

Names for artifacts and natural kinds

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Introduction

- A key conceptual distinction in the domain of things: artifacts vs. natural kinds.
pencil, book, truck vs. cat, flower, butterfly
- **Goal:** To explore its import to morphology.
- **Domain of exploration:** English noun-noun and adjective-noun compounds.

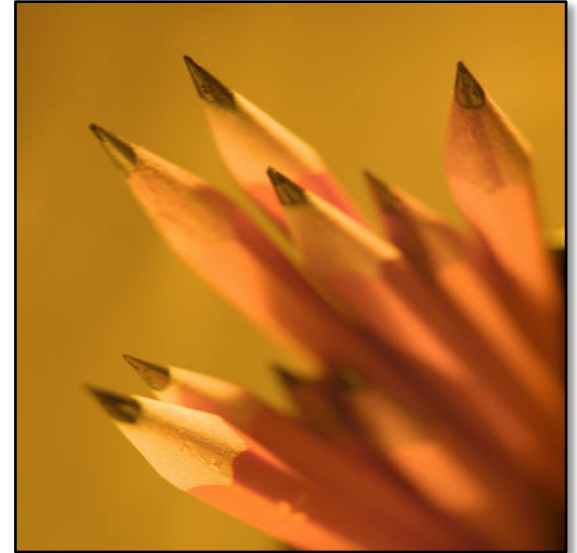
Introduction

- **Motivation:**
 - Research over the last twenty years in psycholinguistics, anthropological linguistics, and language acquisition reveals significant differences in the strategies for naming natural kinds and artifacts.
 - These differences have been tied to their different nature.
- **Hypothesis:** The most prevalent head-modifier relations in compounds naming natural kinds are different from those in compounds naming artifacts.

Roadmap

- The artifact/natural kind distinction
- The distinction affects names given to things
- Reflexes of the distinction in head-modifier relations in NN and AN compounds
- Case study: English NN and AN compounds naming foodstuffs and kitchen utensils

The artifact/natural kind distinction



The artifact/natural kind distinction

- A key conceptual distinction in the domain of things: artifacts vs. natural kinds.

pen, paper, car vs. dog, tree, river

- The distinction goes back at least to Aristotle and is discussed by philosophers, cognitive and developmental psychologists, and anthropologists (e.g., Bird & Tobin 2009, Keil 1989, Margolis & Laurence 2007, Wierzbicka 1985, Wiggins 2001).

Natural kinds have essences

- Natural kinds are said to be defined by nature or natural law.
- They have 'essences' which reflect their biological nature.
- A prevalent idea in the philosophical literature (Bird & Tobin 2009, Keil 1989, Kripke 1980, Putnam 1975).

Natural kinds have essences

Keil (1989): Children say that a raccoon that is painted black with a white stripe and given a sac of smelly stuff is a raccoon, not a skunk.



Artifacts do not have essences

Keil (1989): Children say that a coffeepot whose spout is removed and has a hole cut in its 'belly' to hold birdseed is indeed a birdfeeder.



Artifacts have associated events

- Artifacts, unlike natural kinds, evoke what Nichols (2008) calls an ‘associated event’ that they participate in some way in:

“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”
(2008:694)

Artifacts have associated events

- The associated event often reflects the artifact's intended function: it is the event that the artifact is designed to be used in, cf. the 'telic' component of Pustejovsky's (1995) qualia structures.

Example: cutting for a knife, writing for a pen

- It may also relate to how the artifact come to be, cf. the 'agentive' component in qualia structures.

