A Cognitive Account of the English Meronymic *By* Phrase
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1. Introduction

Various researchers have noted that some predicates in English permit the expression both of certain arguments and meronyms of those arguments – that is, both an entity and some zone or part of that entity. Langacker (1984) refers to these meronymic entities as *active zones*. In example (1), the active zone of the DOG, loosely speaking, is the TEETH, because of the semantics of *bite*, whereas the active zone of the CAT is unspecified in (1a) but can be instantiated in a separate constituent, as in (1b).

(1)   a. Your dog bit my cat
        b. Your dog bit my cat on the tail with its sharp teeth.

Some of the past analyses (Langacker 1984, Jackendoff 1990) have briefly noted the differences among various prepositions, but they have neither analyzed the differences systematically, nor looked specifically at phrases with *by*, which has a very specific semantics, as opposed to *in* or *on*. In this study, I am concerned only with those constructions in which the preposition is *by*, and in which the referent of the object of the *by* phrase (HANDLE) is in a meronymic relationship with a given ENTITY (the direct object of an active sentence, or subject of a passive or unaccusative sentence) and is somehow construed as a "handle"; it is the point of contact between either the AGENT and ENTITY (2) or the GROUND and ENTITY (3). I call the whole construction H-BY.

(2)   BNC: I got hold of him *by the scruff of the neck* and took him along to the police box and rang up for the wagon.[2]
(3)   BNC: They belonged to a heavily built young man, hanging nonchalantly from the ceiling *by his boots*.

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[1] Thanks to Chuck Fillmore, Andreas Kathol, Eve Sweetser, the FrameNet project, George Bergman, Simon Corston-Oliver, Andrew Garrett, Kevin Moore, Len Talmy, and others who provided comments and feedback on this project.
[2] Examples from the British National Corpus are prefaced with "BNC" so as to distinguish them from my own constructed ones.

In my analysis, I follow the work of researchers like Susan Lindner (1981) and Claudia Brugman (1988), who did extensive studies on the semantic and cognitive structures of English prepositions. However, I am also interested in exploring the core semantics of H-BY by looking at the kinds of lexical predicates and objects of the *by* phrase which can participate in it. For a similar approach, see, for example, Barker (1998), which analyzes the semantics of the English *–ee* morpheme (e.g., *evacuee, amputee*) by looking at constraints on the thematic roles of the participants, and by organizing the words formed with this morpheme into semantic or conceptual groups.

2.   Methodology

The data for the study are all from the British National Corpus. My goals in collecting corpus data were: to find relevant and interesting examples of H-BY for qualitative analysis; to do the searches in consistent ways that would also allow for quantitative analysis; to develop hypotheses, and gather evidence about which classes of verbs participate in the H-BY construction; to gather negative evidence (that is, to actively look for H-BY in contexts in which it was not expected to appear so that infelicitous sentences could be constructed with some degree of confidence); and to find novel examples of uses of H-BY with verbs which might not fit the typical lexical prototypes.

3.   Results I: Semantics of HANDLES

To see the most common uses of H-BY, it is informative to look at the ten most frequent lexical items of the HANDLES:

(4)
Ranked frequency of 10 most frequent objects in H-BY construction

Lemma	arm	hand	shoulder	hair	wrist	neck	throat	leg	foot	collar
Freq.	74	61	60	35	28	27	20	17	17	16

Total tokens in sample: 592

Even allowing for possible metaphorical uses of these body part terms, it is clear that this constuction is most commonly used in discussing the manipulation of humans and other animate entities. Articles of human clothing (*collar, sleeve, lapel*) are satisfactory body parts, for this purpose, as they are appropriate "handles" by means of which another person's body can be gotten under control. Other kinds of secondary locatives distinguish between body parts and clothing:

(5)   Pat hit Chris
      a. on the chest   c. *on the shirt
      b. in the nose   d. *in the glasses

The highest frequency objects which are not, in their base meanings, parts of humans or animals (including clothing), with a frequency of 5 tokens each, are *strap, handle,* and *root*. Obviously, there is nothing grammatically wrong with sentences with inanimate ENTITIES, but they occur quite infrequently. This is not surprising; our entire understanding of an event of one human touching, restraining, or manipulating the body of another differs vastly depending on the specific body part. Compare sentences like:

(6)   a. Pat pulled Chris along by the hand / by the hair / by the feet.
        b. Pat picked up the cup by the handle / by the rim / by the bottom.

