Idioms are not so compositionally special

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This talk

The compositionality question

The perspective taken here reflects...

- ► temerarious ignorance about idioms

- ► extended experience with coercion and co-compositionality (Pustejovsky 1995)

- ► recent experience with distributional semantics (Landauer & Dumais 1997, a.m.o.; see Baroni et al. 2014 for connections to formal semantics)

- ► emphasis on meaning as something we *do*: among other things, we construct complex descriptions and use them to individuate things/events

The main points

- ▶ For descriptive content, co-compositionality is arguably the rule, not the exception

    - ▶ Brief tour of some "non-idiomatic" data will point to similarities with idioms

    - ▶ Lesson from my quest for the right tools: Distinguish complex descriptive content and referential aspects of meaning

- ▶ Co-compositionality is different from coercion

    - ▶ Various examples we saw yesterday look like cases of a decision to refer to something under a description that does not, strictly speaking, apply to it

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Modification of nouns by adjectives

American Airlines goes after **Korean passengers**

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Modification of nouns by adjectives

(Arsenijević, et al. 2014)

American Airlines goes after **Korean passengers**
American Airlines, one of the three major U.S. carriers, is set to
steal Korean Air customers heading to the United States as it
launches non-stop daily flights between Incheon and Dallas, Texas.

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Modification of nouns by adjectives

red

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Modification of nouns by adjectives

red

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Modification of nouns by adjectives

red hair

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Modification of nouns by adjectives

red wine

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Modification of nouns by adjectives

red grapefruit

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"Figurative" uses of verbs
(McNally & Spalek 2015)

Sense	English	Spanish
'reduce'	**cut** costs	–
'stop'	**cut** the supply	**cortar** el suministro
'interrupt'	**cut off** the line	**cortar** la llamada
'block'	**cut off** the road	**cortar** la calle
'remove'	**cut** fat **out** of my diet	–
'divide'	**cut** the budget **up** into pieces	–
'create'	**cut** the story **out** of *whole cloth*	–
'make'	**cut** *a niche* **in** the scene	–
'attack'	**cut at** *the heart* of s.t.	–

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Interim conclusion

A not terribly helpful question:
Are these examples compositional?

A more helpful one:
How can we provide an informative analysis of them?

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Classical predicate logic

(Bosch 1983, Rothschild & Segal 2009, Arsenijević et al. 2014, a.o.)

Hidden variable approach:
Korean passengers: $\lambda x.\textbf{passengers}(x) \wedge R_i(x, \textbf{Korea})$

Indexical approach:
red hair: $\lambda x.(\textbf{red}_i(\textbf{hair}))(x)$

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Pros and cons

- **Pro:** Appropriately flexible

- **Con:** Too weak: No account of the default intuitions (or their apparent generalizability to new examples)

- **Missing:** A theory of how context plays its role

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The Generative Lexicon
(Pustejovsky 1995, Badia & Saurí 2000, a.o.)

$$
\begin{bmatrix}
\textbf{pen} \\
\text{ARGSTR} \quad \begin{bmatrix} \text{ARG1} & y \end{bmatrix} \\
\\
\text{QUALIA} \quad \begin{bmatrix}
\text{FORMAL} & \textbf{pen}(y) \\
\text{CONST} & \textbf{ink}(w, y) \\
\text{AGENTIVE} & \textbf{make}(e, x, y) \\
\text{TELIC} & \textbf{write}(e, z, y)
\end{bmatrix}
\end{bmatrix}
$$

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Pros and cons

- **Pros**

  - Captures many default interpretations

  - Seems supported by cross-linguistic generalizability

- **Cons**

  - Too strong: no account of context dependent interpretations (see e.g. Fodor & Lepore 1998), set of necessary and sufficient primitives hard to establish

  - Too weak: no account of *red* (see also Murphy 2002)

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"Modern Type Theories" (MTT)

(Martin-Löf 1984, Asher 2011, Chatzikyriakidis & Luo 2013, a.o.)

- ▶ Very rich system of basic types (not simply e, t)
- ▶ Truth characterized in terms of proof
    - ▶ The semantic value of a sentence (a proposition) is a type: The type of the proofs of the sentence
- ▶ Common nouns are interpreted as types
    - ▶ *hair*: HAIR, *wine*: WINE

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"Modern Type Theories" (MTT)

(Martin-Löf 1984, Asher 2011, Chatzikyriakidis & Luo 2013, a.o.)

2 approaches to modification in MTT:

- ▶ Adjectives as **polymorphic** types (Asher):

- ▶ Adjectives as **dependent** types (Chatzikyriakidis & Luo):

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Pros and cons

- **Pros**

  - Appropriately flexible, implementable

  - Dependent types offer promising account of co-composition

- **Cons**

  - Polymorphism looks like a relabeling of the problem

  - The logical properties of dependent types are non-trivial to understand (G. Morrill, p.c.)

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Compositional distributional semantics

(work by Baroni, Clark, Erk, Herbelot, Lapata, Lenci, Padó, Socher, Steedman, van der Cruys, and colleagues, a.m.o.)

- ▶ The Distributional Hypothesis (Harris 1954): Words that occur in similar contexts are semantically similar.

- ▶ The (content) words that surround a given (content) word in context are clues to the concept that the word labels.