Example: cooking for a cake, knitting for a sweater

Artifacts have associated events

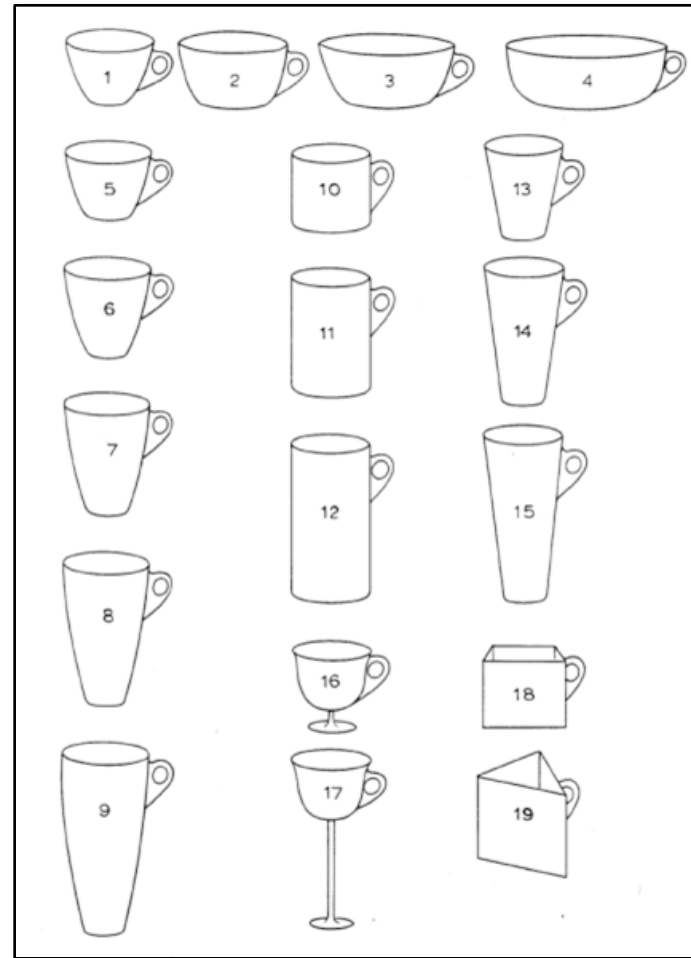
Studies show that function (and hence the associated event) and not form is primary in characterizing an artifact.

Example: The various forms of cheese slicers



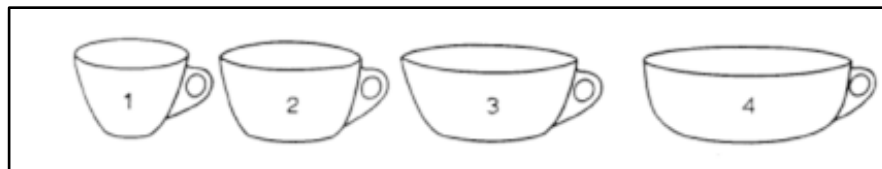
Artifacts have associated events

Labov (1973): Speakers are asked to name a variety of line drawings of small containers, shown either with or without handles.



Artifacts have associated events

- The name given to some containers is consistent across speakers (e.g., 1, 4).
- The name given to others varies according to whether the speaker is asked to consider someone drinking coffee from it or eating mashed potatoes from it (e.g., 2, 3).



Names of artifacts and natural kinds



Names of artifacts and natural kinds

- The artifact/natural kind distinction is grammatically relevant.
- Artifacts and natural kinds are given different types of names (e.g., Brown 1995, 1999, Kemler Nelson et al. 2003, Nichols 2008).
- These distinct naming patterns underscore the importance of an associated event in the characterization of an artifact.

Names of artifacts and natural kinds

- Cecil Brown's *Lexical Acculturation in Native American Languages* (1999) considers the names given in native languages of the Americas to items brought by Europeans.
- It reveals significant differences in the naming patterns for artifacts and natural kinds.

Names of artifacts and natural kinds

- 292 Native American Languages

Alabama, Algonquin, Arawak, Atsugewi, Aymara, Biloxi, Blackfoot, Miwok, Cheyenne, Chickasaw, Choctaw, Comanche, Quechua, Karok, Dakota, Inuit, Iroquois, Jacaltec, Guarani, Miskito, Mixtec, Mohawk, Mojave, Nahuatl, Navajo, Southern Ute, Tewa, Tzeltal, Zapotec, Yucatec, Zuni, ...

- 77 items imported from Europe

apple, apricot, barley, beet, board, book, bottle, box, bread, bull, butter, button, cabbage, calf, candle, cat, cheese, chicken, clock, coffee, colt, coriander, cow, cup, donkey, flour, fork, garlic, goat, grapes, hen, horse, hour, ...

Names of artifacts and natural kinds

Among Brown's findings:

- The names of natural kinds are more likely to be borrowed than the names of artifacts.

