

Artifacts: Reference, Countability, and Categorization

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The Puzzle of *Furniture*-Nouns

Nouns like *furniture* might be considered misfits at best, and spoilsports at worst!

- ▶ *furniture, jewelry, luggage, mail, ammunition*

They cast doubt on the generalization that there is a mapping from countable nouns to individuals (e.g. *dog, book*) and from non-countable nouns to substances (e.g. *water, mud*).

Why? They show a surprising combination of properties, which straddles mass and count.

The Puzzle of *Furniture*-Nouns

- ▶ **Grammatically non-countable:** A property shared with core mass nouns — liquids and substances (e.g. *water*, *butter*, *sand*, *sugar*):
 - ▶ furniture/*furnitures, mail/*mails
 - ▶ *two furnitures, *three mails
 - ▶ water/*waters, gravel/*gravels
 - ▶ *two waters, *three gravels

The Puzzle of *Furniture*-Nouns

- ▶ **Individuals in their denotation:** A property not shared by core mass nouns
 - ▶ These individual entities are in principle countable
 - ▶ *Ed listed the furniture in the dining room.*
 - ▶ They are modifiable (Schwarzschild 2006)
 - ▶ *big furniture* distributes over the individual pieces
 - ▶ They provide for a dimension of comparison (Barner & Snedeker 2005)
 - ▶ If Ed has more pieces of furniture than Eva, then he may be considered to have more furniture.
- ▶ Hence, Barner & Snedeker's (2005) label "*object-mass*" nouns, contrasting with the core or "*substance-mass*" nouns (See Deal 2016 for the many names given to *furniture*-nouns)

The Puzzle of *Furniture*-Nouns

- ▶ **Individual constituents are often heterogeneous:** A property not shared by core mass nouns, which are said to be homogeneous (in the non-technical sense)
 - ▶ e.g. *furniture* may be comprised of a variety of types, each with their own names:

chairs, tables, beds, sofas (cf. *sand/grain of sand*)

- ▶ Hence, nouns denoting the constituent entities may be used in their place

John arranged $\left\{ \begin{array}{l} \text{the furniture.} \\ \text{the sofa, coffee table, chairs.} \end{array} \right.$

- ▶ This observation has not played a prominent role in past analyses

Key questions facing any account:

- ▶ What is in the meaning of *furniture*-nouns that allows them to have this puzzling conjunction of properties?
 - ▶ Non-countable syntax
 - ▶ Individual entities in their denotation
 - ▶ Heterogeneity of these individuals

The visibility of the constituent entities has prompted analyses in which the denotation of a *furniture*-noun is simply composed of these entities (e.g. Chierchia 1998, Bale & Barner 2009)

- ▶ It denotes a collection of individuals
- ▶ It is synonymous and co-extensive with its component parts

“What else can the denotation of *furniture* be, if not all the pieces of furniture (down to the single ones)?” (Chierchia 1998: 68)

Concomitantly, most formal treatments of the countability behavior of *furniture*-nouns are typically built on algebraic properties that make reference to the atoms in the denotations of nouns.

- ▶ Cumulativity, divisivity, homogeneity

Among others: Bale & Barner 2009, Chierchia 1998, 2010, Rothstein 2010, Deal 2016

However, *furniture*-nouns are more than collections of entities: they have another important meaning component.

Key to the analysis: *furniture*-nouns denote artifacts.

- ▶ Artifacts have a **function** and thus participate in some way in an **associated event**, e.g. furnishing for *furniture*

The special properties of *furniture*-nouns follow from the type of associated event at issue:

- ▶ The associated event canonically involves the participation of multiple, and often diverse, entities

Thus, *furniture*-nouns are **artifactual aggregates** (cf. granular aggregates such as *sand*, *gravel*, *sugar*)

The artifact/natural kind distinction is an essential conceptual distinction among entities, as discussed by philosophers and cognitive and developmental psychologists.

Among others: Aristotle, Wiggins 2001, Keil 1993, Wierzbicka 1985

Artifacts and Their Associated Events

Artifacts, unlike natural kinds, have a function, evoking what Nichols (2008) calls an 'associated event', cf. the 'telic' component of Pustejovsky's (1995) qualia structures

“two types of noun meaning

- a. nouns whose meaning is based on physical properties of the referent, and
- b. nouns whose meaning is represented by the canonical event associated with the referent” (Nichols 2008: 694)

Artifacts and Their Associated Events

The artifact/natural kind distinction is grammatically relevant, having a linguistic manifestation in the names given to entities in the world (Downing 1977, Wisniewski & Love 1998, Brown 1999, Kemler Nelson et al. 2003, Nichols 2008, Levin, Glass & Jurafsky 2015).

Artifacts and natural kinds show different naming patterns.

Further, these naming patterns underscore the importance of the associated event in the characterization of an artifact.

Brown (1999) studies how items imported from Europe are named in languages of the Americas:

- ▶ Reference to function is more prevalent in artifact names (63%) than natural kind names (10%).

Example: Head-modifier relations in compound names

- ▶ For artifacts, this relation typically makes reference to the artifact's associated event (e.g. *coat hook*)
- ▶ For natural kinds, this relation typically involves perceptual properties of the natural kind (e.g. *snow goose*)

Among others: Downing 1977, Wisniewski & Love 1998, Levin, Glass & Jurafsky 2015

Artifacts and Their Associated Events

The canonical associated events for *furniture*-nouns:

- ▶ *furniture*: furnishing a space
- ▶ *mail*: transmittal through the postal system
- ▶ *change*: being returned from a monetary transaction
- ▶ *luggage*: pulling or carrying throughout a journey

Several different types of entities may participate in the same way in these associated events, hence the connotation of heterogeneity.

Artifacts and Their Associated Events

Etymological evidence for the associated event:

- ▶ *Furniture*-nouns are often deverbal:
 - ▶ *furniture* (< French *fournir* 'to furnish')
 - ▶ *luggage* < *lug* (v.) + *-age*
 - ▶ *change* < *change* (v.)
- ▶ Or are otherwise closely tied to an event:
 - ▶ *mail* is derived from bags used by couriers ("mail of letters"), cf. Modern French *malle* 'suitcase'

The key component of the meaning of *furniture*-nouns:

- ▶ The existence of an associated event which is jointly satisfied by multiple, often heterogeneous participants.

This associated event gives rise to their observed properties:

- ▶ The presence of individual entities in the denotation
- ▶ The heterogeneity of these entities
- ▶ The requirement that these entities jointly allow the associated event to be performed

Furthermore, the associated event explains still other properties of these nouns.

