

Meaning at a crossroads

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The theory of meaning now stands at a crossroad:

either it will remain an attempt at formalizing meaning-systems by increasing sophistication of the logico-mathematical tools which enable it to formulate models on the basis of a conception (already rather dated) of meaning [...]; or else [....]

Kristeva (1973)

Red





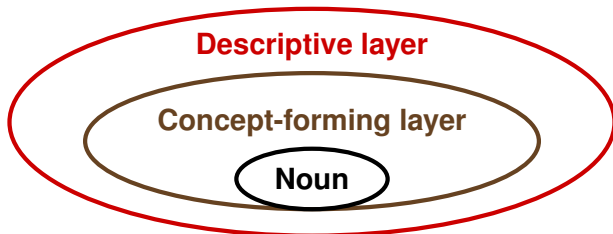




blue: $\lambda x. P_i(x) \wedge \mathbf{correlated}(P_i, \mathbf{blue})$

Adjective ordering

Bouchard (2009: 268): “The more the property expressed by an Adj can form a relevant and usual Concept with the N, the more this Adj tends to be close to the N.”



a **serious** legal adviser

??a legal **clever** adviser

Catalan “pseudo-incorporation”

Té **una parella**.
has a partner
'S/he has a partner.'

Té **parella**.
has partner
'S/he has a partner.'
(so, s/he's married / can now dance / ...)

Catalan “pseudo-incorporation”

Té **parella estable**.
has partner stable
'S/he has a stable partner.'

??Té **parella alta**.
has partner tall

Té **una parella alta**.
has a partner tall
'S/he has a tall partner.'

Catalan “pseudo-incorporation”

$$\lambda x_k [\text{parella}(x_k) \wedge \text{estable}(x_k)]$$
$$\lambda x_k [\text{parella}(x_k) \wedge \text{alta}(x_o)]$$
$$\lambda y_o \exists x_k [\text{parella}(x_k) \wedge \text{Realize}(y_o, x_k) \wedge \text{alta}(y_o)]$$

x_k : a kind (\approx concept?)

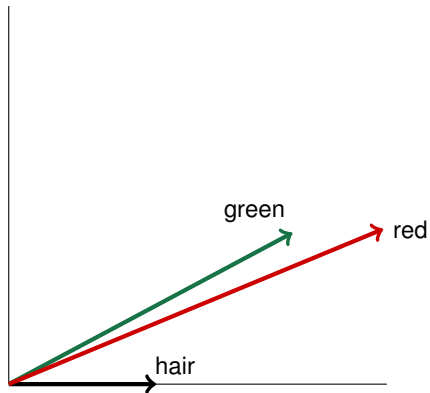
y_o : an object

Realize: holds between objects and the kinds they are instances of

Words and their distributions

because not all boots are red. Similarly, the items for the (dead or living), number of packed red blood cell units transfused, at the 6 mo before transplant, red blood cells transfused, and positive by saying, It's round, it's red, it is a fruit; I've been in the Promotion, Ontario, Canada, 2008-2009. red dots, malaria case-patients, protein; and absence of dysmorphic red cells, heavy protein, and anemia indicated by darker shades of red. Map was constructed by using Ikoma Ward in northwest Tanzania. red dots indicate cases of malaria regarding abnormal uterine bleeding. Recognise red flag symptoms: green apple, a red apple, red grapes, and green grapes, family make a guess before the red screen appeared. The instructor asks it's important to rule out any red flag symptoms for cauda equina

Comparing word representations



Phrases and their distributions

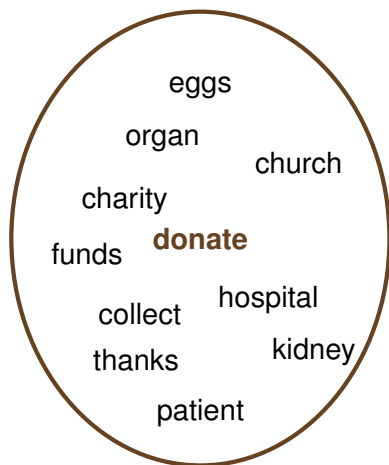
and sturdy, with carrot **red hair** that matched his temperament
and her bundle of curly **red hair** is out of control.
Although we both have **red hair** and freckles, our dispositions a
her glorious, flaming mane of **red hair** only once before, when a
She had dyed **red hair** -- that bloody shade -- brutal amounts
The woman with **red hair** and freckles was crying.
ex-professor with freckles and curly **red hair**. When I asked how
A strand of copper **red hair** had escaped her hood and
29 years, a rocket of flaming **red hair**, drive, defiance, raw po
with her combo of **red hair**, porcelain skin and fine bones
silence, she let her fiery **red hair** fall over her shoulders as
school. Iris had wild **red hair**, green eyes, a strong nose