The selection of the body part completely reframes our understanding of the sentences in (6a), including the relationship of the participants to one another, because of the differences in how much control Chris has over the situation, in bodily orientation, and in physical, sociological, and psychological forces involved. However, in (6b), the differences in the exact place in which the object is touched do not reframe the sentences in these ways.

4.   Analysis of valence patterns and diathesis alternations of predicates

One difficulty with traditional conceptual structure papers, such as Brugman (1988) and Lindner (1981), is that they rely largely on the intuitions of the researcher about the relationships between the different parts of the conceptual structure; in particular, for separating the uses of a particular lexical item or construction into different senses or classes, and rejoining them into conceptual clusters. Such arguments seem to me to be unfalsifiable, and therefore indefensible.[3] A preferable technique is the one used by Fillmore (1968) to find 'covert' distinctions in uses of similar grammatical functions, and by George Lakoff (1987) in the analysis of the various constructional uses of English *there* (and followed by Bergen and Plauché (in press) in their analysis of the French deictic words *voilà, voici, il y a*); the observable evidence of syntactic alternation provides evidence for a category structure. Thus, I examined the data for diathesis alternations to find the syntactic behaviours of different instantiations of H-BY.

4.1   Diathesis alternations examined
4.1.1   Direct object realization

This is similar to Levin's (1993) "body part possessor ascension alternation"; the HANDLE in a *by* phrase can alternate as the direct object of the sentence.
     The sentences in (7) may describe the same scene, while those in (8) may not:

(7)   Pat grabbed Chris by the waist / Pat grabbed Chris' waist.
(8)   Pat lifted Chris by the waist / *Pat lifted Chris' waist.

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[3] For a further critique of these methods, see Sandra and Rice (1995).

4.1.2 H-BY required

Some sentences, as in (9), allow paraphrases, which may be underspecified, but still essentially describe the scene, by removing the H-BY phrase altogether, while others do not, as in (10) below:

(9)   I grabbed Chris *by the hand* / I grabbed Chris
(10)   I plucked Chris *by the sleeve* / *I plucked Chris

4.1.3 Conative alternation

Some verbs allow for a conative alternation, in which the phrase with H-BY is loosely paraphrasable by substituting *on* or *at*:

(11)   a. BNC: Benjamin tugged Ruthven *by the sleeve*, indicating he wished to talk to him.
        b. Benjamin tugged on/at Ruthven's sleeve.
(12)   a. BNC: George dragged her upright *by her hair*.
        b. *George dragged on/at her hair.

4.2 Participant role alternations

In addition to diathesis alternations, in which semantic constituents in the sentence can be instantiated in different grammatical functions, I also regard participation in a frame, as defined by Chuck Fillmore's frame semantics (e.g. Fillmore 1992, Fillmore & Atkins 1992), to be a kind of evidence for positing a particular category. One piece of evidence that a group of predicates share a common frame is that they have similar semantic participant roles, in addition to those which are basic participants in the H-BY construction (ENTITY, HANDLE)

4.2.1 CONNECTOR

Some verbs allow a CONNECTOR phrase, as well as an H-BY phrase:

(13)   BNC: The boy was tied **with a rope** *by his feet* …

Here, the CONNECTOR phrase looks more like a MEANS OF phrase. However, the more common way for the connector to be instantiated is with *by*, which makes it a bit difficult to distinguish the HANDLE uses of the by-phrase from the CONNECTOR uses. A clear example of a connector use is in (14):

(14)   BNC: A bloody-mouthed mastiff tied *by a chain* to a lintel of a door snarled and barked. (compare with H-BY *tied by its neck to a lintel*)

Difficulties occur because many sentences are ambiguous about whether the object of the BY phrase is a "part" of the ENTITY, as in (15):

(15)   BNC: He pointed to the binoculars hanging *by their strap* from the arm of his chair.

While it is typically the case that the HANDLE in H-BY is a meronym of the ENTITY, meronymy is loosely construed enough that a test for meronymy would be only marginally helpful in these overlap cases – for example, "clothing" is an acceptable HANDLE, while it is not strictly speaking a meronym. On the other hand, clothing is part of the *frame* of a human being, as the strap is part of the *frame* of binoculars. We can see this through the use of possessives (*hanging by their strap*) or the definite article (*pulled him by the sleeve*); this is not possible with pure connectors (**a mastiff tied by the chain to a lintel*).

