

Idioms and the syntax/semantics interface of descriptive content vs. reference

Berit Gehrke (HU Berlin) & Louise McNally (Universitat Pompeu Fabra)

U. Konstanz 5/7/2018

1. Introduction

Weinreich (1969:42): Idioms are “phraseological unit[s] that involve [...] at least two polysemous constituents, and in which there is a reciprocal contextual selection of subsenses.”

At least two aspects of this selection remain challenging:

- Reference to “polysemous constituents” implicitly places the focus on content words (e.g., N, V, A) and sets aside function words (e.g. D, P). How does selection work in e.g. (1)?

- (1) to pull strings
a. to pull some/a few/those strings
b. to pull political/local strings

- Varying degrees of compositionality (see, e.g., Nunberg et al. 1994, and Espinal & Mateu 2010 for discussion), ranging from fully frozen(?) *shoot the breeze*, to *kick the bucket*, whose frozenness has fairly compositional cases like (1).

Our goal:

- Use idiom data as an argument for a particular way of articulating syntax/semantics interface: Multi-level semantics for multi-level syntax (*level* as in Ladusaw 1988).
- Distinguish the semantic composition of descriptive content from composition that connects descriptive content to reference (builds on McNally & Boleda 2017, McNally 2017, with important antecedents (pseudo-)incorporation literature, esp. Carlson 2003, Farkas & de Swart 2003).

Plan:

- Overview of data: determiner and modifier intervention in idioms.
- Previous (mainly syntactic) proposals to account for intervention.
- Our account, including some preliminary generalizations concerning (de)compositionality of idiomatic expressions.
- Conclusion.

2. Delimiting the data

Preliminary: Focus restricted to decomposable idioms (‘idiomatically combining expressions’ in Nunberg et al. 1994), mainly involving verbs and direct objects, possibly accompanied by particles/prepositional phrases (e.g., *to blow off steam* – hereafter, V(-P-)N idioms) but we see no reason why our analysis could not extend to other sorts of idioms.

2.1 Determiner variability in idioms

General overview and data based on Bruening et al. (2018); see references cited there:

- Canonical (singular) definite replaced by, e.g., *some*, *a*, or *another*.

- (2) a. to rock the boat: “This’ll rock **some** boats”

- b. to bark up the wrong tree: “Have you ever barked up **a** wrong tree?”;
“you’re barking up **another** wrong tree”
- Canonical singular indefinite article replaced by, e.g., *many*, *that*.
- (3) a. to smell a rat: “Do we all smell **many** rats connected with this legislation?”
b. to beat a dead horse: “it’s moronic for a public figure to beat **that** dead horse of a joke”
- Canonical bare singulars/plurals replaced by, e.g., *the*, *some*, *no*, *many*, some with additional adjectives as well.
- (4) a. to close up shop: “international banks have not totally closed up **the credit** shop”
b. to eat humble pie: “Obama might eat **some** humble pie”
c. to (not) make head or tail of: “He spoke so rapidly that I could make **no** head or tail of his speech”
- (5) a. to build castles in the air: “Mother Meade had built **many** castles in the air.”
b. to cut corners: “This is What Happens When Companies Cut Too **Many** Corners and Don’t Give a Damn”
c. to make tracks: “so me and Walker made **some quick** tracks to the truck while Ben held rear guard for us”

Questions: How can a sub-constituent of a putatively non-compositional phrase vary? Under what conditions can determiners vary?

2.2. Intervening modifiers

Ernst (1981) distinguishes *external*, *internal* and *conjunction* modification (see also, e.g., Stathi 2007, Cserép 2010, McClure 2011, Sailer 2017).

- **External modification:** Modifier applies to the idiom as a whole; can usually be paraphrased adverbially (e.g. *politically*, *sociologically*).¹
- (6) a. He made a speech in Dublin which touched a raw **political** nerve.
b. Don’t rock the **sociological** boat with your new ideas.
- Problem: How to “extract” adjective’s contribution when encrusted in the idiom. Considered less problematic than the other sorts of modification Ernst identified: If the semantic effect of the adjective is postponed until after the composition of the idiom, the pieces of the idiom itself are not separated by any intervening material.
 - **Internal modification:** Applies to the noun denotation alone, on its idiomatic reading.²

¹ All examples in this section are from Ernst (1981).

² Nicolas (1995) attempts to reduce internal modification to external modification, but examples like those in (i) are hard to reanalyze in terms of external modification.

- (i) a. In an extremely quixotic effort, he was casting **Marxist** pearls before **capitalist** swine.
b. In doing the project we were caught between the **theoretical** devil and the **practical** deep blue sea.