Comparing approaches

Formal

x **donate** y to z
x causes s
x acts volitionally
s = z has y
s is intended to be permanent
z is intended to benefit from y
⋮

Distributional



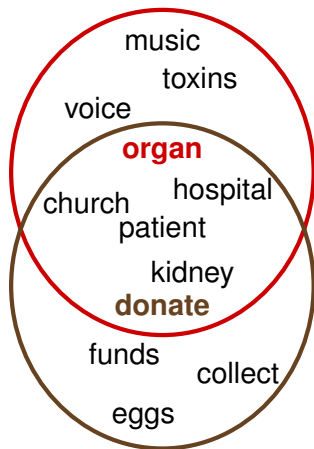
donate

Comparing approaches

Formal

x **donate** y to z
x causes s
x acts volitionally
s = z has y
s is intended to be permanent
z is intended to benefit from y
y is an **organ**
y is a part of something
y has a designated function
⋮

Distributional



donate an organ

Comparing approaches

And: $\lambda q \lambda p . p \wedge q$

adaptation, which featured the up **and** coming David Garrick, on the people around them **and** the pressures put on the the four books (two double volumes) **and** took the occasional as little terror to the mind **and** as much ease as though interested in the quality of Pamela **and** Mr.B's love, **and** its

The: $\lambda P \iota x . P(x)$

adaptation, which featured **the** up and coming David Garrick, on **the** people around them and **the** pressures put on **the the** four books (two double volumes) and took **the** occasional as little terror to **the** mind and as much ease as though interested in **the** quality of Pamela and Mr.B's love, and its

Comparing approaches

Once upon a time there were three little pigs. One pig built **a house** of straw while the second pig built **his house** with sticks. They built **their houses** very quickly and then sang and danced all day because they were lazy. The third little pig worked hard all day and built **his house** with bricks.

A big bad wolf saw the two little pigs while they danced and played and thought, ``What juicy tender meals they will make!'' He chased the two pigs and they ran and hid in **their houses**. The big bad wolf went to **the first house** and huffed and puffed and blew **the house** down in minutes. The frightened little pig ran to **the second pig's house** that was made of sticks. The big bad wolf now came to **this house** and huffed and puffed and blew **the house** down in hardly any time. Now, the two little pigs were terrified and ran to **the third pig's house** that was made of bricks.

The big bad wolf tried to huff and puff and blow **the house** down, but he could not. He kept trying for hours but **the house** was very strong and the little pigs were safe inside.

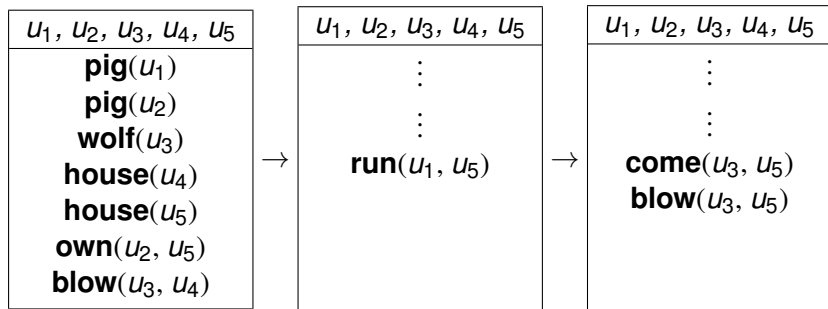
(<http://shortstoriesshort.com/>)

Comparing approaches

The wolf went to **the first house** and blew **the house** down.

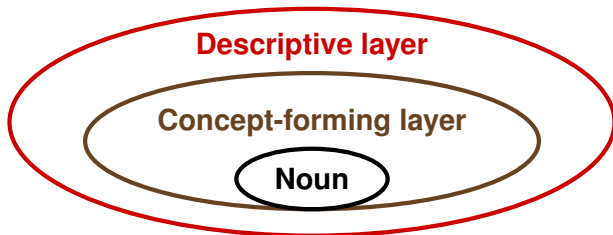
The [first] pig ran to **the second pig's house**.

The wolf came to **this house** and blew **the house** down.