Names of artifacts and natural kinds

Most likely to be borrowed (percent of languages)				Least likely to be borrowed (percent of languages)			
coffee	81	peach	54	spoon	31	clock	25
coriander	72	mule	54	shovel	30	grapes	25
cat	70	goat	53	store	30	oats	23
garlic	69	sugar	53	bread	29	book	22
orange	67	tea	53	flour	29	needle	11
cheese	66	horse	52	board	28	paper	20
donkey	64	rice	52	butter	28	hundred	19
lemon	60	table	52	wagon	28	beets	18
apple	59	soap	51	peas	28	thread	17
cow	58	bottle	51	cup	27	town	15
saturday	56	cabbage	47	mile	27	rich	13
pig	55	lettuce	47	pistol	27	money	11
soldier	55	hour	45	window	27	fork	10

Names of artifacts and natural kinds: Borrowed names

Two reasons for the distributional difference:

- The name of the natural kind in the original language is taken to 'capture' its essence; hence, it is retained.
- Reference to function, which alternative naming strategies allows, may be preferred for artifacts; however, artifacts may sometimes have borrowed names when used frequently in cultural contact situations.

Names of artifacts and natural kinds

Hypothesis: “Given their utilitarian intent, one would expect artifacts commonly to be named by labels literally reflecting use” (Brown 1995:53)

- Investigate analyzable names to determine if they make reference to function; naming strategies include:
 - Extending the name of an artifact with similar function to a new artifact: e.g., ‘shell’ for ‘money’
 - Using a deverbal name: e.g., English *can-opener*; ‘which we buy with’ for ‘money’
 - Using a compound name whose head has a comparable function: e.g., ‘wood sack’ for ‘box’

Names of artifacts and natural kinds

Findings:

- Reference to function is commoner for artifact (63% of items) than natural kind (10%) names.
- Most often utilitarian: 'cup' 98% of languages, 'pistol' 95%, 'key' 94%, 'book' 93%, 'table' 87%.

Thus, the associated event influences the names available to artifacts.

Names of artifacts and natural kinds

Although there is arbitrariness in the conventional name given to an entity, the nature of the entity still influences the name chosen.

An example: Different names for the same thing in British and American English.

Names of artifacts and natural kinds

- Artifacts which are given distinct names, but both names refer to an associated event:

American *thumbtack* vs. British *drawing pin*

American *plastic wrap* vs. British *cling film*



Names of artifacts and natural kinds

- Natural kinds which are given distinct names, but both names are borrowed:

American *zucchini* vs. British *courgette*

Italian: *zucca + ini* (DIM)

French: *courge + ette* (DIM)



Compounds for artifacts/natural kinds



Compounds for artifacts/natural kinds

Compounds: The basics

- Focus on endocentric noun-headed compounds, which consist of a head and a modifier.
- Such compounds are hyponyms of their head: a *chocolate cake* is a kind of *cake*.
- The modifier distinguishes the entity named by the compound from other instances of the entity named by the head: a *chocolate cake* is different from other cakes such as a *carrot cake* or a *spice cake*.

Compounds for artifacts/natural kinds

Question:

Are the kinds of head-modifier relations found in noun-noun and adjective-noun compounds naming artifacts different from those found in compounds naming natural kinds?

Proposed answer:

Yes, due to their different nature.

Compounds for artifacts/natural kinds

Hypotheses about compound names:

- The most prevalent head-modifier relations in compounds naming artifacts will be different from those in compounds naming natural kinds.
- The attested head-modifier relations should reflect the nature of each type of entity.

Compounds for artifacts/natural kinds

Hypotheses about compound names:

- For an artifact, the head-modifier relation might be expected to make reference to an associated event and hence its function or mode of creation.

Compounds for artifacts/natural kinds

Hypotheses about compound names:

- For a natural kind, the head-modifier relation might be expected to reflect its 'essence', which might be manifested in reference to its perceptual properties or suggested by reference to its habitat or geographical origin.

Initial support for these hypotheses comes from previous studies; supplemented with evidence from a new study.