- (7) a. In spite of its conservatism, many people were eager to jump on the **horse-drawn**³ Reagan bandwagon.
 b. The federal agency decided to take the project under its **well-muscled** wing.
- McClure (2011) argues that internal modification can only apply if the noun can be associated with idiomatic semantic content of some sort (for example, *bandwagon* with “cause/movement” in the case of (7a)), while no such restriction applies to external or conjunction modification, an observation also implicit in Ernst (1981).
 - **Conjunction modification:** Applies to the noun denotation along, but on its literal interpretation.
- (8) a. In spite of the treatment the other refugees received from the rescue party in the desert, he bit his **thirst-swollen** tongue and kept to himself.
 b. The \$6,000,000 man came over and lent us a helping **electronic** hand.
- According to Ernst, conjunction modification adds a second proposition (e.g., *he has a thirst-swollen tongue*) to the proposition associated with the idiom (e.g. *he stopped himself from saying something*).
 - Often set aside as word play or metalinguistic, but any such claim requires a definition of word play and criteria for identifying it. We consider a semantic representation that is able to capture these data more promising than one that does not.

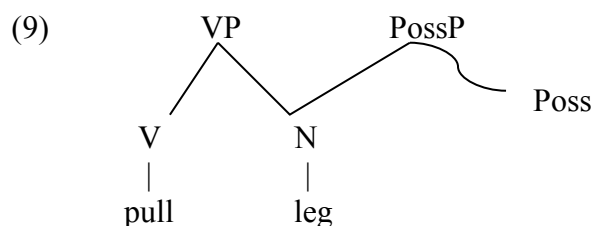
Summarizing: We need an analysis of idioms that accounts for the idiosyncratic semantic relations between their parts, but that nevertheless allows for some flexibility in the choice of determiner and the possibility of intervening modifiers.

3. Previous accounts

3.1. Determiner variability as determiner independence

Three general categories of analyses that try to preserve local selection between the content words in the idiom while allowing determiner independence (NB: focus on the selection between V and N, though other sorts of selectional relations could be modeled similarly).

1. **Represent V and N as co-constituents, while keeping the determiner structurally separate** (e.g., Svenonius 2005 “Banyan” trees, as in (9) for *pull X’s leg*).



³ Ernst assumes that this modifier is interpreted non-literally, describing the cause or movement (i.e. bandwagon) in a fashion that would be analogous to *horse-drawn* describing a physical bandwagon, i.e. as old-fashioned or conservative.

Related proposals: Sportiche (2005), Cecchetto & Donati (2015). Sportiche analyzes (10) using (11): V combines with NP in the lower position; D is generated in the higher position to which the NP moves; the lower copy of NP is deleted at PF but is interpreted at LF, under reconstruction (Fox 2002, Sauerland 2005, Romoli 2015).

(10) Much care seems to have been taken *t* of the victims.

(11) ... [D NP] ... [~~NP~~ V ...] ...

Problem: No semantics provided for these, leaving open the how to compose the determiner with the V+N(P) (see Bruening et al. 2018 for criticism).

2. **Reject the DP hypothesis** (Abney 1987; see Bruening 2015, Bruening et al. 2018). If N heads NP, selection is not a problem. But still leaves us with the task of providing a semantics for determiner/modifier intervention.

3. **Separate the representation of selection from that of managing the rest of the constituent structure which drives semantic composition** (e.g., Bargmann & Sailer, to appear, which builds on Sailer’s 2004 semantics for HPSG, Pollard & Sag 1994). Sailer (2004) distinguishes between *local semantics* (stores basic lexical information manage sortal and selectional restrictions between predicates and their arguments, (13)) and *compositional semantics* (regulates the rest).

- (13) a. The dodo/??Max is extinct.
 b. Hans pflückte eine Pustelblume / ??ein Buch aus dem Regal.
 Hans plucked a dandelion / a book out the.DAT shelf
 ‘Hans plucked a dandelion / ??a book from the shelf.’

Problem: No technique for combining the local contents to produce idiomatic meanings.

Similar in spirit: Chae’s (2015) constructional account, building on Jackendoff (1997).⁴ Like Bargmann and Sailer’s analysis, separates the treatment of constituent structure (14b) from that of the content words (14c), but posits a looser relation between these two components than do Bargmann and Sailer (subscripted “A” in (14c) signals an open argument slot).

