

Countability in the Nominal and Verbal Domains

August 17, 2016
ESLLI 2016, Bolzano
Advanced Course

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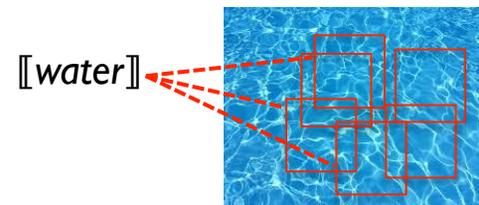
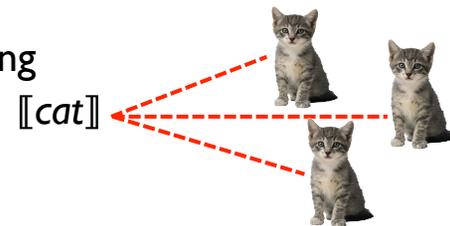
LANDMAN, FRED (2011). Count Nouns - Mass Nouns, Neat Nouns - Mess Nouns.

- **Main question**

Why cannot we directly count the denotations of mass nouns like *meat* and *salt*?

- **Main thesis**

- Count noun denotations have distinct non-overlapping “things (semantic building blocks) that we would want to count as one”.
- Mass noun denotations have “too many” semantic building blocks and they overlap. Therefore, counting in the mass domain fails.
- Counting is counting of non-overlapping things, “count means non-overlap, or overlap made irrelevant” (p.17).



- **Main data:** Mass nouns like *furniture* - NEAT MASS NOUNS in Landman’s terms.
- **Puzzle:** Neat mass nouns have ‘natural’ minimal parts in their denotation, e.g., individual pieces of furniture in the denotation of *furniture*, and yet we cannot count them: # *three furniture(s)*.

Chierchia's (2010) treatment of "fake" mass nouns like *furniture*

Counterargument 1: Mass nouns like *furniture* are "real" mass nouns, not "fake" mass nouns.

interpretation	volume/mass-based	number-based
MOST + water ("core" mass N)	+	-
MOST + furniture ("fake" mass N)	+	-
MOST + animal ("core" count N)	-	+



(based on Barner and Snedeker 2005)

- | | |
|---|----------------------|
| (1) In terms of volume weight, most livestock is cattle. | true |
| (2) # In terms of volume/weight, most animals are cattle. | false, if felicitous |

Counterargument 2: Mass noun denotations are not vague, or "lexically not accessible", in a way that Chierchia's theory requires (e.g., "don't know whether it's one or two").

"The problem is that it is not particularly difficult to semantically or contextually pull a set of atoms out of an atomic structure" (Landman 2011, p.15). When the set of atoms is made salient in context—portions like glasses or minimal water parts like H₂O molecules—why should the coercion be sanctioned only in (3) but not in (4)?

- | | |
|---|---|
| (3) I would like two waters , please. | [two GLASSES of water] |
| (4) # There are far more than a billion waters in this cup of water. | [a billion of H ₂ O MOLECULES] |

Minimal generators and overlap

- The domain in which mass nouns and count nouns are interpreted is atomic.
- Three types of noun denotations are distinguished:

non-overlapping generators	overlapping generators	
COUNT [+C]	MASS [- C]	
<i>boys, peas</i>	non-overlapping minimal generators	overlapping minimal generators
	NEAT [+N]	MESS [- N]
	<i>furniture, kitchenware</i>	<i>meat, salt</i>

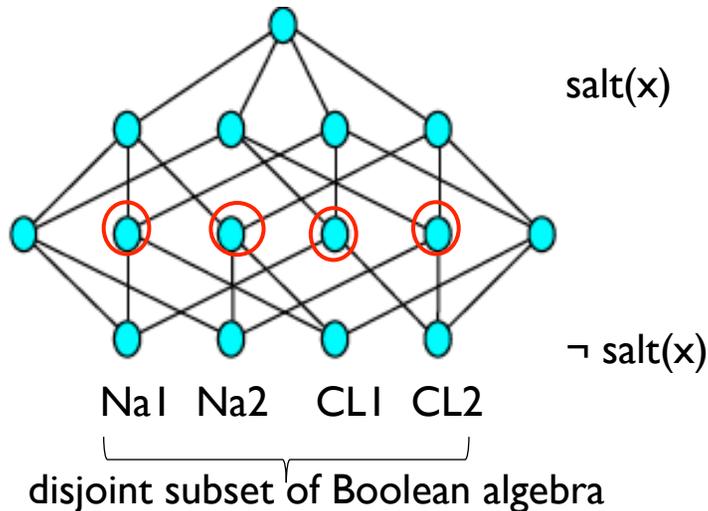
- **Count Ns** have denotations built from NON-OVERLAPPING GENERATORS: “things that we would count as *one*” *P* in a single context”.
- **Mass Ns** have denotations built from OVERLAPPING GENERATORS:
 - **MESS** mass Ns have denotations built from overlapping minimal generators (“horizontal” overlap).
 - **NEAT** mass Ns have denotations built from overlapping generators, where the overlap is not located in the minimal generators (“vertical” overlap).