Compounds for artifacts/natural kinds:

Previous studies

- Studies often focus on the many interpretations of a particular compound and, concomitantly, the multifarious relations that the modifier can bear to its head.

cow-pony (Downing 1977:818)

- A pony with an udder
- A pony used to herd cows
- A pony standing next to a cow
- A pony with grazing habits different from a cow
- The offspring of a cow and a pony

Compounds for artifacts/natural kinds:

Previous studies

- Costello and Keane (1997) find that on average artifact compounds are more polysemous than natural kind compounds.
- They link this property of artifact compounds to the fact that artifacts have functions and, hence, are associated with an event.

Compounds for artifacts/natural kinds:

Previous studies

- Downing's (1977) corpus study suggests the head-modifier relations of compounds naming artifacts and those naming natural kinds are distinct.
- Most frequent relations attested:
 - **Plants:** appearance (*trumpet plant*), habitat (*Texas roadside flowers*)
 - **Synthetic objects:** purpose (*banana fork, hedge hatchet*)

Compounds for artifacts/natural kinds:

Previous studies

“These results suggest that naturally existing entities (plants, animals, and natural objects) are typically classified, at least in our culture, on the basis of inherent characteristics; but synthetic objects are categorized in terms of the uses to which they may be put. This would seem to correlate with the fact that synthetic objects are typically created with some goal in mind, while natural entities generally are not.”

(Downing 1977:831)

Compounds for artifacts/natural kinds:

Previous studies

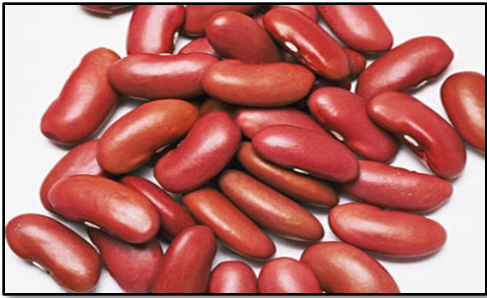
- Wisniewski & Love's (1998) corpus study of English noun-noun compounds.
- The types of head-modifier relations attested depend on whether the compound names an artifact or a natural kind.
- Closer examination shows the relations for artifacts often involve, albeit sometimes indirectly, an associated event.



snow goose: refers to color
leopard lizard: refers to appearance
coat hook, pencil case: refers to function



The food/utensil study



The food/utensil study introduced

Intended to further confirm the proposal that head-modifier relations are different in compounds naming natural kinds vs. artifacts.

Carried out with Dan Jurafsky and Lelia Glass (Stanford University).



The food/utensil study: Hypotheses

- The head-modifier relations should reflect that kitchen utensils are artifacts and greens/legumes/rice ('plants') are natural kinds.
- Thus, the head-modifier relations found with utensil names should be different from those with plants.

The food/utensil study: Design

- Considered compound names of:
 - kitchen utensils (323)
 - plants, i.e. greens, legumes, rices (342)
- Collected compounds from on-line lists, primarily, but not exclusively American English.

The food/utensil study: Design

- Endocentric, noun-headed compounds whose non-heads are adjectives or nouns.
- Two- and three-word compounds:
e.g., NN, AN, [NN] N, N [NN], A [NN], ...
- For a three-word X1 [X2N] compound, included the compound twice:
 - For the relation of X1 to X2N
 - For the relation of X2 to N

The food/utensil study: Data sample

Greens	Legumes	Rice	Utensils
iceberg lettuce	black bean	arborio rice	balloon whisk
Dutch chicory	broad bean	pecan rice	clam knife
red cabbage	green lentil	instant rice	pasta fork
spoon leaf mustard	velvet bean	pearl rice	French whisk
turnip greens	fava bean	Carolina rice	kitchen shears
butter lettuce	winter pea	white rice	spider skimmer
land cress	garden pea	jasmine rice	ginger grater
pepper cress	soup bean	risotto rice	silicone spoon
rainbow chard	English pea	sticky rice	straight peeler
...

The food/utensil study: Coding

- Two or three coders coded the head-modifier relation in each compound; disagreements were resolved by discussion.
- On the set of head-modifier relations:
 - Inspired by Wisniewski & Love's categories.
 - Not exactly same due to nature of items coded, inclusion of adjective-noun compounds, and some questions about their categories.
 - Significant overlap with Downing's categories (1977:828).
 - Supplemented by Dixon's (1982) property concept categories.