- (14) a. Now is as good a time as any to let bygones be bygones and **bury those hatchets** once and for all.⁵
 b. [_{VPx} V [_{NP_y} Det N]]
 c. [RECONCILE ([_A, [DISAGREEMENT]_y)]_x

Problem: Does not overtly connect idiomatic and non-idiomatic interpretations, leading to the criticisms that it is stipulative and fails to capture certain aspects of idiom interpretation that *do* remain compositional (see e.g. Svenonius 2005 and especially Espinal & Mateu 2010).

⁴ Jackendoff does not specifically address determiner variability but only the separability of the verb from the direct object, as in *The hatchet was buried*.

⁵ <https://www.holidailys.com/single-post/2015/08/25/Kiss-and-Make-Up-Day>.

Summarizing: None of these offers a particularly explicit account of the syntax-semantics interface of the idiomatic interpretation that can simultaneously account for determiner variability, the idiomatic reading, and the non-idiomatic reading.

3.2. Intervening modifiers and lexical “reanalysis”

Ernst (1981): Two levels of interpretation, simultaneous representation of idiomatic and non-idiomatic meaning, with links between these, e.g., internal modification (7a) as in (15); conjunction modification (8a) as in (16).

- (15) JOIN CAUSE/MOVEMENT (idiomatic)
 | |
 JUMP ON [THE HORSE-DRAWN REAGAN BANDWAGON] (non-idiomatic)
 Jump on the horse-drawn Reagan bandwagon (surface string)
- (16) CHECK SPEAKING-CAPACITY
 | | ^ HE HAS A THIRST-SWOLLEN TONGUE
 BITE HIS THIRST-SWOLLEN TONGUE
 He bit his thirst-swollen tongue

Problem: No precise syntactic and semantic implementation of this idea.

We know of no more detailed published analysis of internal/external modification in idioms:

- Nunberg et al. (1994) limit themselves to observing that such modification exists as part of a more general argument for the existence of idiomatically-combining expressions.
- Nunberg et al. (1994), Jackendoff (1997), Espinal and Mateu (2010), and Chae (2015): Some kind of re-representation of the parts of the idioms (as in (14c)), such as coercion or metaphorical meaning extension, facilitates such modification.
- McClure (2011), Bargmann et al. (to appear): conjunction modification strongly suggests non-restrictive modification or the introduction of a CI-like layer (Potts 2005)

3.3. Summary

- All previous syntactic accounts of determiner variability in idioms have a two-step syntactic derivation or two different syntactic representations: One deals with selection (e.g. of Ns by Vs) and sortal and/or other restrictions imposed on the selected constituent; the other takes care of the syntax of determiners, (strong) quantifiers, and classifiers.
- Previous discussions of the modification data, while still informal, all point at the need for different sorts of descriptive content – both idiomatic and non-idiomatic – to be available simultaneously (and, indeed, Espinal & Mateu 2010 note there is some language processing research supporting this idea).
- **Conclusion:** We need a model that 1) distinguishes the interpretive mechanisms associated with descriptive content expressions from those associated with reference-related expressions; 2) provides a richer notion of descriptive content than mere truth conditions; and 3) can predict how these components of meaning interact in grammar, e.g., that could shed light on the fact that conjunction modification is only possible if the modified noun can be associated with a referent fitting its literal interpretation.

4. The analysis

- Inspiration in incorporation literature: 1) Carlson's (2003) claim that incorporation involves the construction of complex event types (vs. event tokens); 2) Farkas & de Swart's (2003) proposal to distinguish composition mediated by thematic arguments, which serve as glue between predicates and role-bearing expressions, from compositional processes that introduce discourse referents.
- We model descriptive content using *distributional semantics*, connecting it to referential semantics adapting ideas from McNally (2017), McNally & Boleda (2017); the result fits well with psycholinguistics literature on the processing of idiomatic expressions.

4.1. Composition of descriptive content vs. reference: Ideas from noun incorporation

Inspiration 1 – Carlson (2003):

[T]he VP is the domain of a context-free interpretive mechanism specifying an event-type, which is then the input to the usual context-sensitive propositional semantics generally assumed for all levels of the sentence. That is, something fundamentally different goes on within the VP that does not go on 'above' the VP – it is only information about types/properties that appears there and not information about (contingent) particulars. (Carlson 2003:198)

- (17) a. bike ride
b. collect stamps, ride a bike

(18) VP-level: $[[\text{collect stamps}]] \leq [[\text{collect}]]$

- Event types akin to natural kinds in Carlson (1977).
- Referential/quantificational nominals are combined with verbs only at the clause level, following Diesing (1992). At this level, event types are mapped to event tokens.
- Works well for incorporating structures, but less clear how it works for non-incorporating structures. Raises the same sorts of questions faced by syntactic accounts of idioms such as Sportiche's: How do we combine the descriptive content of DP with that of V, ignoring D? How and where do we add the information contributed by D?