Another piece of evidence for a CONNECTOR as opposed to a HANDLE is purely semantic: the prototypical connector is a long, thin, extended object, such as rope, chain, wire, stalk, thread, strap, etc; it is less of a point of contact than a bridge between figure and ground. Other pieces of evidence are standard tests for means or instrumental relationships: CONNECTORS may alternate as the subjects of active sentences (if passive), or they may be paraphrased with *with* instead of *by*. The object in an H-BY phrase is not construable as an instrument:

(16)   a. The dog was tied by a chain to the door.
         b. The dog was tied with a chain to the door.
         c. A chain tied the dog to the door.
(17)   a. The dog was tied by its neck to the door.
         b. *The dog was tied with its neck to the door.
         c. *Its neck tied the dog to the door.

4.2.2   GROUND

Some of the scenes evoked by H-BY allow an instantiation of a GROUND constituent. The interpretation of these scenes is that the HANDLE is in contact with the GROUND and not with an AGENT. The preferred preposition may be *to*, as in (18) or *from*, as in (19):

(18)   BNC: He was handcuffed and taken to a locker room where he was chained **to a metal grille** *by the arms and legs.*
(19)   BNC: I said I'd remember that if ever I found him dangling upside down *by one toe* **from a ski-lift cable**.

4.2.3.   PATH or GOAL constituent

Some of the scenes evoke a potential GOAL or PATH constituent. These are the scenes in which the ENTITY is a theme; it is participating in a caused-motion frame.

(20)   BNC: Then another diver dragged the shark *by its tail* **to the beach** ...

5.   Results II: Semantics of predicates

Inspecting the possible valence patterns and diathesis alternations of particular lexical verbs showed that verbs cluster into several semantic groups,

summarized in (21). These groups were posited based on their behaviour with respect to the H-BY phrase in particular; while they bear some relation to standard classifications of verbal predicates into clusters (for example, FrameNet frames (for details, see the homepage at http://www.icsi.berkeley.edu/~framenet) or Levin's (1993) verb classes), they are at least partially orthoganal to them. In particular, because the meanings of these sentences are relative to scenes, different instantiations of the same verb in different contexts might fall into different conceptual groups even if one wouldn't ordinarily think of them as being different senses per se. For example, attested uses of *pluck* fall into three different groups with respect to H-BY: pluck (a person) by the sleeve (MANIPULATE), pluck out (a doll) from a toy chest by the waist (LIFT), pluck out (a hair) by the roots (PLUCK).

Based on these syntactic observations, as well as semantic entailments (discussed in detail below), I propose 6 conceptual groups of predications which have affinity for the H-BY construction. (21) below shows the ways in which the diathesis alternations and instantiations of the participant role structures are varied according to the conceptual groups:

(21)
Diathesis alternations and participant role patterns of semantic groups

	HOLD	MANIPULATE	ATTACH	HANG	CONVEY.	PLUCK
Direct object realization	✓	✓	✓	X	X	X
H-BY required	X	✓	X	X	X	X
Conative	X	✓	X	X	X	X
CONNECTOR	X	X	✓	✓	X	X
GROUND: to	X	X	✓	X	X	X
GROUND: from	X	X	X	✓	X	✓
PATH/ GOAL	X	X	X	X	✓	X

5.1 HOLD

catch, clasp, get, get hold of, grab, grasp, grip, hang on, have, have hold of, hold, seize, snatch, take, throttle

This group entails that there is contact between the AGENT and the HANDLE such that the whole entity is controlled.

(22)   a. BNC: He was still clasping her *by the shoulders* ...
        b. BNC: Scott grabbed him *by the lapels* and hauled him to his feet.

5.2 MANIPULATE
pluck, press, shake, squeeze, tweak

In this set, the agent is also in contact with the HANDLE of the entity so as to get it under control, but the action is construed as affecting the HANDLE more than the entity as a whole. For that reason, the sentence no longer has the correct entailments without reference to the H-BY phrase, which is why the H-BY phrase is required. It entails the HOLD schema; to *tweak* you by the nose, I must *hold* you by the nose.

(23)   a. BNC: Soon the Mayor was shaking the Captain *by the hand*.
       b. *The Mayor was shaking the Captain (with the same interpretation)
(24)   a. BNC: Harriet plucks me *by the sleeve* and whispers, "Mummy, what will Tracey's Gran do now she's dead, if she wants to go to the loo?"
       b. *Harriet plucks me and whispers ....

5.3 ATTACH
anchor, attach, bind, chain, connect, harness, knot, nail, pin, tie, trap

In almost all cases, these sentences entail a means of attachment, which may be instantiated through a CONNECTOR phrase with *by* or a different preposition like *with* (*tied with a rope*), or by incorporation into the verb itself (*chained by the legs*). These sentences necessarily entail a GROUND, which can be stated, in (25), unstated, as in (26), or reflexive, as in (27):

(25)   BNC: ... he was chained to a metal grille *by the arms and legs*.
(26)   BNC: He said that he hadn't been treated 'badly', but had, like Jenco and Jacobsen, been chained *by one or both ankles* for most of the time.
(27)   BNC: A cream sweater was knotted *by its sleeves* around his neck.