In order to argue for the constituent entities, Barner & Snedeker (2005) show they provide for a dimension of cardinality comparison.

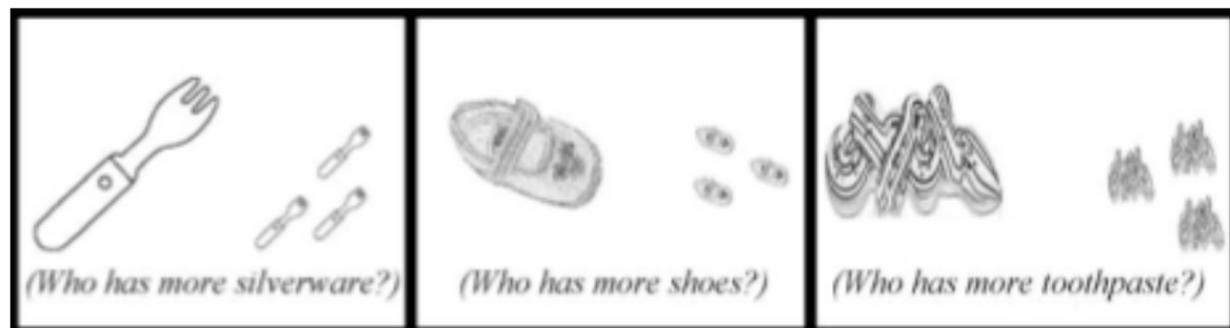
Prediction: If the meanings of *furniture*-nouns include an associated event, more than one dimension of comparison might be expected to be available, including:

- ▶ comparisons that involve the number of constituent entities in the denotation (Barner & Snedeker 2005)
- ▶ comparisons that involve how well the constituent entities satisfy the associated event (McCawley 1975)

Only the first type of comparison has been previously investigated.

Comparisons involving number of constituent entities

Barner & Snedeker (2005) illustrate such comparisons are made via a task involving making judgments about differing quantities of *furniture*-nouns, count nouns, and substance mass nouns.



The general finding: The syntactic status of a noun, i.e. (non-)countability, does not determine how quantity judgments were made:

- ▶ For substance mass nouns, participants judge one large portion to be “more” than three tiny portions.
- ▶ For count nouns, participants judge “more” according to number of physical objects.
- ▶ For *furniture*-nouns (their “object-mass” nouns), participants also judge according to number of physical objects

The experiment shows that number of individuals can be relevant

It does not show that the denotation consists only of these individuals

Limitations of the experiment:

- ▶ heterogeneity may not have been adequately controlled for
- ▶ visual scene may encourage counting pieces
- ▶ there may be other relevant dimensions of comparison, e.g. volume, value (Solt 2008, Rothstein 2010)

Searle notes that there may be variation in how quantity is construed for *furniture* nouns:

“... relative to one conceptual scheme, if I am asked, ”How many objects are there in this room?” I may count the various items of furniture in this room. But relative to another conceptual scheme, that does not distinguish between the elements of a set of furniture but just treats the furniture set as one entity, there will be a different answer to the question ...” (Searle 1998: 23)

Next step: Three experiments that show that the associated event provides **another** dimension for comparison.

General properties of the experiments:

- ▶ The stimuli were presented on Amazon's Mechanical Turk.
- ▶ Each item was seen by 20 participants.
- ▶ 50% or more of the items were fillers.

Comparison: Experiment 1

Goal: To investigate whether comparison judgments may be affected by the degree of heterogeneity of constituent entities

When one set is more diverse than a second of the same size, will it be judged as “more”?

- ▶ Participants evaluated which counted as more furniture:
 - ▶ (i) five chairs
 - ▶ (ii) a sofa, two chairs, a coffee table, and a bookcase (five items)

Results:

- ▶ All 20 participants chose (ii) — the heterogeneous set
- ▶ Many commented that this set better performed the function of furnishing

The results are problematic for a theory where the denotation of *furniture* is only equivalent to the constituents in the set.

Comparison: Experiment 2

Goal: To investigate whether the degree of satisfaction of the associated event provides a dimension for comparison:

When a set of entities related to a *furniture*-noun satisfies the associated event better, will it be judged as “more” than a set which has greater cardinality?

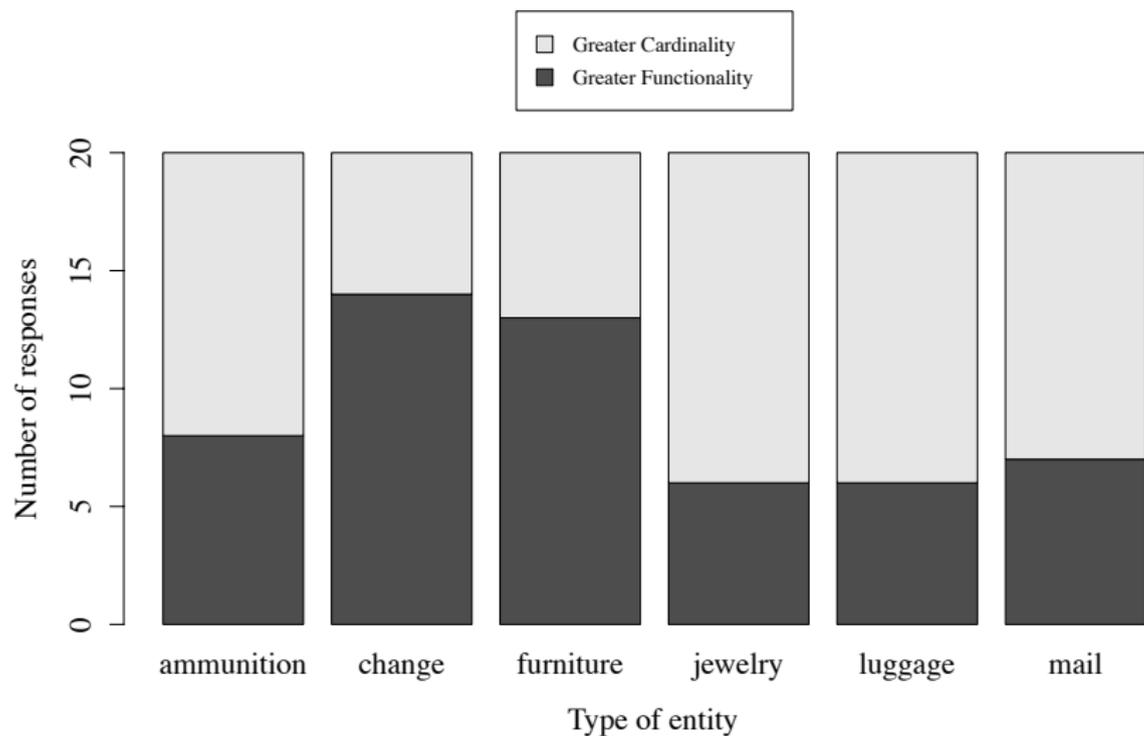
Comparison: Experiment 2

SAMPLE CONTEXT: Two women are at a gala event.