Why can't mass noun denotations be directly counted?

- Mass Ns have denotations built from OVERLAPPING GENERATORS.
- Their OVERLAP cannot be made irrelevant, which blocks (correct) counting in mass nouns.

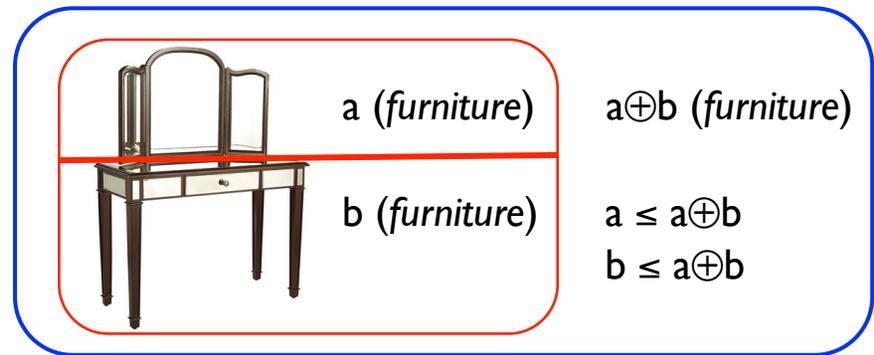
MESS mass N: *salt*

overlap of minimal generators **salt molecules**



NEAT mass N: *furniture*

no overlap of minimal generators (mirror, table)



How many pieces of furniture are there?

Variant 1: One = the sum individual $a \oplus b$.

Variant 2: Two = $a + b$.

Variant 3: Three = $a + b + a \oplus b$.

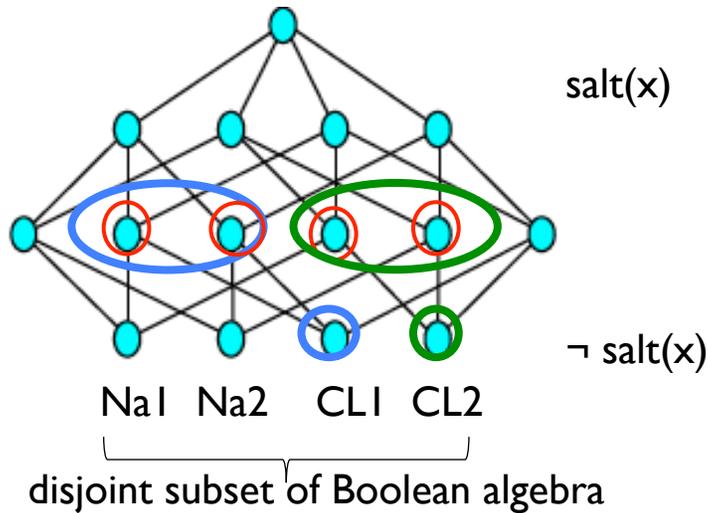
- NA and CL are atoms relative to the complete domain but not MINIMAL GENERATORS (atoms) of the predicate *salt*.
- In the same context, different VARIANTS, or partitions of the domain into generators (what is 'one'). The variants overlap; if we try to count what is 'one', we will count overlapping generators, each variant leads to a different counting result – counting goes wrong.