Adjective ordering

Bouchard (2009: 268): “The more the property expressed by an Adj can form a relevant and usual Concept with the N, the more this Adj tends to be close to the N.”



a **clever** legal adviser

??a legal **clever** adviser

Pseudo-incorporation

Dayal (2011: 136f.) “We now turn to evidence establishing that the Hindi incorporated nominal cannot be [a noun] but must be an NP.” Consider:

anu sirf **puraanii** **kitaab** becegii
Anu only old book sell-FUT
‘Anu will only sell old books.’

“Of course, there are certain types of modification and conjunction that are not acceptable in incorporation. For example, [the above] cannot have a modifier like *bhaarii* ‘heavy’. This is because modification must preserve proto-typicality, and while old books can enter into a prototypical relation with *sell*, heavy books cannot.”

Borer (2003: 34f.) on “exoskeletal” morphosyntax

[the open-class lexicon consists of] sound-meaning pairs, where by meaning we refer to the appropriate notion of a concept....Crucially, an [open-class item] is not associated with any formal grammatical information concerning category, argument structure, or word-formation. It is a category-less, argument-less concept, although its meaning might give rise to certain expectations for a felicitous context. (...)

In the absence of a category determination, [open-class items] are inserted as an unordered set into an unmarked lexical-phasal domain [L-D], as in (3):

(3) [_{L-D} sink, boat, dog]

(...) Particular functional structures, in turn, will categorize whatever L-D they dominate.

Interim conclusions

- ▶ Our models of meaning should not set aside either concepts or reference, even for expediency, because:
 - ▶ Grammar has dedicated constructions for complex concept formation.
 - ▶ Function words/morphology mediate between concepts and reference.
- ▶ No reason not to consider different representational tools for different aspects of meaning.
- ▶ Leverage the idea of meaning as something speakers *do*, not just something expressions *have*.

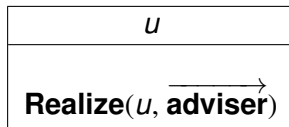
Combining approaches

- ▶ Use distributional semantics to model (simple and complex) kind descriptions.
- ▶ Port these into Discourse Representation Theory.
- ▶ Use the **Realize** relation and a property ascription relation (**Bear**) to relate discourse referents to these (distributional) descriptions.

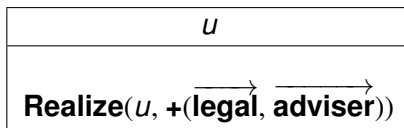
Combining approaches

Concept-forming layer:

an adviser:



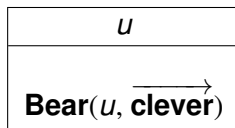
a legal adviser:



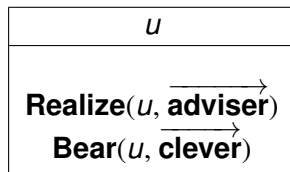
Combining approaches

Descriptive layer:

X is clever:



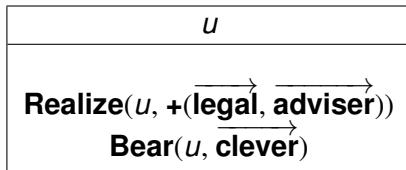
a clever adviser:



Combining approaches

Combined layers:

a clever legal adviser:



Further down the path

- ▶ Extend this approach to complex event descriptions.

Blog post: I think the best solution is that your mom doesn't just drop in, your [fiancé] gets a heads up...]

Reply: I agree with **the giving him a heads up and allowing him space.**

(GloWbE corpus)

Further down the path

- ▶ Extend this approach to complex event descriptions.

pull [some/a lot of/...] **strings**

Further down the path

- ▶ Improve the model of how (quasi-)logical aspects of lexical meaning interface with non-logical aspects.

[[*x* ACT] CAUSE [*y* BECOME *<result-state>*]]

[*x* ACT *<manner>* *y*]

Further down the path

- ▶ Use this work to develop a better theory of how grammatical aspects of lexical knowledge interface with semantic memory.
- ▶ Explore seriously the view of grammar – including function words – as a crucial and highly adapted set of instructions for communicative interaction that can tell us something about ourselves.