5.4 HANG
dangle, hang, string up, suspend, swing

This concept group entails the ATTACHMENT schema; to overcome gravity, the hanging ENTITY must be attached to a GROUND. Differences between the HANG and ATTACH groups in syntactic instantiation include the choice of preposition for the GROUND constituent (*from* vs *to*) and the possibility of unaccusative verbs, as in (28) with H-BY, none of which were found in the ATTACH group:

(28) BNC: my harness slipped and I dropped ten thousand feet hanging *by one leg*
(29) BNC: he was gazing at a row of hares suspended *by their feet* from a rack

5.5 PLUCK
pluck, pull, yank (by the part at which it was attached)

A few verbs of traction require interpretation of the by-phrase not as a handle, but as the point at which the ENTITY was attached to a GROUND before

its extraction from that ground; it presupposes an ATTACHMENT schema. Perhaps not surprisingly, the only word which was the object of the *by* phrase with this usage was *root*, e.g.:

(30)   BNC: A rotating mechanism traps the hair and plucks it out *by the root*.

5.6   CONVEY
carry, guide, drag, draw, haul, help, hoist, lead, lift, lug, pick up, pull, tow, tug, yank

These change-of-location propositions do not allow the instantiation of the object of H-BY as the direct object of the verb (with the same meaning):

(31)   a. BNC: Drag me off to your lair *by my hair*, perhaps?
        b. *Drag my hair off to your lair.

These scenes allow directional GOAL and PATH adjuncts like above, where *to your lair* is a GOAL); in some cases, directional information is incorporated in the semantics of the verb, as in (32) below, where the PATH (UP) is incorporated into the semantics of the verb.

(32)   BNC: she lifted the calliper *by its straps* and flung it over the small cliff.

5.6.1   Subclasses of CONVEY co-occuring with H-BY
Propositions in this group fall into three general subclasses with different entailments – in particular, different force-dynamic entailments (Talmy 1988), and entailments about the animacy and volitionality of the ENTITY. However, the syntactic instantiations of the participant roles are not affected by these subclasses, and they do not differ with respect to the interpretation of the *by* phrase itself; thus they should be considered equally part of the CONVEY group.

5.6.1.1   LIFT predications (lift you by the waist, pick up a bottle by the neck)
These sentences specify that that PATH is upwards, or against gravity. The ENTITY is understood not to contribute to the force of the caused-motion, nor to hinder the caused motion through its tendency to move in the opposite direction by any volitional action. The animacy of the ENTITY is therefore not a factor in the interpretation of the proposition.

(33)   BNC: [he] picked him up *by both elbows* and pulled him on to his lap.

5.6.1.2   DRAG predications (drag you by your hair, pull a cart by the handle)
These sentences imply a PATH which is non-specified for verticality. The ENTITY is understood to be caused by the AGENT to be moving along a path which the ENTITY otherwise resists moving along. The ENTITY may be either animate or inanimate, but if animate, as in (34), it is understood to neither be resisting nor helping the caused-motion:

(34)   BNC: A tiger snatched a five-year-old girl from a van full of tourists after smashing a window with a paw and dragging her away *by the head*.

5.6.1.3 LEAD predications (pull you by the hand, guide you by the elbow)

These sentences are similar to the DRAG predications, but the ENTITY must be animate; while the DRAG predications are specifically caused-motion, the LEAD predications are better thought of as causing or assisting the ENTITY to participate in an act of self-motion. This is a psychological instantiation of the TRACTION schema; any resistance is at least partially psychological, due to lack of volitionality or ability (to have the motion caused), as in:

(35)   BNC: Five children were yanked *by arm or hand* across a road.

Unlike in (33) and (34) above, the physical force of the traction is probably not the only thing causing the motion; the ENTITY, though perhaps unwilling, may still contribute to the direction of motion. Another possible cause of resistance is the inability to find a path, or the inability for the ENTITY to move along a path on its own:

(36)   BNC: ... the gentleman had every right to take the woman's arm and even, over a rough patch, help her *by the waist*.

5.6.2   Subclasses not readily occuring with H-BY

The three subclasses of caused-motion verbs above are particularly interesting in light of the subclasses of caused-motion verbs which do not occur in conjunction with H-BY. That is, the possibility of an H-BY phrase is not a general property of caused-motion clauses; it is specifically these types of verbs which allow it.