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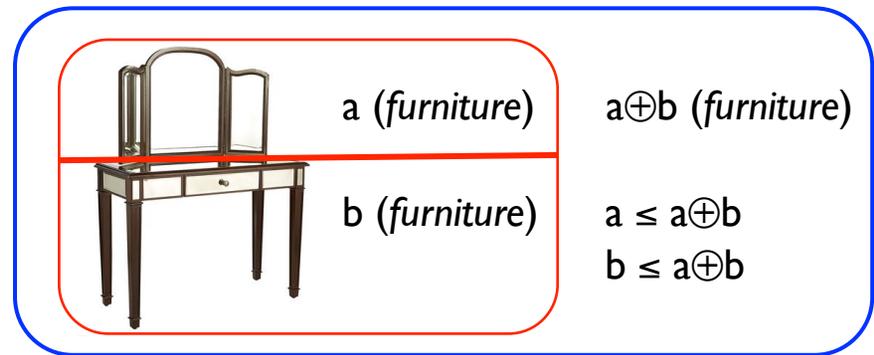
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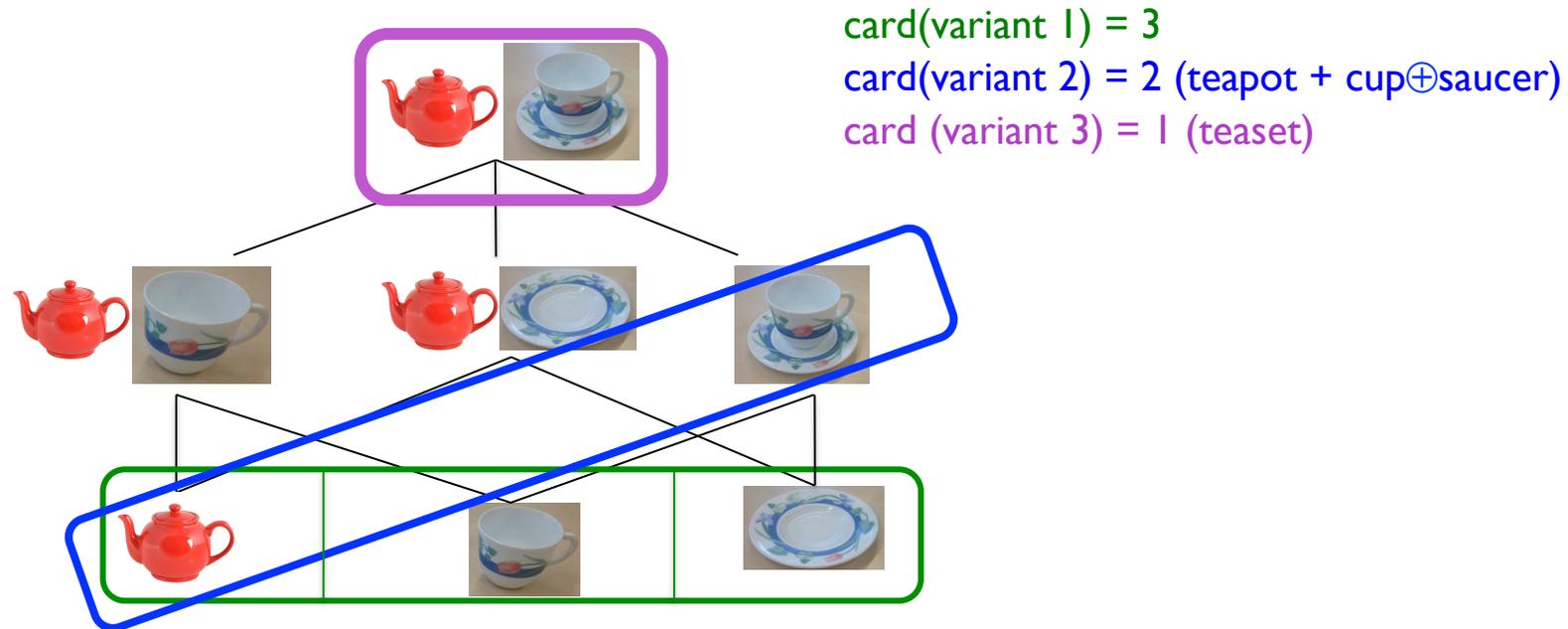
Variant 1: One = the sum individual $a \oplus b$.

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Another example: **neat mass noun** *kitchenware*



- Minimal generators—the teapot, the cup and the saucer—do **not** overlap. Why is # *three kitchenware(s)* odd? Why cannot we directly count *kitchenware*?
- The variants that represent different partitions of the same stuff into generators (what counts as ‘one’) are scrambled together into one set. This set contains mutually overlapping elements: “vertical” overlap of sums and their parts that may simultaneously count as ‘one’. Counting fails, because if we try to count these elements, we will count overlapping elements.

