and thus as hyponyms of it, or as part of the building, and thus as meronyms. In those instances, the context had to be carefully scrutinized and a cultural mismatch was envisaged. Both construction and urban design show clear geographical traits and *cafés*, for instance, might be an independent building in one country while just a small part of it in another country, or even in another city of the same country. Similarly, the high frequency of such meronyms as *lift, storey* or *heating* would indicate that the corpus is addressed to a very specific type of audience, that which designs or constructs modern Western buildings. Based on the corpus findings, a prototypical building would have structural parts (*walls, windows* and *roof*), it would have different *floors* and *rooms* and different building services such as *heating* or *lifts*. The strong cultural connotations associated with this building and the fact that some meronyms can also be hyponyms show the context-dependant

character of parts, which will require expertise knowledge of the discipline and of its social, cultural or geographical implications to be interpreted.

#### 4.2. A WORD TREE OF THE MERONYMS OF ‘BUILDING’

It is generally accepted in the literature that the lexicon forms a network of relationships “rather than a listing of words as in a published dictionary” (Saeed, 1997: 63). The taxonomical hierarchies of these semantic relations are “classificatory systems and they reflect the way speakers of a language categorize the world of experience” (Cruse, 2000: 180). In the same way that professionals construct a building from its foundations to the finishing details, the word tree of the textual *building* can be built as a hierarchy, which can be illustrated in a Word Tree (Figure 2). This representation of the semantic relation of the meronyms of *building* in the CTC contributes, in my view, to visually reflect how concepts are constructed, related and used at a textual level and how expert knowledge about buildings is hierarchically constructed.

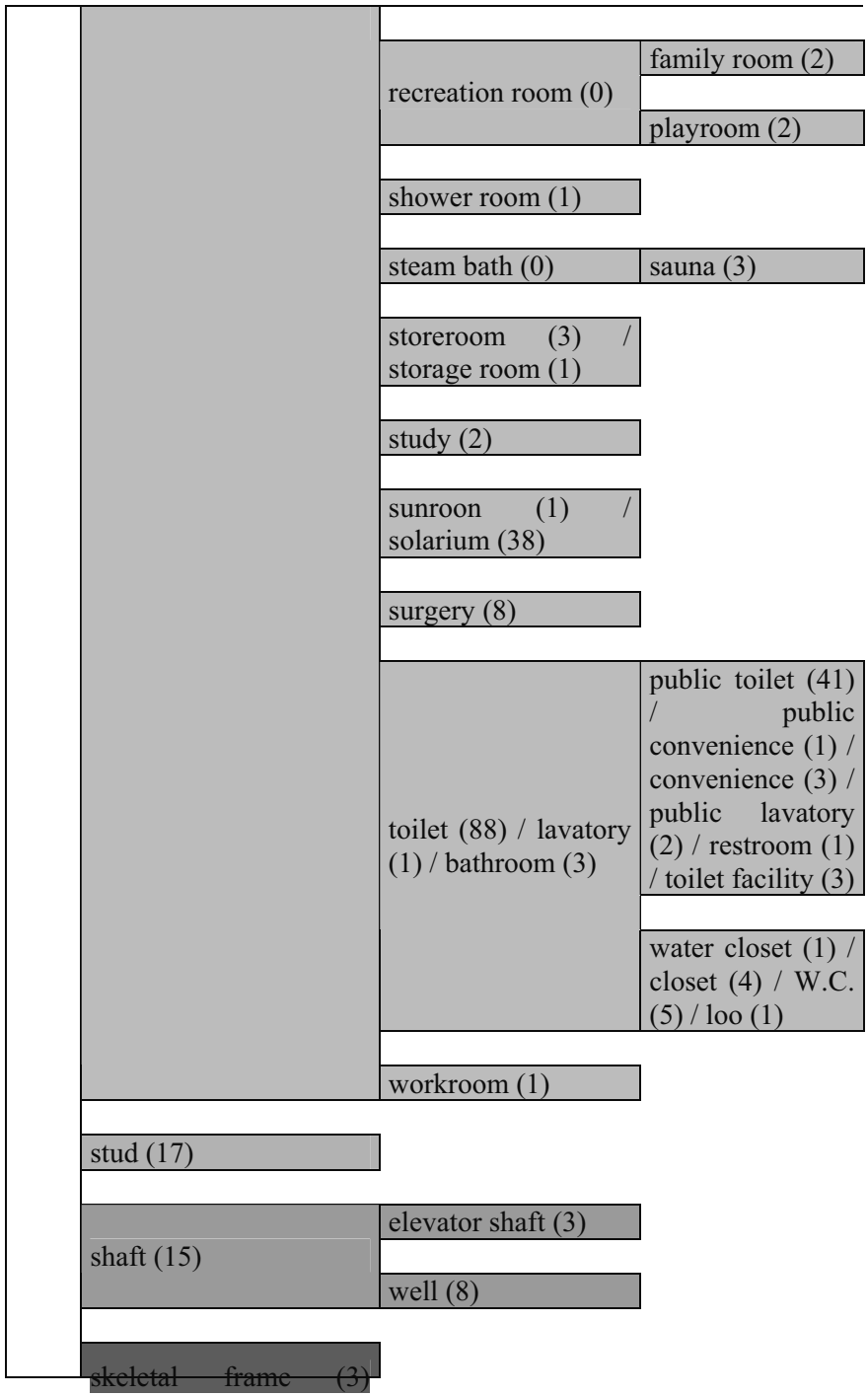
<b>building</b>	extension (48) / wing (10)	
	entrance hall (1) / hall (11) / foyer (3) / lobby (15) / vestibule (2)	
	corner <sup>3a</sup> (7) / quoin (23)	
	corner <sup>b</sup> (10) / nook (1)	
	cornerstone <sup>a</sup>	
	cornerstone <sup>b</sup>	
	court (14) / courtyard (35)	atrium (42)
	elevator (20) / lift (18)	dumbwaiter (2)