Inspiration 2 – Farkas & de Swart (2003): DRT analysis of Hungarian pseudo-incorporation inspired in in Koenig & Maurer (1999).

- (19) a. János **beteget**_i vizsgált ... ??**öt**_i ...
Janos patient.ACC examine.PAST ... him
'Janos patient_i-examined ... ??him_i ...'
b. János **betegeket**_i vizsgált ... **öket**_i ...
Janos patient.PL.ACC examine.PAST ... him
'Janos patient_i-examined ... him_i ...'
c. János **egy beteget**_i vizsgált ... **öt**_i ...
Janos a patient.ACC examine.PAST ... him
'Janos examined a patient_i ... him_i ...'

- Variables for discourse referents (and which instantiate the arguments of a predicate) distinguished from variables for so-called Thematic Arguments, which serve as

compositional glue and represent the arguments that need to be saturated (see (20), where x is a thematic variable and u_x is a discourse referent).

- (20) a. *beteget*: $\langle \{\}, \{\mathbf{patient}(x)\} \rangle$
 b. *egy beteget*: $\langle \{u_x\}, \{\mathbf{patient}(u_x)\} \rangle$

- Two general kinds of semantic composition rules: Unification and instantiation.

- (21) **Unification of thematic arguments**: Replace the relevant thematic argument z of a verbal predicate with the thematic argument x contributed by a nominal argument of the verb. (Farkas & de Swart 2003: 65, variable names changed for expository purposes)

- (22) a. *vizsgált*: $\langle \{\}, \{\mathbf{examine}(e, y, z)\} \rangle$
 b. *beteget vizsgált*: $\langle \{\}, \{\mathbf{patient}(x), \mathbf{examine}(e, y, x)\} \rangle$

- (23) **A(rgument)-Instantiation**: Instantiate the n -th thematic argument of a verbal predicate by the discourse referent contributed by the fully interpreted nominal argument. (ibid.: 33)

- (24) **D(eterminer)-Instantiation**: Instantiate the thematic argument z of the NP by the discourse referent u contributed by material under D, and subscript u with the index x , writing u_x . (ibid.: 35)

- (25) *egy beteget vizsgált*: $\langle \{u_x\}, \{\mathbf{patient}(u_x), \mathbf{examine}(e, y, u_x)\} \rangle$

- (26) **Secondary Instantiation**: Instantiate the thematic argument x of a nominal with a discourse referent a_x that it is co-indexed with. (ibid.: 49)

- (27) a. *betegetet*: $\langle \{\}, \{\mathbf{patient}(x)\}, \{u_x\} \rangle$
 b. *betegetet vizsgált*: $\langle \{\}, \{\mathbf{patient}(x), \mathbf{examine}(e, y, x)\}, \{u_x\} \rangle$
 c. *betegetet vizsgált*: $\langle \{u_x\}, \{\mathbf{patient}(u_x), \mathbf{examine}(e, y, u_x)\}, \{u_x\} \rangle$

Farkas and de Swart make the following comment:

Secondary Instantiation, unlike D-Instantiation, is driven by the presuppositional semantics of the plural rather than by the lexical input of the syntactic configuration. Unlike D-Instantiation, Secondary Instantiation is not triggered by a [specific syntactic configuration], *and therefore its application is not tied to a particular point in the derivation* [italics ours – BG/LMcN]. It is a last resort strategy that allows a discourse referent contributed by the plural feature to connect to the thematic argument of the nominal in the absence of a proper binder. (ibid.: 48-49)

- We will generalize the use of Secondary Instantiation.

Summarizing: Both Carlson and Farkas and de Swart establish the groundwork for distinguishing the composition of descriptive content-contributing expressions from that of composing potentially complex descriptive contents with reference-related expressions.

- Farkas and de Swart suggest a mechanics.
- Carlson provides the insight that the key to a better analysis of descriptive content

involves modeling it as something closer to a concept description, as opposed to in a classically referential fashion.

4.2. Enriching descriptive content and descriptive content composition

- Titone & Connine (1999) argue that idioms are processed simultaneously in a compositional and non-compositional (“long word”) fashion.
- Results on the processing of literal vs. figurative (i.e. metaphorical or metonymic) meanings suggest that when a word or phrase is processed, initially all of its interpretations are activated, with irrelevant meanings only later suppressed (see, e.g., Swinney 1979, Rubio Fernández 2006, Hogeweg, to appear, and references cited there).
- *Distributional semantic models* (see Lenci 2018 for an overview for linguists) offers what this psycholinguistic research suggests that we need.