Summary: Count Nouns - Mass Nouns, Neat Nouns - Mess Nouns

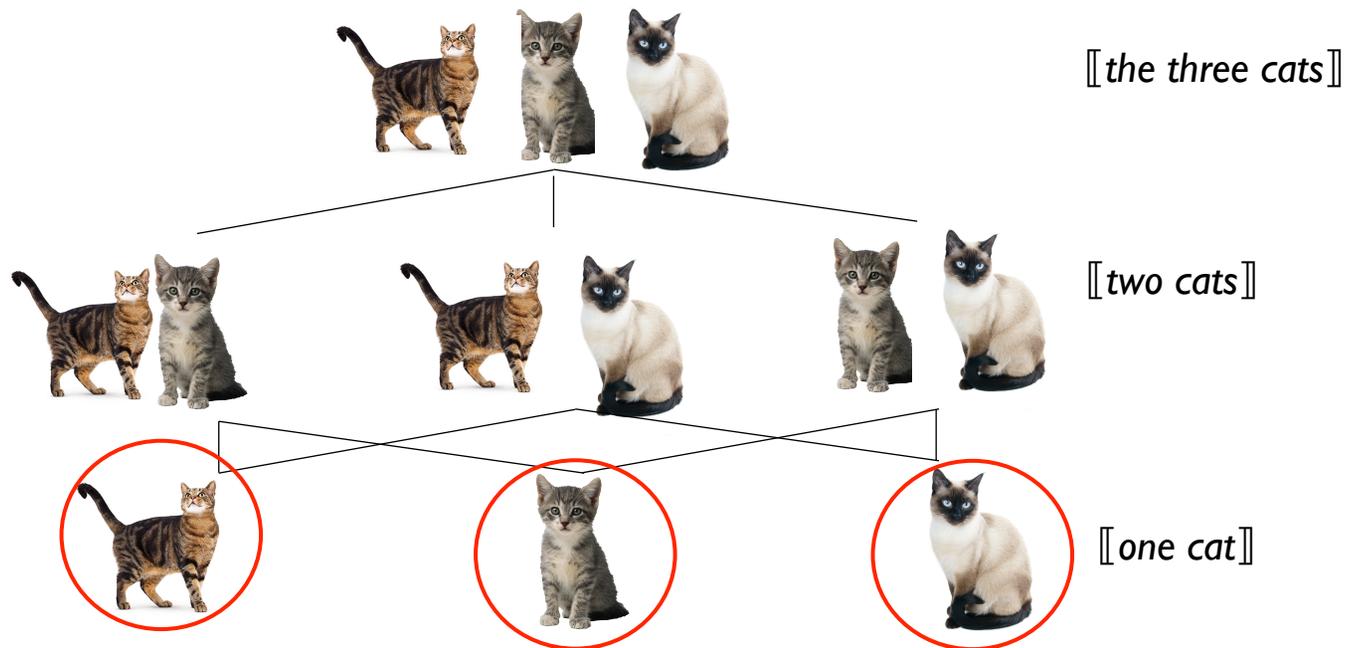
- The **mass** noun denotation is generated from a simultaneous multiplicity of variants (Boolean algebras), each variant represents a different way of partitioning the *same* stuff (i.e. with the same supremum). These Boolean algebras are scrambled together into a regular set, collecting the variants together in one set of generators. This means that the set of generators is going to contain mutually overlapping elements, since the variants represent different partitions of the same stuff.

(This comes close to the idea of a higher-order vagueness of mass nouns denotations: it is not the set of atoms which is vague, but the whole part-of structure itself, which is why we cannot count mass noun denotations.)

- The reason you cannot count **MESS mass** noun denotations is ‘horizontal’: “when you look around you at the other building blocks, you see a multitude of overlapping building blocks coming from different variants.”
- The reason you cannot count **NEAT mass** noun denotations is ‘vertical’: Their generating set (what counts as ‘one’) overlaps, but *the overlap is only vertical*: a sum and its parts count as one simultaneously. Minimal generators do not overlap.

Why can count noun denotations be directly counted??

There is **only one way** of partitioning the lattice structure corresponding to *CAT* into its minimal and non-overlapping cat-units. (*CAT* is a number neutral intensional property that applies to individual cats and pluralities of cats.)



The denotation of a count noun is generated from a *single variant* = a partition of the domain into generators (what is 'one'), a set of non-overlapping minimal elements.

Comparison: Chierchia (2010) and Landman (2011)

Why can't we directly count mass nouns?

- Chierchia (2010): “We don't know what to count, not even in principle (Chierchia 2010, p. 118)

The reason is that the denotation of mass nouns is vague in a way that we cannot know which minimal elements to count as “one” in all the relevant situations (in all the relevant ways of making the things precise), so we cannot count them. What counts as “one” (atom) under one precisification, may not count as “one” under another. There are no stable, same, atoms across all precisifications.