- ▶ Woman A is wearing two gold bracelets, a diamond tiara, and a ruby and emerald necklace. (4 ITEMS)
- ▶ Woman B is wearing three gold rings, a pearl necklace and a silver bracelet. (5 ITEMS)

QUESTION: Who has more jewelry?

Comparison: Experiment 2



Comparison: Experiment 2

Participants left comments which showed they were deciding between two dimensions of comparison: cardinality and satisfaction of the associated event.

- ▶ **Jewelry:** “Although Woman B has one more piece of jewelry, Woman A’s jewelry appears to be more elaborate, with more jewels, probably larger, and probably more valuable.”
- ▶ **Furniture:** “Friend A has fewer pieces but a more diverse and practical collection”
- ▶ **Mail:** “The packages and boxes are generally bigger in mass, therefore it would appear to me that Resident B received more mail for the day.”

Conclusion: having more pieces is not always enough to count as “more” .

The dimensions of comparison include at least:

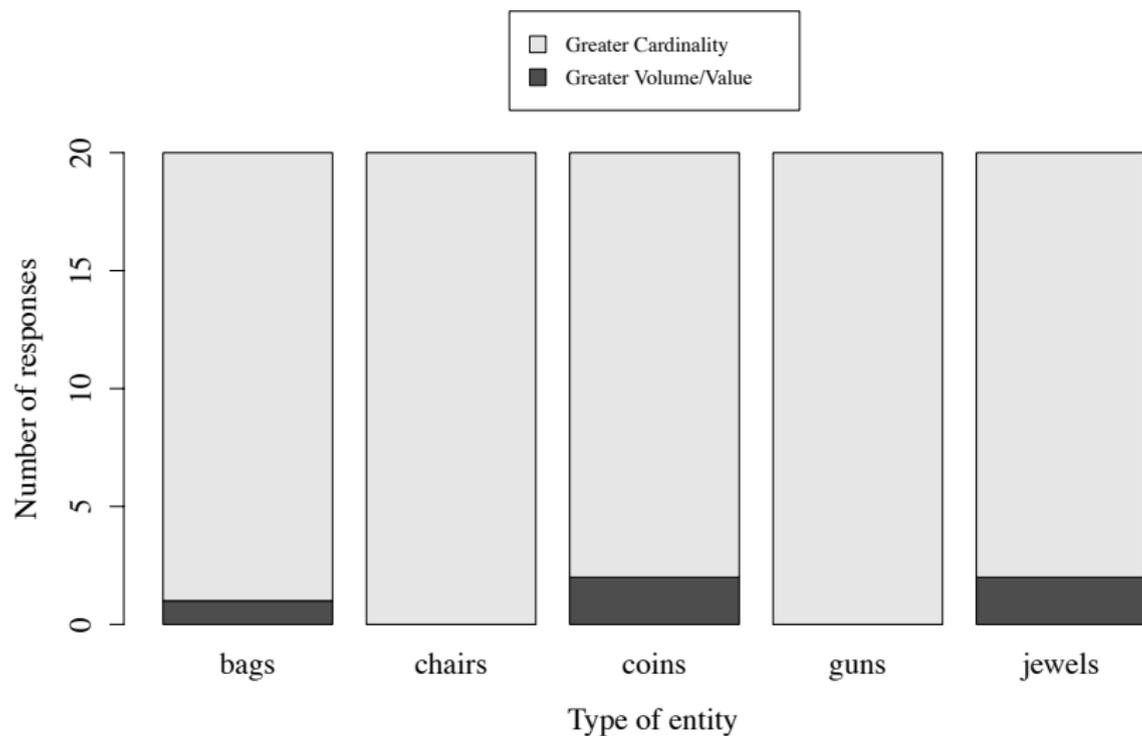
- ▶ number of pieces
- ▶ satisfaction of the associated event

Comparison: Control Experiment 1

It is possible that the effects in Experiment 2 are due to context and not to the associated event.

- ▶ **Prediction:** If so, similar effects should be found for the constituent entities in the denotations of *furniture*-nouns (e.g. *jewels*, *chairs*) when put in the appropriate context
- ▶ **Task:** Use a version of the Experiment 2 task whose items are the constituent entities of *furniture*-nouns.
- ▶ **Results:** Participants based their comparisons solely on quantity