<sup>3</sup> WordNet lists different senses of some words. The definitions are available at <http://wordnet.princeton.edu/>

exterior door (0)	back door (1)	
	front door (5)	
floor (75) / level (19) / storey (85) / story (19)	basement /cellar	
	ground floor (28) / first floor (15) / ground level (29)	
	loft <sup>a</sup> (6) / attic (5)	
	loft <sup>b</sup> (0)	mezzanine (1)
foundation stone (7)		
heating (43) / heating system (23)	central heating (4)	
	gas heat (1)	
roof (320)	mansard roof (2)	
	dome (25)	cupola (1)
		geodesic dome (1)
	gable roof (2)	gambrel roof (1)
	hipped roof (2)	
	thatch (1) / thatched roof (1)	
	vault (7)	barrel vault (3)
ribbed vault (1)		
room (271)	entrance hall (1)	
	/hall <sup>a</sup> (11) / foyer (3)	

	/ lobby (15) / vestibule (2)	
	ballroom (5)	disco (2)
	bar (10) / saloon (2)	
	bathroom (14) / bath (2)	
		child's room (0) nursery (1)
	bedroom (31) / chamber (3)	hotel room (4)
		master bedroom (11)
	belfry (2)	
	boardroom (3)	
	cell <sup>a</sup> (1) / prison cell (2)	
	cell <sup>b</sup> (2)	
	classroom (4) / schoolroom (1)	lecture room (1)
	clean room (1)	
	cloakroom (1)	
	closet (0)	cubicle (5) / stall (2) / kiosk (4)
	clubroom (1)	
	compartment (15)	

	conference room (2)	
	courtroom (1)	
	dining room (12)	
	door (2)	
	gallery <sup>a</sup> (16)	
	gallery <sup>b</sup> (9) / art gallery (8)	
		concert hall (25)
	hall <sup>b</sup> (11)	exhibition hall (1) / exhibition area (1)
	hospital room (0)	operating theatre (1)
	kitchen (45)	
	library (1)	
		common room (3)
	living room (23) / front room (1) / parlor (1)	morning room (1)
		salon (2)
	locker room (1)	
	lounge (6) / waiting area (3)	
	reception room (0)	drawing room (1)



/frame (116)		
stairway (10) /staircase (33)	backstairs (1)	
	escalator (16)	
	fire escape (2)	
	flight (23) / flight of stairs (1) / flight of steps (2)	
	stairs (78) / steps (21)	
	ramp (18)	
upstairs (1)		
wall (697)	bearing wall (12)	
	cavity wall (7)	
	chimney breast (1)	
	gable (4) / gable end (2) / gable wall (1)	pediment (3)
	parapet (8)	
	proscenium (2)	
	sidewall (8)	
	Hadrian's Wall (1)	
	window (405)	bay window (1)
clerestory (5)		

	dormer (1)
	dormer window (1)
	rose window (2)
	skylight (4)
	sliding window (2)
	stained-glass window (2)