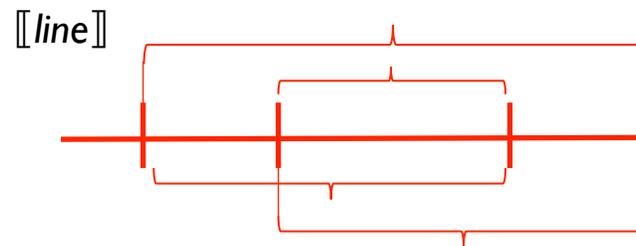
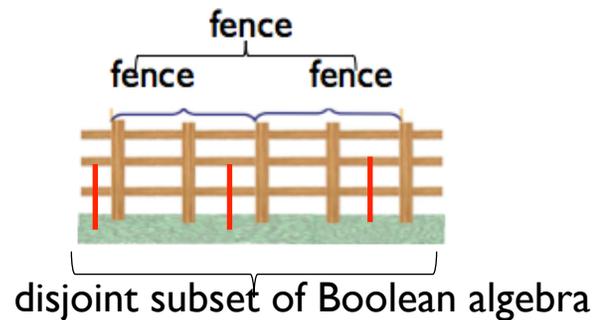
- Landman (2011): There are many ways of counting possible, *simultaneously* in one and the same context, and therefore counting always goes wrong. The total set of all the possible generators (of all the possible partitions of the domain into single counting units) will contain mutually overlapping elements, and as a result counting fails.

Landman (2011): Some problems

Problem 1: The countability status of count nouns like *fence* is unclear.

Fence-like nouns: *wall, rope, twig, line, highway, mirror ...*

- Objects in the denotation of these nouns typically have objects as parts that themselves can be in the denotation of these nouns: a fence divides into fences, a line into lines. Their denotations are built from minimal generators that overlap (“horizontal” overlap).



- This would mean that they pattern with mess mass nouns (also Champollion and Krifka 2016, p.525); neat mass nouns do not overlap in their minimal generators.
- Landman (2011) suggests that the meaning of *fence-like* count nouns is partially specified by context, in a given context, they have only non-overlapping generators in their denotation (neat mass nouns overlap in the same context, p. 34-5) - a pretheoretical observation.

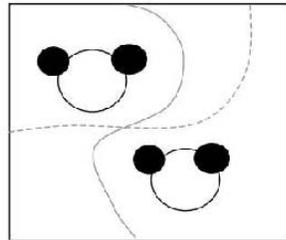
“But before the mirror breaks, we do not, in a normal context, count the mirror and its parts that would count as mirrors when broken as *more than one*: only the maximal mirror counts. Thus the mirrors that we *do* count don’t overlap, or we *make* them not overlap by packaging (...) Neat mass denotations are different: the teapot, the cup, the saucer, the cup and saucer all count as kitchenware and can all count as one simultaneously in the same context” (Landman 2011, p.34-5).

Problem 2: Overlap and mess mass nouns

- MESS mass Ns: *water*

Claim: minimal elements of water always overlap in their non-essential structure, e.g., the overlap is located in the space between the hydrogen and oxygen molecules of water.

water: H₂O molecules



- MESS mass Ns: *mud, meat* (heterogeneous stuff)
 - Claim: built from minimal parts, though not natural minimal parts, but minimal parts that are appropriately minimal in a context.
 - Problem: It is unclear what the various simultaneous variants of minimal mud parts in a given context could be. This makes the question about the atomic DISJOINTNESS of minimal mud parts in a single variant and their “horizontal” OVERLAP across simultaneous variants, hard to defend.



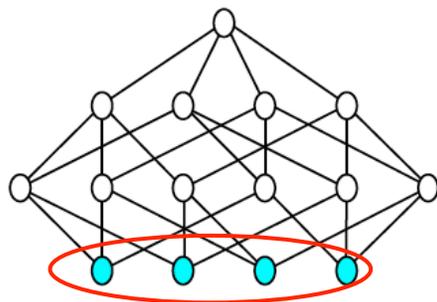
Problem 3: Intra- and crosslinguistic variation

- If the denotation of the English count noun **lentils** is built from non-overlapping generators, then it is puzzling, why the same should not be true of the mass Czech *čočka* ('lentil-stuff').
- If lentils and rice come in natural units of equal perceptual salience, then it is puzzling that the denotation of *lentils* is built from non-overlapping generators, but the denotation of *rice* (mass) should be built from overlapping generators.
- Dutch: near synonyms *meubel(s)* (count) and *meubilair* (mass). The minimal building blocks of *meubilair* (furniture) are the discrete pieces of furniture, *meubels*, yet only the generating set of *meubilair/furniture* overlaps, a sum and its parts count as one simultaneously:

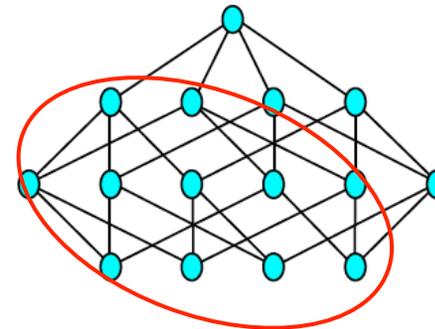
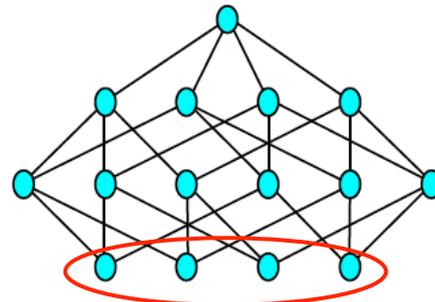
meubel → <MEUBEL, MEUBEL>
sg count, a disjoint,
non-overlapping set

meubels → <*MEUBEL, MEUBEL>
pl count

meubilair → <*MEUBEL, *MEUBEL>
neat mass



counting base



Chierchia (2010), Rothstein (2010), Landman (2011) : Coverage and Comparison

	Main Idea	Strengths	Weaknesses
Chierchia (2010)	Mass Ns are vague Count Ns have stable atoms	Why <i>water, rice, mud</i> is mass Why <i>cat, chair</i> is count	Fake mass Ns (<i>furniture</i>) “Granular” count Ns (<i>lentils</i>)
Rothstein (2010)	Count Ns are indexed to counting contexts. (Difference in semantic type)	Context Sensitive Count Ns (<i>fence, hedge</i>)	Type-based distinction is too weak to predict count/mass variation
Landman (2011)	counting is a matter of non-overlap	Fake mass Ns (<i>furniture</i>)	Why <i>water, meat, mud</i> is mass

References

- BARNER, DAVID & JESSE SNEDEKER (2005). “Quantity judgements and individuation: evidence that mass nouns count”, *Cognition* 97.
- CHIERCHIA, GENNARO. (1998a). Plurality of Mass Nouns and the Notion of ‘Semantic Parameter’. In S. Rothstein (Ed.), *Events and Grammar* (pp. 53–103). Dordrecht: Kluwer.
- CHIERCHIA, GENNARO. (1998b). Reference to kinds across language. *Natural language semantics*, 6(4), 339-405.
- CHIERCHIA, GENNARO. (2010). Mass Nouns, Vagueness and Semantic Variation. *Synthèse*, 174, 99–149.
- LANDMAN, FRED. (2011). Count Nouns - Mass Nouns, Neat Nouns - Mess Nouns. In B.H. Partee, M. Glanzberg, & J. Skilters (Eds.), *Formal Semantics and Pragmatics. Discourse, Contexts, and Models, The Baltic International Yearbook of Cognition, Logic, and Communication* (Vol. 6). Manhattan, KS: New Prairie Press.

Appendix

- The denotation of a count noun is generated from/by a disjoint set of generators (or a set of non-overlapping elements), for every world w : **gen**(X_w).
- A set is disjoint if any two elements in it are disjoint.
 X is *maximally disjoint* in Y if X is a disjoint subset of Y and adding any more elements of Y to X makes X overlap.
- X overlaps iff X is not disjoint.
- **min**(X) is the set of minimal elements of X : x is a *minimal element* of X iff $x \in X - \{0\}$ and for every $y \in X - \{0\}$: if $y \sqsubseteq x$ then $y = x$.

Let X be a function from worlds to regular sets.

The class of regular sets is the smallest class containing the sets $\{0\}$, $\{1\}$, $\{\varepsilon\}$, and \emptyset which is closed under union, concatenation, and Kleene closure.

X is **[+C]**, **count**, iff for every w : **gen**(Xw) is disjoint,
i.e. the generators of Xw do not overlap - disjoint generators.