Comparison: Control Experiment 1

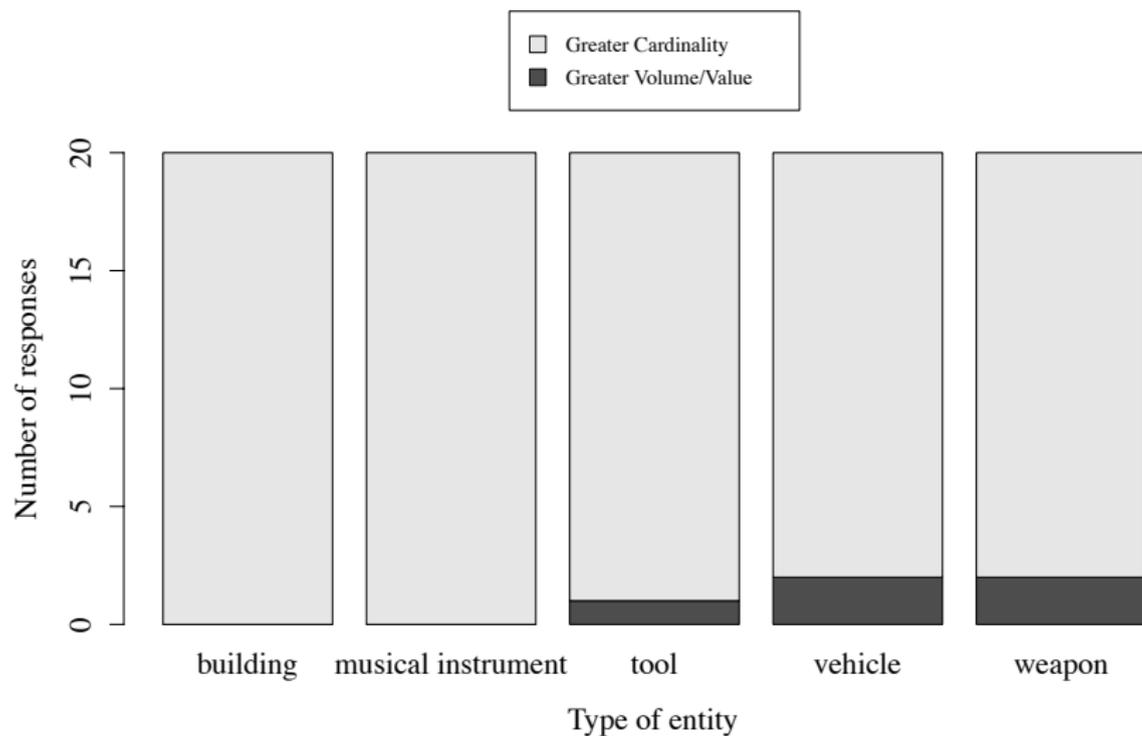


Comparison: Control Experiment 2

It is possible that the effects in Experiment 2 are due to the apparent superordinate nature of *furniture*-nouns.

- ▶ **Prediction:** If so, comparable effects should extend to countable superordinates (e.g. *vehicle*, *weapon*).
- ▶ **Task:** Use a version of the Experiment 2 task whose items are countable superordinate nouns.
- ▶ **Results:** Participants again based their comparisons solely on quantity.

Comparison: Control Experiment 2



Comparison: Experiment 3

Goal: To investigate the extent to which the associated event plays a part in comparison judgments.

Prediction: The availability of judgments along the “satisfaction of the associated event” dimension should depend on the immediate context, viz. whether the entities are engaged in the associated event or not.

Associated Event in effect:

CONTEXT: You are visiting different friends.

- ▶ Imagine upon entering Friend A's room, you see a sofa, an easy chair, a coffee table and a small bookcase. (4 ITEMS)
- ▶ Imagine upon entering Friend B's room, you see one table and four chairs. (5 ITEMS)

QUESTION: Whose room has more furniture?

Associated Event neutralized:

CONTEXT: Different dealers bought furniture at an antiques auction.

- ▶ Dealer A bought a sofa, an easy chair, a coffee table and a small bookcase. (4 ITEMS)
- ▶ Dealer B bought one table and four chairs. (5 ITEMS)

QUESTION: Which dealer bought more furniture at the auction?

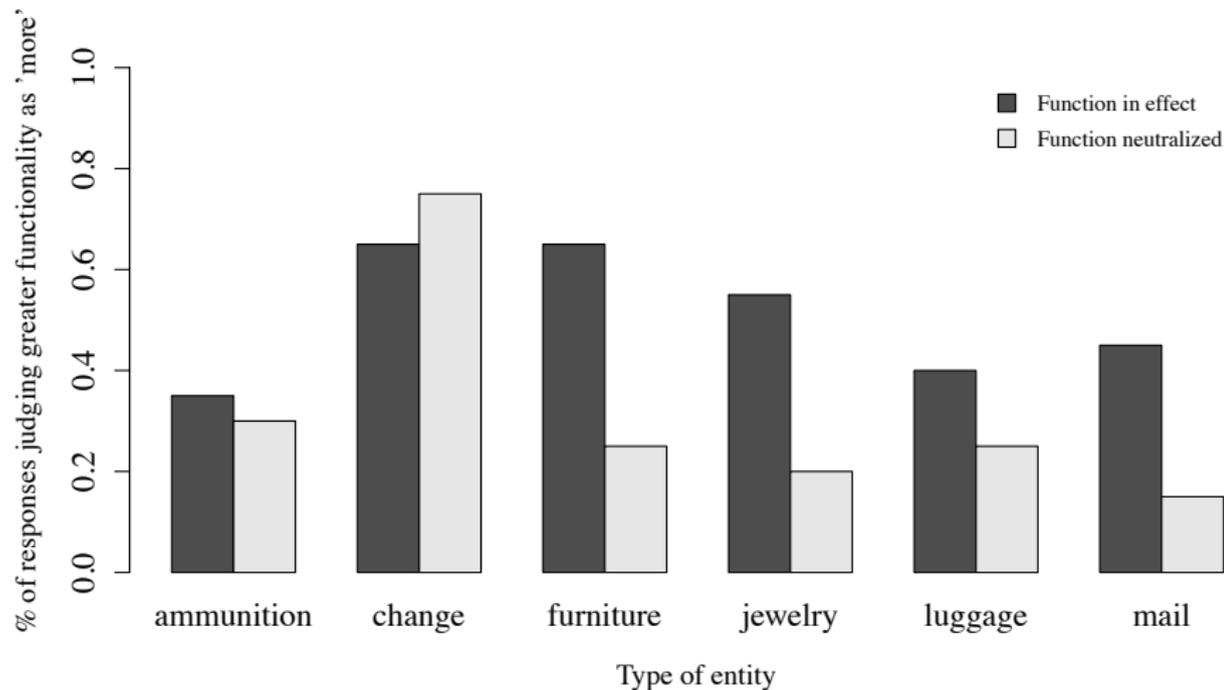
Comparison: Experiment 3

Results for *furniture*

The preferred basis of comparison depends on the condition:

	Function in effect	Function neutralized
Greater Functional Value	65%	25%
Greater Cardinal Value	35%	75%
	100%	100%

Comparison: Experiment 3



Comparison: Experiment 3

Conclusion: What counts as “more”—i.e. which dimension is used for comparison—is often dictated by the context in which the comparison takes place.

Outline of Proposal: Artifactual Aggregates

Artifact nouns encode a relation between entities and a predicate designating the associated event.

Furniture-nouns are a specific type of artifact noun.

- ▶ Their associated event permits, and typically implies, a set of often diverse entities in the relevant relation.

Thus, our name “artifactual aggregates”.

Next steps:

- ▶ Challenges in representing the meanings of artifact nouns
- ▶ Meanings for artifact nouns are built on the associated event
- ▶ Artifactual aggregates and (non-)countability
- ▶ The explanatory power of the associated event

Challenges in Representing Artifacts

Why not represent the meaning of *cup* in the same way as *dog*?