The food/utensil study: Coding

Meta-category	Category	Examples
Perceptual	Color	red rice, green bean
	Dimension	broad bean, wide spatula
	Distinctive part	oak leaf lettuce, string bean
	Speed	quick rice, instant rice
	Taste/smell	sugar pea, jasmine rice
	Texture	sticky rice, waxy rice
	Visual	kidney bean, cabbage lettuce
Environmental	Habitat	garden pea, swamp spinach
	Season	winter pea, winter purslane
	Social/political	Chinese cabbage, Boston lettuce, French whisk

The food/utensil study: Coding

Meta-category	Category	Examples
Associated event	Eaten by	navy bean, cow cabbage
	Location of use	kitchen scissors, kitchen torch
	Made like	praline bar, sundae cake
	Made of	rubber spatula, butter cookies
	Method	refrigerator cookie, skillet cake
	Obj-nom	burger press, olive pitter
	Occasion of use	birthday cake, Christmas cake
	Purpose	fish knife, risotto rice

The food/utensil study: Coding

Meta-category	Category	Example
Other	Whole (part)	beet greens, turnip tops
	Named after	Graham cracker, Sally Lunn cake
	Value	wacky cake, magic bars
	Other property	itchy bean, serrated knife
Borrowed	Borrowed	fava bean, basmati rice

The food/utensil study: Hypotheses

- The head-modifier relations found with utensil names should be different from those with plants in ways that reflect the nature of the compound as naming an artifact or a natural kind.

The food/utensil study: Results

The most common types of relations among all compounds, aggregating the more specific coding categories into 'meta-categories':

Meta-category	Plants	Utensils
Borrowed	13%	0%
Associated event	8%	80%
Environmental	30%	1%
Perceptual	43%	10%
Other	6%	10%

The food/utensil study: Results

- Borrowed modifiers are attested with plant names, but not utensil names.
- An apparent extension of Brown's finding about borrowed names being more prevalent among natural kinds.
- Among NN compounds:

% Borrowed	
Plants	28%
Utensils	0%

The food/utensil study: Results

- Why? If the name of the natural kind in the original language is taken to 'capture' its essence, then it is not surprising that a borrowed word might be used as a modifier in combination with a head that taxonomizes the kind.

The food/utensil study: Results

- 43% of the compounds naming plants have modifiers that describe perceptual properties of the head noun (e.g., color, shape, texture, or general appearance), while only 10% of the compounds naming utensils are of this type.

red cabbage, curly endive, kidney bean

- This naming pattern arises because the essence of a natural kind is reflected in its appearance or other perceptual properties.

The food/utensil study: Results

- Concomitantly, more plant compounds than utensil compounds involve adjectives as modifiers.

	Adjective	Noun
Plants	40%	60%
Utensils	18%	82%

The food/utensil study: Results

- Why? Adjectives lexicalize properties so they would be more likely to be found with plants as natural kinds to express those inherent properties that reflect their essence.

The food/utensil study: Results

- 30% of the plant compounds have environmental modifiers vs. 1% of the utensil compounds.
- They describe the preferred habitat of the head (e.g. *garden pea*), its geographical origin – a proxy for habitat – (e.g., *Chinese cabbage*), or the season in which it grows (e.g., *winter pea*).
- The essence of a natural kind constrains the environmental conditions in which it is found.

The food/utensil study: Results

- Most relations with utensil compounds make reference in some way to an associated event (80%), while few plant names involve such relations (8%):

Obj-nom (40%): *burger press, banana slicer*

Purpose (21%): *fish knife*

Made of (16%): *silicone spatula*

Location-of-use (3%): *kitchen scissors*

The food/utensil study: Results

- Concomitantly, about 60% of the utensil names have deverbal heads, whether zero-related or *-er* affixed.
- Such heads are overtly built on a verb naming the associated event.
- Reflects the importance of an associated event.

The food/utensil study: Results

- Why does the 'made of' relation figure among utensil compounds?
- The material that a utensil is made from can help it better perform its function.
- Contrast: The near absence of modifiers describing color or other transitory property of appearance among utensil compounds.

The food/utensil study: Discussion

- The differences in distribution of head-modifier relations reflect the differing nature of artifacts and natural kinds.