Figure 2. A proposed word tree for the meronyms of ‘building’ in the CTC

In line with the studies which have argued about the limitations of WordNet (cf. Bodenreider et al., 2001; Cederberg & Widdows, 2003; Kozareva et al., 2008; McNamee et al., 2008; Pasca & Harabagiu, 2001; Ruiz-Casado et al., 2007), the analysis of meronyms showed that a number of meronyms are not included in the WordNet database. Some of these new meronyms are not listed as meronyms of *building*, but they do appear as meronyms of some hypernyms of *building* like *structure* or *construction*. These new meronyms are structural elements, such as *partition*, *façade*, *foundation* or *beam*. Also missing from the meronymy database are some parts of the building which might have a parallel role to that of rooms (e.g. *corridor*, *porch*, *landing* or *balcony*). The relationship of meronymy is frequently discovered in patterns such as enumerations which signal the equivalent status of co-meronymy

- (1) *made of metal, concrete, glass, plastics, or preassembled bricks, a panel may extend from **foundation**\*<sup>4</sup> to **roof** in single-story buildings, or from **floor** to **floor** or from **window** header in one **story** to **window** sill of **floor** above in **multistory buildings***
- (2) *The **building** was oblong and consisted of three **rooms**: the **porch**\*, the main **room**, and the Holy of Holies in which the Ark rested*
- (3) *the **corridor**\* enabled private activities to evolve and the **house** took on the form of an internal street, with **rooms** arranged in an orderly form along either side.*

Although *floor* (meaning ‘a structure consisting of a room or set of rooms at a single position along a vertical scale’) is listed as a meronym of *building*, its sense

<sup>4</sup> \* absent from the database



‘the inside lower horizontal surface, as of a room, hallway, tent, or other structure’ is a particularly significant absence:

- (4) *Bearing walls*, in contrast, serve not only as an enclosure but also to transmit to the foundation loads from other **building components**, such as *beams\**, *floors\**, *roofs*, and other *walls*. (b&c\_bp12)

The absence of some notable hyponyms and meronyms of *building* suggests the lack of specificity in the coverage of the lexical database. The CTC is a specialized corpus of the domain of engineering construction and, therefore, a compendium of its members’ knowledge, not always shared by members of other discourse communities, including those linguists involved in the development of large lexical databases such as WordNet.

#### 4.3. THE RHETORICAL FUNCTION OF MERONYMY

The semantic analysis of meronymy should be further widened, in my view, to understand the rhetorical relations established by *building* and its meronyms in the organization of the discourse of construction engineering textbooks. The basic meronymy relation of buildings to their parts serves the rhetorical function of identifying which part the writer refers to or in which particular building the part can be found. However, the analysis of the rhetorical use of the holonym/meronym pair showed that they play a further part in discourse. Meronym pairs are used in some of the key rhetorical techniques of scientific and technological discourse (Trimble, 1985): description, definition, classification and exemplification.

The part-whole relation of meronyms and *building* is commonly used for general descriptive purposes since a full description of any object or artifact, or building in the case of the CTC, requires a description of its parts:

- (5) Described as the second empire baroque, these monumental **buildings** had strong horizontal layering, *mansard roofs* and classical elements (Roth, 1979). (a&be\_ha8)

Thus a general statement is followed by a detailed description:

- (6) There are some architectural programs where it is thought that a view out may lead to a lack of concentration, as in a **school classroom**. It was the author’s experience that *classrooms* in his *school* in the 1930s had *windows* at high level, precluding a view out; a view which prevailed until the new *school building* programs of the 1960s.(b&c\_bp18)

In the following example the part is the fundamental element of the description as it is also the most fundamental element to characterize the building:

- (7) **Hotel** Pennsylvania in New York City has 2,200 **rooms**—largest of the time. (a&be\_pd20)

The description can include an enumeration of several parts:

- (8) They had modern **homes** with **kitchens**, **bathrooms** and **central heating**, modern schools for their children to attend, and grass and trees about them. (a&be\_ud18)

or rather the meronym can be a common part of a number of different buildings enumerated:

- (9) **Escalators**, or powered **stairs**, are installed in such **buildings** as department stores and transportation terminals, or in the lower **stories of office buildings** and **hotels**, where there is heavy pedestrian traffic between **floors**. (b&c\_bp12)