- ▶ I.e. why not extend the standard Carlsonian semantics for natural kinds to include artifacts?
- ▶ “artifact kinds” could in principle be defined through reference to an *intended function* (Simon 1996)

Drawback: “*Intended function*” not a sufficient criterion for many nouns

- ▶ in certain contexts a sock may qualify as *laundry*, yet it is difficult to argue that being laundered is related to the “intended function” of the sock

At least two major differences between artifacts and natural kinds:

1. **Opportunistic reference:**

- ▶ for artifacts, an entity may be used opportunistically to serve a certain function, and it then qualifies as an instance of the relevant artifact
 - ▶ a crate can serve as “furniture” in a student apartment
 - ▶ a lobster trap may be “recycled” as an outdoor planter (Dennett 1990)
- ▶ not so for natural kinds: a raccoon painted black with a stripe down its back and given a sac of “smelly stuff” is still a raccoon and not a skunk (Keil 1993)

2. **Non-stable reference:**

- ▶ for certain artifact terms, entities only temporarily qualify as instances of that artifact term:
 - ▶ a package which is currently in the postal system qualifies as *mail* today, but next week, after delivery, it no longer can be legitimately described as *mail*
- ▶ natural kind terms, like *dog*, stably identify their referents throughout their lifetimes

Representing the Associated Event

Analyze artifact nouns as properties which pick out individuals that participate in the noun's associated event

Preliminary representation:

- (1) a. pen $\rightsquigarrow \lambda y \exists e [x \text{ writes with } y \text{ in } e]$
- b. chair $\rightsquigarrow \lambda y \exists e [x \text{ sits on } y \text{ in } e]$
- c. furniture $\rightsquigarrow \lambda z \exists e [x \text{ furnishes } y \text{ with } z \text{ in } e]$

Representing the Associated Event

Two types of relations to the associated event, functional and stage-level:

- ▶ FUNCTIONAL ARTIFACT NOUNS possess a potential relation to the associated event: e.g. *furniture*, *cup*
 - ▶ the vast majority of artifact nouns
- ▶ STAGE-LEVEL ARTIFACT NOUNS possess a direct relation to the associated event: e.g. *mail*

- ▶ FUNCTIONAL ARTIFACT NOUNS possess a potential relation to the associated event rather than an *actual* one:
 - ▶ A pen does not have to be involved in a writing event at every moment to qualify as a pen.
 - ▶ Similarly, furniture stacked in a hallway still qualifies as furniture even though it is not actively furnishing a space.

Analysis: Functional Artifacts

The representation of many artifacts involves a modal component

- ▶ use Brennan's (1993) extension of the Kratzerian framework for modals to modalize properties

$$(2) \quad \textit{cup} := \lambda y[\text{ABLE}[\exists e[x \text{ drinks out of } y \text{ in } e]]]^{w,g,h_y,j}$$

In prose: *cup* is true of an entity for which, given the actual properties of the entity, there exists an accessible (and maximally close) world in which one can drink out of this entity.

Not the full story:

- ▶ not sufficient to distinguish *cup* and *mug*—other factors such as size, shape, possession of a handle, are in play

Can cope with “opportunistic reference”:

$$(3) \textit{furniture} := \lambda z[\text{ABLE}[\exists e[x \textit{ furnishes } y \textit{ with } z \textit{ in } e]]]^{w,g,h_z,j}$$

- ▶ if an entity, say a crate, is currently furnishing a location, then trivially there is an accessible world in which that entity can furnish a location, namely the actual world

Analysis: Stage-level Artifacts

Second class of artifact nouns such as *mail* and *laundry* are simply true of entities during the stretches of time when they are participating in the associated event

- ▶ Whether a letter counts as *mail* depends solely on whether the letter is participating in the associated event at that time

Refer to them as “stage-level” artifact nouns to recognize parallels with stage-level predication (Carlson 1980)

Analysis: Stage-level Artifacts

To capture the key properties, representations of stage-level artifacts include a temporal parameter, but not a modal component:

- (4) a. mail \rightsquigarrow
 $\lambda x \exists e [x \text{ is transmitted in the postal system in } e \text{ at } t]$
b. laundry $\rightsquigarrow \lambda x \exists e [x \text{ is being laundered in } e \text{ at } t]$

Further motivation:

- ▶ stage-level artifacts allow temporal modification by default
 - ▶ *yesterday's mail* refers to the mail that was in the postal system (in some manner) yesterday
- ▶ in contrast, functional artifacts and natural kind terms require contextual support to interpret such modifiers:
 - ▶ artifact terms, *yesterday's hammer*; natural kind terms, *yesterday's dog*

The representations for the two classes of *furniture*-nouns receive support from distinct sets of inferences:

- (5) Ed touched a chair. \Rightarrow Ed touched furniture.
- (6) Ed touched a letter. $\not\Rightarrow$ Ed touched mail.

Follows from the analysis given here:

- ▶ associated event for *furniture* is modalized: if one touches a chair, then it follows that one touches furniture
- ▶ associated event for *mail* is not modalized: if an entity is a letter, it does not follow that it is in the postal system, and the inference does not go through

Analysis: Restriction to Minimal Events

Need to refine the meaning representations to ensure they pick out an associated event of the right granularity.

Why? Currently, they can be satisfied by overly complex events:

- ▶ the representation for *cup* could be satisfied by a complex event consisting of Person 1 drinking out of cup A and Person 2 drinking out of cup B

The refinement: Add a restriction to minimal events.

(7) *Minimal event with respect to a predicate:*

$$\min(e, P) = P(e) \wedge \neg \exists e' [e' < e \wedge P(e')]$$

(8) $cup := \lambda y [ABLE[\exists e [x \text{ drinks out of } y \text{ in } e \wedge \min(e, \text{drink-out-of})]]]^{w, g, h_y, j}$

Analysis: Restriction to Minimal Events

The restriction to minimal events has different effects depending on the nature of the associated event.

Effect of the minimality restriction on canonical artifacts: *cup*

The minimality condition restricts the domain of entities which can satisfy the associated event to singular entities.

- ▶ a minimal drinking event typically only involves a single cup

Why? Consider whether the sum of two cups, $a \oplus b$, could satisfy the representation for *cup*.