Natural kinds:

- Perceptual properties: color, shape, texture, general appearance
- Habitat
- Origin, which is a proxy for habitat
- All stem from or suggest essence

The food/utensil study: Discussion

Artifacts:

- Purpose
 - Obj-nom
-
- The head-modifier combination evokes the associated event, though what this means depends on nature of head.

The cake/cookie study



Photos by Stephanie Shih
(dessertsforbreakfast.com).

The cake/cookie study: Hypotheses

- Cakes and cookies, as manufactured entities, are also artifacts, though unlike utensils they aren't differentiated by their function.
- They are more often defined by the event that brings them into being, rather than the event they are used in.
- Thus, head-modifier relations found in cake and cookie names should not be entirely the same as those for utensils (or plants).

The cake/cookie study: Design

- Coded the head-modifier relations for 283 English compounds naming cakes/cookies.
- Collected the compounds from on-line lists, primarily, but not exclusively American English.

The cake/cookie study: Data sample

Cakes	Cookies
Election Day cake	chocolate chip cookies
chocolate cake	lemon bars
birthday cake	lace cookies
poppy seed cake	marble brownies
red velvet cake	skillet cookies
layer cake	butter cookies
rum cake	spritz cookies
bundt cake	chocolate chews
chiffon cake	anise biscotti
crumb cake	Christmas cookies
...	...

The cake/cookie study: Results

The most common types of relations across all compounds:

Meta-category	Plants	Utensils	Recipes
Borrowed	13%	0%	2%
Associated event	8%	80%	73%
Environmental	30%	1%	5%
Perceptual	43%	10%	14%
Other	6%	10%	5%

The cake/cookie study: Results

- Both for cakes/cookies and for utensils the preponderance of head-modifier relations makes reference to an associated event.
- However, the specific head-modifier relations used are different.
 - Cakes/cookies: Involve the event of creation
 - Utensils: Involve the event of use (i.e. function)

The cake/cookie study: Results

Event type	Category	Utensils	Recipes
Creation	Made like	0%	8%
	Made of	16%	49%
	Method	0%	9%
Use	Eaten by	0%	1%
	Location of use	3%	0%
	Obj-nom	40%	0%
	Occasion of use	0%	6%
	Purpose	21%	0%

The cake/cookie study: Results

- The most common head-modifier relation is the ‘made of’ relation (49%), which indicates the principal ingredient and relates to the mode of creation.
e.g., oatmeal cookie, applesauce cake
- This relation is less frequently attested among utensils (16%) and unsurprisingly is unattested among plant names.

The cake/cookie study: Results

- 9% have modifiers making reference to the 'method' (of creation).

e.g., refrigerator cookie, skillet cake

- 6% have modifiers naming the occasion on which the item is eaten, the major modifier relating to use.

e.g., birthday cake, Christmas cookie

The cake/cookie study: Results

- About 14% of the cake/cookie compounds have modifiers that describe perceptual properties such as color, shape, texture, or general appearance.

daffodil cake, foam cake, marble brownies

- These properties reflect design features that the cake/cookie is intended to have.

The cake/cookie study: Discussion

- For cakes/cookie compounds the most prevalent head-modifier relations make reference to an associated event.
- This associated event is most often the event that creates the cakes/cookies.
- In contrast, for utensil compounds, the associated event is the event of use.

Conclusions

- Naming patterns reflect the artifact vs. natural kind distinction.
- Specifically, the attested head-modifier relations in compounds are sensitive to this distinction in ways that reflect the nature of each type.

Thank you!

- A special thank you to Dan Jurafsky and Lelia Glass for carrying out the food/utensil studies with me and discussing the analysis of the results.
- I also thank Scott Grimm for discussion of artifacts and natural kinds.

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cheese	66	horse	52	board	28	paper	20
donkey	64	rice	52	butter	28	hundred	19
lemon	60	table	52	wagon	28	beets	18
apple	59	soap	51	peas	28	thread	17
cow	58	bottle	51	cup	27	town	15
saturday	56	cabbage	47	mile	27	rich	13
pig	55	lettuce	47	pistol	27	money	11
soldier	55	hour	45	window	27	fork	10