The physical description of a part can be included in a fuller description:

- (10) It was a functional **building** accommodating over 80000 spectators, had a steel **frame**, and was the first purpose-designed modern Olympic **stadium**. (a&be\_pd13)

The most common rhetorical type of description is to specify the location and position of parts in wholes, i.e., in buildings. The prevalence of prepositional phrases (e.g., **toilets in shops**; **rooms within a building**) and location verbs (e.g., **a building that extends above the ground level**) as lexico-grammatical patterns of meronymy further corroborates that tendency. The semantic load of the meronym is reinforced by the use of verbs or adverbials, lexical signals marking position:

- (11) At first, it was discovered that the **building** envelope was too small and so the decision was made to have a **wing branch off** the main **structure at an angle** to fit the lot better and provide the additional area needed. (a&be\_pd11)

Description can also be functional when it refers to the purpose of the part in the building. The function can be explicitly expressed:

- (12) The main purposes of **windows** are to illuminate the **building** interior with daylight, to ventilate the interior, and to give occupants a view of the outside. (b&c\_bp12)

or more implicitly:

- (13) The **greenhouse** overheated the **house** in summer so additional **window shading** had to be designed for several window banks. (a&be\_pd11)

Different types of description can be combined, as the physical description of aspect and position combination in

- (14) Cylindrical **stairs** have been made as free-standing towers placed outside the **building** envelope. (a&be\_pd3)

In the following example the part is identified by the introduction of the name of the *theatre*, and then a description of its parts offers a more precise characterization of aspect and position:

- (15) Following the first permanent **theater** built in 1576 by James Burbage, this style became the model for many public **theaters**, including **Shakespeare's Globe**. The **galleries** surrounding the central **court** were three tiers high with a roofed stage, which looked like a thatched apron at one end. (b&c\_bp10)

The description can express function and position at the same time, as in

- (16) Exterior **walls** enclose a **building** below the **roof**. (b&c\_bp12)

The three types of description: of aspect (*forming a square*), of position (*at each end, at the eastern end*) and of function (*join them with a new building*) are together in

- (17) The plan was to construct northern and southern **wings** at each end and join them at the eastern end with a new **building**, forming a square with an interior **court**. Some work was completed on the **basement** of the north **wing**, but construction was halted in 1643 when Louis XIII died. (a&be\_ha5)

Meronyms are also used in exemplification. The idea expressed by the holonym is exemplified with the specific mention of the parts. The example can be lexically marked, as in

- (18) Affinities, on the other hand, indicate activities that share something besides circulatory convenience, and thus may tend toward one another in a **building** for reasons of performance or constructability. Here, a good residential example is **kitchens** and **bathrooms**. (a&be\_ta3)

or understood from the context in

- (19) In 1669 Perrault had undertaken a trip to the south of France, where he sketched and took notes on both medieval and classical **buildings**, among them the **vaults** of the **church** of Saint-Hilaire-le-Grand in Poitiers (“la structure est assez particulière”) and the **cathedral** of Saint-André in Bordeaux. (a&be\_ha5)

Nouns such as *component* and *part* are usually followed by an enumeration of meronyms introduced by *such as* or *for example*:

- (20) By using masonry cross-**walls** (either end or party **walls**) to support all the main load-bearing parts of a **building**, for example the **floors** and the **roof**, the front and back **walls** can, in some situations, be made as an infill panel (or panels) as shown in Fig. 1.14. (b&c\_bp20)

Part/*building* pairs are also used in classification. Buildings can be classified according to their parts:

- (21) Price is no indicator—expensive **hotels** may have small **rooms**, while budget **hotels** have larger, better appointed **rooms**. (a&be\_pd20)  
Classification can also apply to the parts of one building:
- (22) The surfaces which form the envelope, that is the **walls**, the **floors** and the **roof** of the **building**, are subjected to various types of loading: external surfaces are exposed to the climatic loads of snow, wind and rain; floors are subjected to the gravitational loads of the occupants and their effects; and most of the surfaces also have to carry their own weight. (a&be\_ta12)  
Physical description and classification combine in
- (23) **Windows** can broadly be divided into two main types, first the **window set in the side walls** of a **building**, and second the opening light set into the **roof**, generally known as rooflights. (b&c\_bp12)

## 5. DISCUSSION OF FINDINGS

Economical, geographical, social or cultural traits have been detected in the lexical choices of construction engineering textbook writers, for example in discerning between some words such as *café* or *hall*, which can be both hyponyms and meronyms of *building*. This is certainly influenced by the nature of the corpus and the details of its compilation and of its intended use, since the corpus samples reflect the particular social, cultural or historical circumstances of the context in which buildings with *heating* and *lifts* are part of Western urban landscape, and increasingly of some parts of Asia.