- ▶ typically the sum of two cups would be used for an event of drinking out of the two entities in separate drinking events
- ▶ this event could be decomposed into smaller sub-events, a violation of the minimality condition

Effect of the minimality restriction on *furniture-nouns*

Restricting the associated event does not result in a restriction to singular entities:

- ▶ the event of furnishing a study may involve a bookcase, a desk and a chair
 - ▶ this is a minimal event since the bookcase, the desk and chair jointly furnish the study
- ▶ attempting to decompose this event into subevents, one must divide the spatial region in unintuitive ways—e.g. the bookcase “furnishes” the left half of the study, while the desk “furnishes” the right half of the study

Artifactual Aggregates and Countability

Countability properties of artifact nouns follow from the nature of the associated event interacting with a minimality restriction on the event.

- ▶ Artifact nouns with minimal associated events which involve single entities are countable nouns

chair: only use one chair at a time to sit on

- ▶ Artifact nouns with minimal associated events which involve multiple entities are typically *not* countable nouns

furniture: use more than one piece at a time to furnish a room

More Complex Cases

Necessary but not sufficient condition (like many lexical semantic generalizations):

- ▶ If an artifact noun's minimal associated event always involves single entities, it is a countable noun
- ▶ but it is not guaranteed that if an artifact noun is countable, then that noun's minimal associated event always involves single entities

Example: *chopsticks*

- ▶ canonical use involves pairs of entities
- ▶ countability behavior has been retained from derivational source, *stick*

More Complex Cases

Case 1. two physically separable entities participating together in a minimal associated event are named as a singular entity

- ▶ two beds pushed together may be referred to as 'a bed'
- ▶ entities' use trumps their entity properties

Case 2. someone drinks from cups a and b exactly simultaneously, so that arguably the drinking event could still be considered minimal

- ▶ unlikely that one would refer to $a \oplus b$ as 'a cup', but rather as 'two cups'
- ▶ entity properties, that two separated entities are under consideration, trumps the consideration that they jointly participate in the same minimal associated event

The Explanatory Power of the Associated Event

Recognizing the associated event allows insight into several much-discussed properties of artifactual aggregates:

- ▶ The lack of taxonomic plurals
- ▶ Apparent arbitrariness in world-to-word mapping
 - ▶ Cross-linguistic variation in countability status
 - ▶ Limitations on referential interchangeability

Taxonomic Plurality

Neither *furniture*-nouns nor substance mass nouns allow a regular plural; however, they diverge with respect to a “taxonomic plural” (i.e. ‘multiple kinds’ interpretation).

- ▶ Substance mass nouns typically allow such plurals:

- (9) a. The store sells many wines from France.
b. Chianti and merlot are two wines that I like.

- ▶ *Furniture*-nouns do not allow them:

- (10) a. *The store sells many furnitures from France.
b. *Chairs and tables are two furnitures that I like.
c. *Victorian and Rococo are my favorite furnitures.

A non-analysis: Attributing the divergence to the artifactual nature of *furniture*-nouns

- ▶ Other artifact nouns permit such interpretations

(11) They sell various cars at this dealership: Audis, Toyotas, and Volvos.

- ▶ Until recently, this gap has not been much discussed with respect to *furniture*-nouns

Proposed analysis:

- ▶ Build on what it means for artifacts to participate in a taxonomy
- ▶ Argue this critically involves the notion of associated event

A taxonomic plural is licensed when a noun designates an entity standing in a taxonomic relation to a kind, and that entity is measured as at least two “kind units”.

$$(12) \quad \llbracket \text{wines} \rrbracket := \lambda w \lambda x [T_w(\text{wine}, x) \wedge KU_w(\text{wine}, x) \geq 2]$$

- ▶ A taxonomic relation T relates kinds and subkinds, where $T(x, y)$ means y is a subkind of x (Krifka et al. 1995).
- ▶ A ‘kind unit operator’ (KU) counts subkinds, where $KU(x, y) = n$ indicates that y contains n number of subkinds of the kind x (Krifka 1995).

- ▶ If a noun participates in a taxonomic relation, then it should have a taxonomic plural.

Natural kind terms: Naturally stand in kind–subkind relations, and thus have taxonomic plurals.

Canonical artifact nouns: Mostly participate in taxonomic relations, and thus have taxonomic plurals.

- ▶ If a noun does not participate in a well-defined taxonomic structure, it will lack a taxonomic plural.

Furniture-nouns: Propose they lack taxonomic plurals for precisely this reason.

Question: What is the analogue of a kind–subkind relation for artifact nouns?

Proposal: Artifact nouns must share the same associated event to stand in a taxonomic ‘supertype–subtype’ relation.

Example: *vehicle* and *car* share an associated event: to provide transportation.

- ▶ *vehicle*: any entity designed to provide transportation
- ▶ *car*: an entity designed to provide transportation, but in a specific way

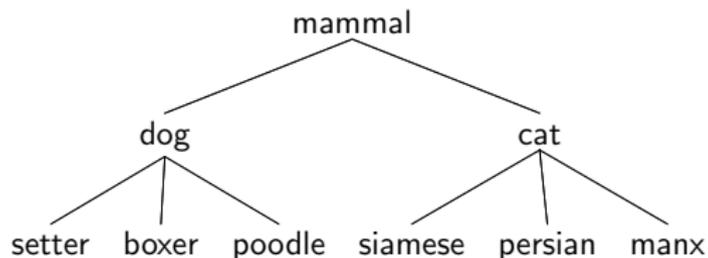
- (13) a. *vehicle* :=
 $\lambda y[\text{ABLE}[\exists e[x \text{ uses } y \text{ for transportation in } e \wedge \text{min}(e, \text{use-for-transportation})]]]^{w,g,h_y,j}$
- b. *car* :=
 $\lambda y[\text{ABLE}[\exists e[x \text{ uses } y \text{ for transportation in } e \wedge \text{min}(e, \text{use-for-transportation})} \wedge \text{has-four-wheels}(x)]]]^{w,g,h_y,j}$

These representations guarantee that $[[\text{car}]] \subseteq [[\text{vehicle}]]$

Next step: Show artifact taxonomies defined via shared associated events have the key properties of well-defined taxonomies.

Properties of taxonomies:

- ▶ **A kind of relation:** A sub-element is a *kind of* super-element
- ▶ **Inheritance:** A sub-element inherits the properties of the super-element
- ▶ **Transitivity:** If A is a sub-element of B, and B is a sub-element of C, then A is a sub-element of C



car is a taxonym of *vehicle*:

- ▶ **A kind of relation:** Any *car* is also a *vehicle*.
- ▶ **Inheritance:** *Car* inherits all the properties of *vehicle*.
- ▶ **Transitivity:** A *sports car* is a kind of *car*; a *car* is a kind of *vehicle*; and it follows that a *sports car* is a kind of *vehicle* (pace Cruse 1986)

The question: Do *furniture*-nouns participate in taxonomies?