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Selected references

- Andrews, M., Frank, S., and Vigliocco, G. (2014). Reconciling embodied and distributional accounts of meaning in language. *Topics in Cognitive Science*, 6:359–370.
- Baroni, M., Bernardi, R., and Zamparelli, R. (2014). Frege in space. *Linguistic Issues in Language Technology*, 9(6):5–110.
- Blakemore, D. (1987). *Semantic Constraints on Relevance*. Blackwell, Oxford.
- Boleda, G., Baroni, M., Pham, N. T., and McNally, L. (2013). Intensionality was only alleged: On adjective-noun composition in distributional semantics. In *Proceedings of IWCS 2013*, Potsdam.
- Borer, H. (2003). Exo-skeletal vs. endo-skeletal explanations. In Moore, J. and Polinsky, M., editors, *The Nature of Explanation in Linguistic Theory*, pages 31–67. CSLI Publications, Stanford, CA.
- Bouchard, D. (2009). A solution to the conceptual problem of cartography. In van Craenenbroeck, J., editor, *Alternatives to Cartography*, pages 245–274. Mouton de Gruyter, Berlin.
- Carlson, G. N. (1977). *Reference to Kinds in English*. PhD thesis, University of Massachusetts at Amherst.
- Dayal, V. (2011). Hindi pseudo-incorporation. *Natural Language and Linguistic Theory*, 29:123–167.
- Del Pinal, G. (2015). Dual Content Semantics, privative adjectives, and dynamic compositionality. *Semantics and Pragmatics*, 8(7):1–53.
- Espinal, M. T. and McNally, L. (2011). Bare singular nominals and incorporating verbs in Spanish and Catalan. *Journal of Linguistics*, 47:87–128.
- Garrette, D., Erk, K., and Mooney, R. (2011). Integrating logical representations with probabilistic information using Markov logic. In *Proceedings of IWCS 2011*.
- Gehrke, B. and McNally, L. (2016). Idioms and the syntax/semantics interface of descriptive content vs. reference. Ms., CNRS and UPF.
- Grimm, S. and McNally, L. (2015). The *-ing* dynasty: Rebuilding the semantics of nominalizations. *Semantics and Linguistic Theory*, 25:82–102.

- Grimm, S. and McNally, L. (2016). *The+VPing* as anaphoric event-type reference. In Kim, K., Umbal, P., Block, T., Chan, Q., Cheng, T., Finney, K., Katz, M., Nickel-Thompson, S., and Shorten, L., editors, *Proceedings of the 33rd West Coast Conference on Formal Linguistics*, pages 167–175, Somerville, MA. Cascadilla Proceedings Project.
- Kamp, H. (1981). A theory of truth and semantic representation. In Groenendijk, J., Janssen, T., and Stokhof, M., editors, *Formal Methods in the Study of Language*, volume 1, pages 277–322. Mathematisch Centrum, Amsterdam.
- Kamp, H. (2014). Using proper names as intermediaries between labelled entity representations. Ms., U. Stuttgart.
- Kennedy, C. and McNally, L. (2010). Color, context, and compositionality. *Synthese*, 174:79–98.
- Kristeva, J. (1973). The system and the speaking subject. *Times Literary Supplement*, pages 1249–52.
- Levin, B. and Rappaport Hovav, M. (2011). Lexical conceptual structure. In von Stechow, P., Maienborn, C., and Portner, P., editors, *Semantics: An International Handbook of Natural Language Meaning I*, pages 418–438. Mouton de Gruyter, Berlin.
- McNally, L. (2015). Kinds, descriptions of kinds, concepts, and distributions. Ms., Universitat Pompeu Fabra.
- McNally, L. and Boleda, G. (2004). Relational adjectives as properties of kinds. In Bonami, O. and Cabredo Hofherr, P., editors, *Empirical Issues in Syntax and Semantics*, volume 5, pages 179–196. <http://www.cssp.cnrs.fr/eiss5>.
- McNally, L. and Boleda, G. (to appear). Conceptual vs. referential affordance in concept composition. In Winter, Y. and Hampton, J., editors, *Concept Composition and Experimental Semantics/Pragmatics*. Springer, Berlin.
- Spalek, A. (2014). *Verb Meaning and Combinatory Semantics: A Corpus-Based Study of Spanish Change of State Verbs*. PhD thesis, Universitat Pompeu Fabra.
- Vallduví, E. (1992). *The informational component*. Garland Press, New York.
- Zamparelli, R. (1995). *Layers in the Determiner Phrase*. PhD thesis, U. Rochester.
- Also visit the web for the workshop ‘Referential Semantics One Step Further: Incorporating Insights from Conceptual and Distributional Approaches to Meaning (RefSemPlus)’ at http://essli2016.unibz.it/?page_id=397