- ▶ Lexical representations are statistical, not symbolic, and concept-like

- ▶ Lexical concepts are "all-inclusive"; semantic composition involves narrowing

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Words and their distributions

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

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Vectors as lexical representations

	fur	bark	purr	run	chase	pen
dog	53	22	0	16	29	0
cat	44	2	40	15	45	0
car	0	4	10	10	30	0
ink	0	0	0	10	0	33

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Semantic composition of vectors

	bright	irritated	burn	stop	warn	apple
red	99	20	40	98	29	15
flag	19	2	1	50	45	0
skin	6	90	79	8	2	15
red flag	118	22	41	148	74	15
red skin	105	99	119	106	31	30

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Pros and cons

- **Pros**

  - Appropriately flexible, implementable

  - Offers very promising account of co-composition

  - Can support an account of default readings (McNally & Boleda, to appear)

- **Cons**

  - Does not generalize to function words, large phrases, episodic/referentially-dependent aspects of meaning

  - No distinction between "linguistic meaning" and "conceptual content"

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A mixed model

Garrette, et al. 2011, Lewis & Steedman 2013, McNally & Boleda, to appear, a.o.

One way to overcome the cons while preserving the pros:

- ▶ Use distributional representations for most lexical and some phrasal content

- ▶ Use a standard referential semantics for the rest

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A mixed model

Garrette, et al. 2011, Lewis & Steedman 2013, McNally & Boleda, to appear, a.o.

One way to overcome the cons while preserving the pros:

- ▶ Use distributional representations for most lexical and some phrasal content

    - ▶ ≈ roots and those phrases that have been argued to denote (properties of) kinds

    - ▶ NP within a layered DP (Zamparelli 1995, McNally & Boleda 2004, Espinal 2010, a.o.)

    - ▶ developing similar idea for VP, building on e.g. Landman & Morzycki 2003, Gehrke 2012, Grimm & McNally, to appear

- ▶ Use a referential semantics for the rest (here, Discourse Representation Theory, Kamp 1981)

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Basic predicate representation

McNally, to appear, McNally & Boleda, to appear

N(P), A(P) as constants over vectors:

$\overrightarrow{\textbf{hair}}$

$\overrightarrow{\textbf{red}}$

Represent their composition using distributional methods like this:

$+(\overrightarrow{\textbf{red}}, \overrightarrow{\textbf{hair}}))$

In other words, vectors (instead of e.g. sets of individuals) are models for the semantic values of certain words and phrases.

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Combining vectors with DRT

Adapt Carlson's 1977 analysis of kinds: Using a DP involves individuating a discourse referent under a particular (simple or composed) vector description.

hair:

$$\frac{u}{\mathbf{Realize}(\text{u, } \overrightarrow{\mathbf{apple}})}$$

red hair:

$$\frac{u}{\mathbf{Realize}(\text{u, } +(\overrightarrow{\mathbf{red}}, \overrightarrow{\mathbf{hair}}))}$$

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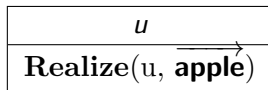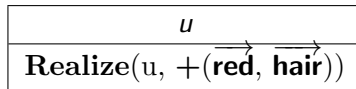
A mixed model

- ▶ The intuition: Such cases of modification are **not** to be understood as two separate (intersective) predications of properties to some individual (cp. classical analyses)

- ▶ Rather, an attempt to improve on predicate modifier accounts

- ▶ Direct ascription of adjectival properties to entities also implementable

- ▶ Some obvious applications within VP (e.g. (pseudo-)incorporation), but the program is to extend the same approach to VPs in general → co-compositionality in VP

Asher on "aspect" ($\neq$ apsectual!) coercion

The *canvas* is **immense**, and, **as an example of a bygone school, interesting** to all art lovers.

Juliet is the sun.

- ▶ Some nouns, like *canvas*, have multiple aspects (e.g. physical object and information), made explicit in their type structure

- ▶ In composition, the predicates we use force a selection of just those aspects that are compatible with the predicate

- ▶ He extends this analysis to metaphor

(See e.g. Kintsch 2000 for an early distributional semantic account of metaphor.)

Coercion to yield "figurative" uses of verbs

[It] **cuts** *a hole* in the ideological unity of capitalism.

...hes...**cutting** *a niche* in the World Music scene.

...Dad would **cut** the story out of *whole cloth*.

[he] has **cut** his career from *the apparel industry cloth*.

Mr. Hills regarded these methods as **cutting at** *the root* of morals.

Systematic campaigns designed to exclude...minority voters and young people from the polling booths...have reached new heights in 2012. This **cuts at** *the heart* of the very notion of democratic elections as an expression of the popular will...

It's a small step to idioms

Despite the discretion I'd shown, every time I appeared with a reporter...the White House folks grew anxious – "Don't spill the beans," Michael Waldman had whispered...leaving me to ponder exactly **which beans** I had that were worth **spilling**.

▶ Perhaps a mistake to think that *which beans* and *spill* are co-composed here

▶ An alternative: The mention of the idiom facilitates a coercive use of the noun and verb, but the composition of the phrase itself is "standard"

Conclusion

- ▶ The mixed distributional/referential model suggests natural and unnatural places for co-composition to occur in clause structure

    - ▶ Leads to hypotheses about places to expect and not expect idiomatic expressions

- ▶ The distributional perspective blurs the word/phrase distinction and pushes one to view language as "decompositional" rather that compositional

    - ▶ Nondecomposable or partially decomposable idioms are not at all odd from this perspective

Conclusion

▶ Coercion – understood as reference to some object under a description that does not fully apply to it, licensed by a particular linguistic context – is obviously pervasive

▶ No reason it should not occur in idiomatic expressions as well

Thank you!

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