One answer: Yes, because *furniture*-nouns are superordinate terms in the Roschian sense (Markman 1985, Rosch 1975, Cruse 1986)

- ▶ This analysis explains why their denotation encompasses so many different types of entities which nevertheless have something in common.
- ▶ Just as a typical count superordinate term (e.g. *vehicle*) gathers together heterogeneous subordinate terms which have something in common, so does a *furniture*-noun.

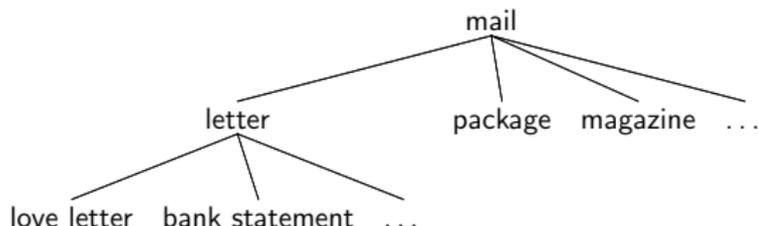
Another answer: No, the relation of such nouns to their purported subordinate terms is inconsistent with the properties of a well-formed taxonomy (Wierzbicka 1985, Wisniewski et al. 1996, Mihatsch 2007)

Our answer: No, *furniture*-nouns and their constituent entities have *different associated events*, and therefore do not participate in the sub-/super-kind relation necessary to form an artifactual taxonomy

- (14) a. $furniture := \lambda z[\text{ABLE}[\exists e[x \text{ furnishes } y \text{ with } z \text{ in } e \wedge \text{min}(e, \text{furnish})]]]^{w,g,h_z,j}$
- b. $chair := \lambda y[\text{ABLE}[\exists e[x \text{ sits on } y \text{ in } e \wedge \text{min}(e, \text{sits-on})]]]^{w,g,h_y,j}$

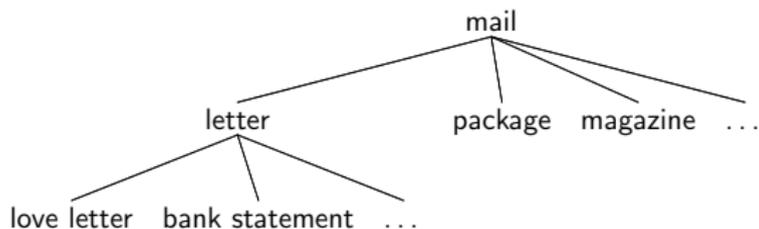
[[chair]] $\not\subseteq$ [[furniture]], even though chairs (in stereotypical worlds) always satisfy the associated event of *furniture*

Letter is not a taxonym of mail



- ▶ **A kind of relation:** Seems awkward:
 - ▶ A letter is not a kind of mail.
- ▶ **Inheritance:** The properties of the purported superordinates do not trickle down (cf. Wierzbicka 1985, Mihatsch 2007).
 - ▶ Mail is delivered, but the purported subordinate terms do *not* inherit this property, viz. not all magazines are delivered.

Letter is not a taxonym of mail



- ▶ **Transitivity:** Does not always hold; contrast:
 - ▶ A *hall mirror* is a kind of *mirror* and a *mirror* is a kind of *furniture*; in fact, a *hall mirror* is a kind of *furniture*.
 - ▶ A *rear-view mirror*, while certainly a kind of *mirror*, is not a kind of *furniture*.

Summing up:

- ▶ *Furniture*-nouns and their purported subordinate terms do not stand in a taxonomic relation
- ▶ Since *furniture*-nouns thus lack subkinds, they cannot form a taxonomic plural

The Explanatory Power of the Associated Event Revisited

Recognizing the associated event allows insight into properties of artifactual aggregates:

- ▶ The lack of taxonomic plurals
- ▶ Apparent arbitrariness in world-to-word mapping
 - ▶ Cross-linguistic variation in countability status
 - ▶ Limitations on referential interchangeability

World-to-Word Mapping: Variability

Acknowledging the associated event provides insight into the much-discussed instances of apparent arbitrariness in the world-to-word mapping:

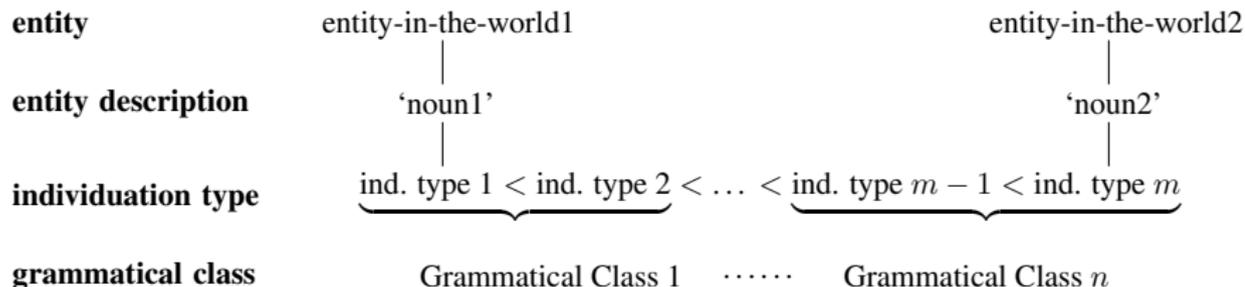
- ▶ Across languages:
English *furniture* (non-countable) vs. French *meuble* (countable)
- ▶ Within English:
letters (countable) vs. *mail* (non-countable)
coins (countable) vs. *change* (non-countable)

“In fact, the same slice of reality can be classified as either count or as mass, as attested by the existence of near synonyms.”
(Chierchia 1998: 56)