X is **[-C]**, **mass**, iff for every w : if $|Xw| > 1$ then **gen**(Xw) is not disjoint,
i.e. the generators of Xw overlap - always overlapping generators

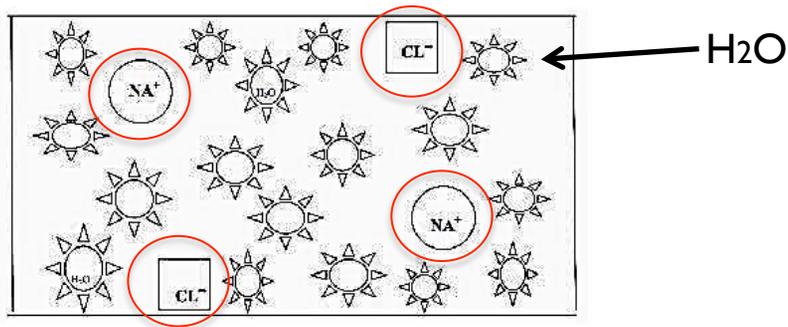
X is **[+N]**, **neat**, iff for every w : **min**(Xw) is disjoint,
i.e. the minimal elements of Xw do not overlap.

X is **[-N]**, **mess**, iff for every w : if $|Xw| > 1$ then **min**(Xw) is not disjoint,
i.e. the minimal elements of Xw overlap.

By definition, count entails neat :	$[+C] \Rightarrow [+N]$
Equivalently, mess entails mass :	$[-N] \Rightarrow [-C]$
neat mass :	$[-C, +N]$.

MESS mass Ns: minimal generators overlap**CASE 1: SALT**

There is salt in the water, two molecules worth.

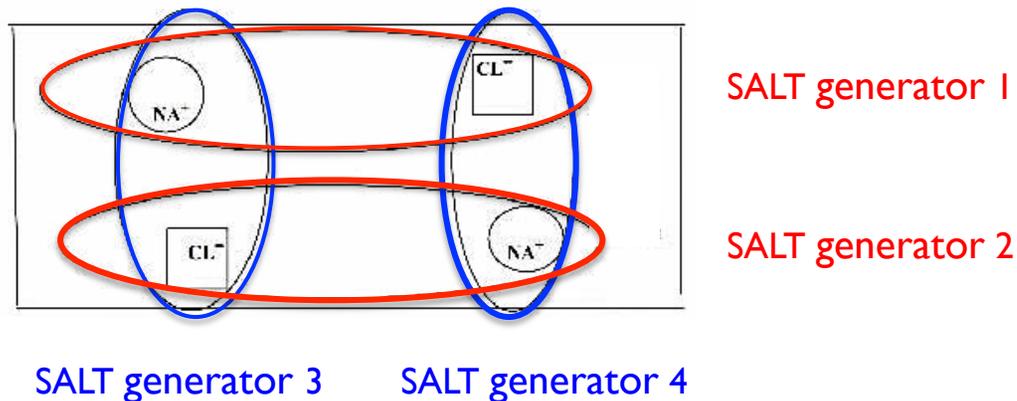


But *which* two molecules?

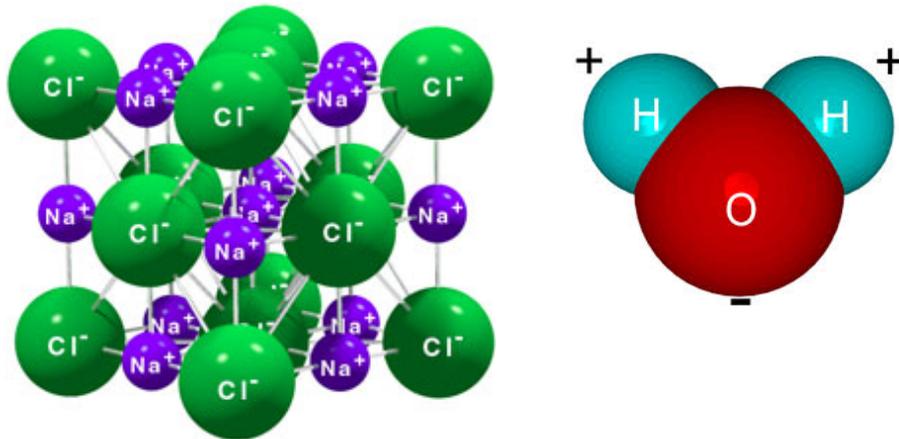
MESS mass Ns: Minimal generators overlap