5.6.2.1 Verbs in primarily non-spatial frames (0 instances found)

Verbs which may entail causing an entity to move but which have their emphasis on social forces – that is, which are not primarily spatial or physical in their frame – do not co-occur with H-BY. To give just a few of the many examples, these includes verbs of commercial transaction – *buy, sell*, etc. (Fillmore 1992) and verbs of "possessional deprivation" (Levin 1993) like *steal, filch*, or *embezzle*:

(37)   a. *Pat stole the shovel by the handle
        b. *Pat bought the shovel by the handle

Because these predicates focus on the means behind the transfer of possession rather than on the motion of the ENTITY (though the ENTITY is often also necessarily or implicitly being moved), the secondary locative may not be used.

5.6.2.2 Verbs of pushing (1 instance found)

A priori, there does not seem to be anything wrong with sentences like these:

(38)   I pushed the shopping cart by its handle.
(39)   Pat shoved Chris by the shoulders.

However, they are simply not found in the corpus. The table in (40) shows the results of 390 PUSH verbs and 474 PULL verbs inspected; only 1 case of H-BY was found for PUSH verbs, as compared with 71 for the PULL verbs.

(40)
Frequency of H-BY with verbs of pushing vs. pulling

	Lemma	Verb freq	Freq of verb near by	Sentences inspected[4]	H-BY found
PUSH	*push*	90mathl74	294	200	0
	shove	742	21	21	0
	press	7068	169	169	1
PULL	*drag*	3075	159	159	39
	pull	13616	390	200	24
	haul	1007	115	115	8

Both sets of verbs have the same kinds of participants, and the same kinds of thematic roles, and can participate in many of the same alternations. However, they have radically different affinities for the H-BY construction. The reason for this, of course, is that the force dynamics of the actions suggested by verbs of traction may actually require some kind of handle for the action to be completed (consider the difficulties of opening a door towards you if the handle has been removed). However, the actions suggested by the verbs of pressure generally do not require handles (a door opening outward needs no handle).

5.6.2.3 Verbs of release (1 instance found)
Since these verbs are metonymically related to HOLD (the interpretation is that the AGENT was holding the ENTITY by the HANDLE at the time of its release), I inspected sets of these verbs for examples of H-BY (*cast, catapult, chuck, drop, eject, fling, flip, heave, pitch, sling, throw, tip, toss, eject*). However, the only example I found of one of these verbs participating in H-BY was:

(41)   BNC: the snake stirred as David dropped the mouse *by its tail* into the terrarium.

Again, while H-BY is certainly possible with some of these verbs, this is rather a marginal class, possibly because these verbs foreground the end state of the action, at which time the AGENT is no longer in contact with the HANDLE.

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[4] Because each sentence with the target verb near *by* had to be manually judged as an instance of H-BY or not, I inspected a maximum of 200 instances of each verb.

5.6.2.4 Verbs of spatial configuration (0 instances found)

Verbs of spatial configuration (Levin 1993) (*lay, place, sit, stand*, etc.) which aren't specifically HANG verbs do not show affinity for this construction – again, at the end state of action, there is no contact between AGENT and HANDLE. Note that (42b) is completely uninterpretable a meaning where the handlebars are a point of contact with the AGENT (*Pat*), but that it is not so bad with an interpretation where the handlebars are the point of contact with the GROUND (*wall*) at the end state, which supports this explanation.

(42)   a. *Pat put the knife on the table by the handle.
        b. *Pat stood the bike against the wall by the handlebars.

6.   Conclusions

Given these different subcategories of semantics of H-BY, can a unified semantics of H-BY be proposed? Probably not, if by "unified" one means a necessary and sufficient set of semantic conditions. However, an inspection of the subgroups makes apparent certain schemata which are central to the various uses; most saliently, these schemata include ATTACHMENT/HOLDING and TRACTION. In the most prototypical uses of H-BY, we find both of these schemata at work (e.g. the DRAG, HANG, and PLUCK groups); in others, we may find only one of them (e.g. LEAD necessarily entails physical or psychological traction but not necessarily physical attachment; MANIPULATE entails HOLDING but not necessarily TRACTION). In addition, the various subcategories of the CONVEY predicates which do not have affinity for H-BY are those in which these schemata are not present or not salient. This suggests a family resemblance type polysemy structure of the H-BY construction; all nodes have similarities to at least one other node, and yet the description of only those features which all nodes have in common would be far less than a full specification of the construction.

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