World-to-Word Mapping: Variability

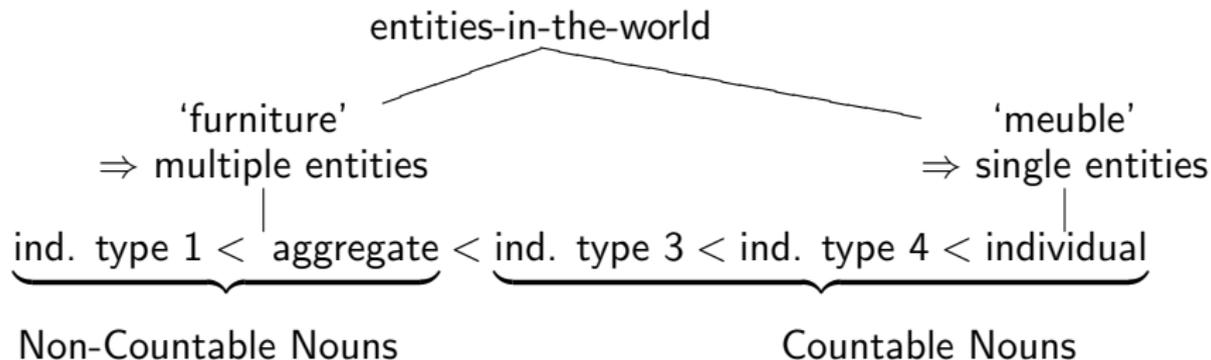
Countability must be understood in the context of several, interrelated, elements:

- ▶ grammatical number categories, individuation properties and entities in the world and **descriptions** of those entities (Grimm 2012)



- ▶ Across languages:
English *furniture* (non-countable) vs. French *meuble* (countable)
 - ▶ These two nouns may refer to the same entities, but they provide different *nominal descriptions* of these entities.
 - ▶ They involve distinct associated events: cf. their different etymologies:
furniture > 'to furnish'; *meuble* > 'movable object'.
 - ▶ The distinct associated events give rise to different countability properties.

World-to-Word Mapping: Variability



Further prediction: If a language has a specialized grammatical category for aggregates used, e.g., for granular aggregates, *furniture*-nouns as artifactual aggregates could also be members of that category.

Welsh: artifactual aggregates, including the counterpart of *furniture*, fall into the collective/unit class

- ▶ *dodrefn* 'furniture' / *dodrefn-yn* 'a piece of furniture'
- ▶ *offer* 'tools' / *offer-yn* 'a tool'
- ▶ *dillad* 'clothes' / *dilled-yn* 'a piece of clothing'

Cases of purported referential interchangeability :

- ▶ *letters* (countable) vs. *mail* (non-countable)
coins (countable) vs. *change* (non-countable)

- ▶ **Fact:** Such pairs are less interchangeable than reported
- ▶ Unsurprising once the associated event is taken into account.

The whole and the components parts may have distinct associated events and, thus, are not always interchangeable.

Two case studies:

- ▶ *Mail vs. letters and packages*
- ▶ Adjectival modification

Mail: a set of entities which have all been mailed and, thus, will travel together through the postal system

- ▶ may include letters, but also magazines, packages, postcards, catalogs, and the like.

Letters and packages: narrower classes of entities, that need not be mailed:

- ▶ Letters are written to convey information to some recipient(s)
- ▶ Packages are used to facilitate the transportation of goods

Key point: Not all letters or packages are mail, nor is all mail letters or packages.

Referential Interchangeability: The Mail Case Study

On a particular occasion, *mail* or *letters* may be used to pick out the same set of entities—but this coincidence is **not** equivalence

In using one noun or the other on such an occasion, a speaker is choosing a specific entity description, with its own attributes, even if both nouns may pick out the same things in the world

- ▶ analogous to the contrast drawn in the literature on aspect concerning events in the world vs. event descriptions

Further evidence from modification:

- ▶ These nouns and those naming constituent entities can be modified independently:

(15) The mail from today contains letters from three months ago.

- ▶ This is predicted under the analysis here; but difficult for the collection of individuals view

Evidence that purportedly referentially interchangeable pairs provide distinct construals of the entities in their denotation:

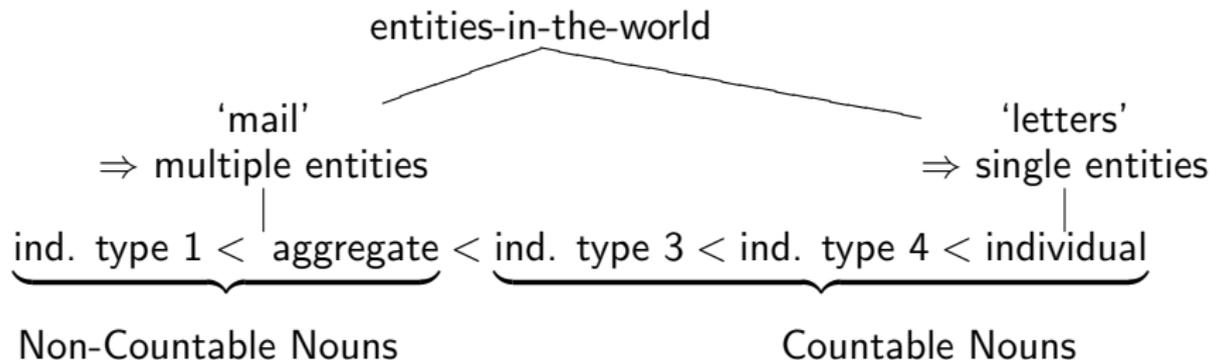
Method: A corpus (BNC) study of adjectival modification across 10 such pairs

Results: Systematic asymmetries in the semantic classes of adjectives (Dixon 1982, GermaNet) attested with each member of a pair, as well as in the felicity of individual adjectives.

An example from the adjective study: *mail/letters*

- ▶ Adjective distribution:
 - ▶ *mail*: Mainly occurs with adjectives of delivery (e.g. *express, international*)
 - ▶ *letters*: About 30% of the adjectives evaluate contents (e.g. *anxious, terrible*).
- ▶ Adjectives are consistent with the posited associated events:
 - ▶ *mail*: transmittal through the postal system
 - ▶ *letter*: conveying information

World-to-Word Mapping: Referential Interchangeability



The Explanatory Power of the Associated Event Revisited

Recognizing the associated event allows insight into properties of artifactual aggregates:

- ▶ The availability of various dimensions of comparison
- ▶ The lack of taxonomic plurals
- ▶ Apparent arbitrariness in world-to-word mapping
 - ▶ Cross-linguistic variation in countability status
 - ▶ Limitations on referential interchangeability

Conclusions for *Furniture*-nouns

- ▶ Are better characterized as *artifactual aggregates*.
 - ▶ Have an associated event, typically involving multiple, distinct participants, acting together.
 - ▶ Thus, designate more than a collection of individuals.
- ▶ This characterization accounts for observed properties, including countability behavior.
- ▶ Artifactual aggregates merit a place in an ontology of nouns:
 - ▶ show similarities with core count and mass nouns, but
 - ▶ are distinct from both due to properties that reflect the nature of the associated event.

Thank*(s)!