CASE 1: SALT

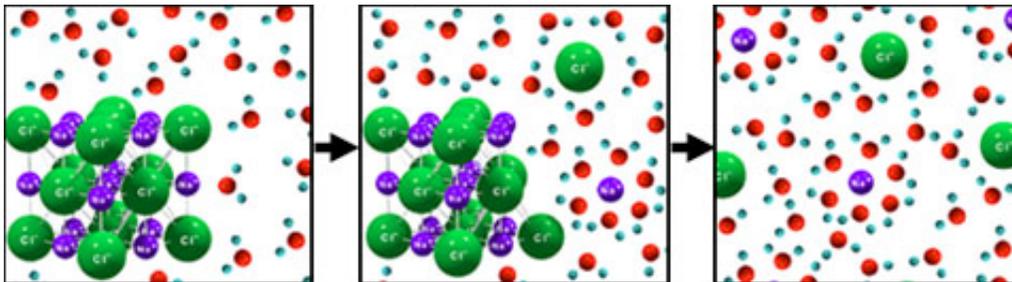
There is salt in the water, two molecules worth.



- For counting we could *choose* EITHER **SALT1+SALT2** OR **SALT3+SALT4**, i.e., one of the two partitions of the domain, and count relative to it. However, neither partition has a privileged status to specify the ‘real’ minimal elements (generators).
- We “regard the salt as built, simultaneously if you want, from both variants.” The mass perspective *merges* these two variants into one part-of structure, which gives **four building blocks—generators—which overlap**.
- If you insist on counting the building blocks in the denotation of the mass noun *salt*, you will count overlapping building blocks (four, in our example), *and you are guaranteed to count wrong!*

MESS mass Ns: Minimal generators overlap**CASE 1: SALT (a chemistry excursus)**

The dissolution of NaCl (s) in water:

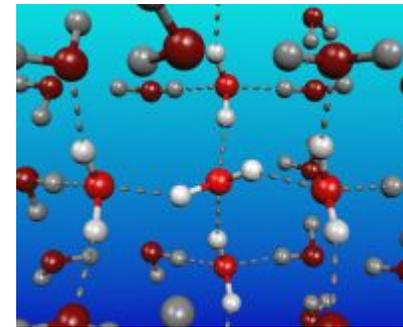
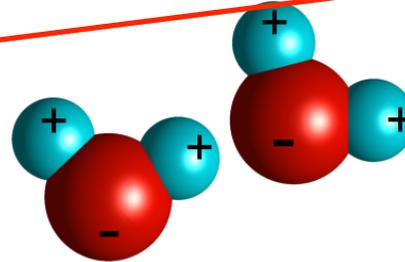
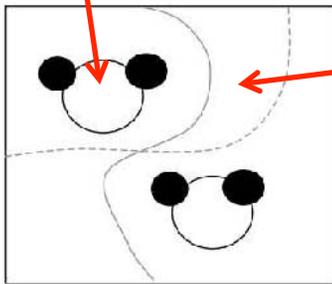


NaCl dissolves to become ions in a solvent. The water molecules surround the ions. These ions are now free to move about in solution since they are no longer in a crystal lattice. This means that the ionic bonds between Na^+ and Cl^- are broken. The oxygen of H_2O surrounds the Na^+ and the hydrogens of H_2O surround the Cl^- . This has to do with the polar properties of water and the charges on the ions.

MESS mass Ns: Minimal generators overlap

CASE 2: WATER

- A minimal element in the denotation of *water* is something that consists of some essential structure (a “Mickey Mouse” H₂O molecule in the picture below) and some space:



- The *space between the molecules* is part of the body of water and shouldn't be ignored (p.21).
- There are many ways of dividing that space, and hence, many ways of partitioning the water into minimal mass-parts.
- Mass perspective *merges* all such variants (different ways of partitioning the water into minimal mass-parts) into one part-of structure, and gives **overlapping building blocks**..

If you try to count such overlapping building blocks, you are guaranteed to count wrong!

MESS mass Ns: Minimal generators overlap

CASE 3: MEAT

- We can think of meat as being built from minimal parts, but not natural parts, unlike in the case of water where the natural minimal parts are “H₂O molecules+space”, but minimal parts that are “appropriately minimal in a context” (p.20).
- Suppose we have a meat cutting machine consisting of two sharp knife-lattices that cut the meat, as in (i). We may move the knife-lattices slightly, and get a different partition into minimal meat pieces, outlined in blue in (ii).



- There are many ways of partitioning the meat, and each partition consists of pieces which, in a given context, can count as minimal meat pieces. None of these partitions has a privileged status, in providing *its* minimal pieces with the privileged status of being the “real” minimal pieces. Given that the variants represent different partitions of the same stuff, **the set of generators will contain mutually overlapping elements.**

If you try to count such overlapping building blocks, you are guaranteed to count wrong!