The analysis of meronymy has confirmed the limitations of WordNet, such as the absence of named entities or of discipline-specific lexis. Understandably a lexical ontology cannot compile all the knowledge of specialized domains. The

analysis of the CTC has shown the limited coverage of the specialized lexis of the domain of construction engineering in the WordNet database, unable to provide a complete mapping of the specialized concept of 'building'. Although, as Ruiz Casado et al. (2007: 114) acknowledge, solving extraction problems would require "near human-level language understanding", work should still be done on expanding the knowledge of the meaning and relationships of lexical items which could help the process of building semantic resources and hence of building dictionaries or lexical databases. Lexical research of specialized domains, as corroborated by the present study, should contribute to enlarge the lexicon of databases or dictionaries by adding certain proper nouns, new words, or new technical and sub-technical senses to general words

The use of meronyms suggests that specialized writing requires specialized lexis to designate buildings. The mention to the parts of the building provides the specificity demanded by the specialized discourse of the community of construction engineers. This indicates that mastering disciplinary lexis requires command of this kind of abstract knowledge; as experts in the profession they have the knowledge but they also have the professional urge to show command of their professional mastery, not only command of technical expertise, but of lexical expertise as well. Showing expertise fulfills the two-fold purpose of acculturating novices into the disciplinary, as well as the rhetorical, practices of their profession, and, at the same time, establishing the author's credentials towards the expert audience of the textbook, the spheres of inter- and intra-specialists in which knowledge is created (Cloître & Shinn, 1985). In short, not only the lexis of construction engineering is specific but the corpus of construction engineering textbooks is also specific to a particular audience set in a particular time and space and connected to their particular professional activities and interests.

The findings above corroborate that the use of meronyms moves beyond lexical choice and acquires the further role of structuring discourse, beyond the sentence boundary, reaching paragraph and even extending to the whole text structure. The inheritance of meaning of meronyms allows an implicit mention to the building. Meronyms thus acquire a dual role as lexical items and as connectors of sentences, which provides the necessary textual cohesion by means of cohesive chains and helps avoid excessive repetition.

When CTC authors describe buildings, they need to resort to a description of its parts; when they classify them, they do it according to their parts. Meronymy pairs have shown to be a frequent lexical device in the basic textual patterns of scientific and technological discourse (cf. Flowerdew, 2003; Hoey, 1983; Markus & Cameron, 2002; Martin, 1993; Trimble, 1985; Wignell et al., 1993; Winter, 1982), particularly in the formulation of descriptions and classifications of buildings thus providing a taxonomical classification of disciplinary knowledge. The way of thinking and of constructing knowledge of scientific and technological experts, who try to make sense of natural phenomena by making generalizations about the concrete examples, by explaining, defining, describing and classifying it, is thus closely linked to the use of meronyms. At the same time, the use of these rhetorical

techniques may be taken to respond to the need of the construction engineering textbook writer to facilitate comprehension by providing first a cohesive and coherent text and at the same time a logical sequence of meaning which allows the reader to follow the reasoning, to clarify an argument which was perhaps too abstract or to facilitate the comprehension of uninitiated readers or even of other experts specialized in other fields.

The professional practice of the construction engineering profession has proved to revolve on the key concept of building. So are the textual practices of the professional community. The corpus analysis has specifically shown that the relevance of the noun *building* as both a process and a product of the construction engineering profession. Assuming that the comprehension of an object therefore implies the comprehension of its parts, the textual picture of the meronyms of *building* has helped us to understand what a building really means for the construction engineering profession. Following Bhatia (2004) the building must be understood as a reflection of the disciplinary, social and institutional knowledge embedded in its ontological meaning. Hence exploring what a building means for this profession requires the analysis of the text-external circumstances which influence the creation of discourse, thus moving from the text to the discourse community and to their socio-disciplinary implications. The lexical analysis has lent credence of how the architectural and engineering view of the building is embodied in its texts and of how this has been textualized by means of the noun *building* and the number of semantic and rhetorical features which are specific to the domain of construction engineering.

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