Distributional semantics, in a nutshell:

- Semantic values for words and phrases are represented as vectors, i.e. arrays of numerical values that reflect statistical co-occurrence in a corpus (see toy example in Table 1).

	...	<i>child</i>	<i>Politician</i>	<i>bucket</i>	<i>strings</i>	<i>hard</i>	<i>slowly</i>	<i>run</i>	...
<i>Kick</i>	...	99	55	100	0	100	1	78	...
<i>pull</i>	...	105	170	0	200	80	50	0	...

Table 1. Sample vectors for *kick* and *pull*

- Distributional semantic models lack the transparency of symbolic representations, they have various features that make them useful for analyzing descriptive content.⁶
 - Non-discrete: useful for the analysis of linguistic phenomena where similarity or analogy plays a role, and where hard category distinctions are difficult to draw.
 - Do not distinguish properly “linguistic” meaning from world knowledge or conceptual content.
 - *Overspecified* as opposed to *underspecified*, and typically not disambiguated; disambiguation is effectively achieved only in context.
 - Can be composed through algebraic operations that can take into account syntactic information, particularly grammatical function or thematic role information. Composition disambiguates vectors by strengthening components that are shared by the composed expressions and weakening (though not necessarily eliminating) those that are not shared.
 - Representations for phrases can be extracted directly in exactly the same way as are those for words.
- These characteristics, especially the second, may concern for semanticists interested in truth conditions, but they illuminate observations in the literature on idioms.
 - Idioms are a form of figurative language use, and such language has been argued to involve either similarity-based reasoning (see e.g. Bowdle & Gentner 2005) or ad hoc feature assignment (e.g. Glucksberg 2001); such processes depend crucially in many cases on much more than limited truth conditional information.

⁶ Indeed, they have a long history in information retrieval and in psychology (where they were developed for Latent Semantic Analysis, Landauer & Dumais 1997), and currently dominate computational semantic approaches to lexical representation.

- “Overspecified” representations fit well with psycholinguistic evidence about the early activation of word meanings mentioned above.
- Possibility of either composing or extracting representations for phrases fits with the observation that representations for idioms could be stored in addition to representations for their components.
- See Senaldi, et al. (2016), Lebani et al. (2016), Liu, et al. (2017) for distributional analyses of idioms.
- Despite their usefulness for the analysis of descriptive content, distributional semantic models are currently not well suited to modeling the semantics of function words or token reference. For this reason, some approaches opt for using them to model only lexical meaning (e.g., Garrette, et al. 2011, Lewis & Steedman 2013; see the papers in Boleda & Herbelot 2016 for discussion). We also adopt this strategy.

4.3. The analysis of idioms

Bringing together Carlson (2003) and Farkas & de Swart (2003) via distributional semantics:

- McNally (2017) suggests using distributional representations to model kinds/types.
- McNally & Boleda (2017) use compositional distributional semantics for something akin to Farkas & de Swart’s Unification; the distributional representations are then associated with discourse referents in otherwise fairly standard DRT.
- Nouns: modeled as vectors, represented in small caps (e.g., **STRING** for *string*); $d(\alpha)$ is the descriptive content of an expression α . Descriptive content is inherited (28b-c).

$$(28) \quad \begin{array}{l} \text{a. } d(\mathbf{N}): \mathbf{N} \\ \text{b. } d(\mathbf{NP}) = d(\mathbf{N}) \\ \text{c. } d([\mathbf{DP} \mathbf{D} \mathbf{NP}]) = d(\mathbf{NP}) \end{array}$$

- Verbs: modeled as n -tuples of a vector plus one matrix for each argument,⁷ where superscript v stands for vector, **su** indicates a matrix that will apply to the subject nominal’s vector, **ob** indicates a matrix that will apply to the object nominal’s vector, \otimes is matrix-by-vector multiplication, $+$ is vector addition (Paperno, et al. 2014):

$$(29) \quad \begin{array}{l} \text{a. If } d(\mathbf{V}) = \langle \mathbf{v}^v, \mathbf{v}^{\mathbf{su}}, \mathbf{v}^{\mathbf{ob}} \rangle, \text{ and } d(\mathbf{DP}) = \mathbf{N}, \text{ then } d([\mathbf{VP} \mathbf{V} \mathbf{DP}]) = \langle \mathbf{v}^v + \mathbf{v}^{\mathbf{ob}} \otimes \mathbf{N}, \mathbf{v}^{\mathbf{su}} \rangle \\ \text{b. If } d(\mathbf{VP}) = \langle \mathbf{v}^v, \mathbf{v}^{\mathbf{su}} \rangle, \text{ and } d(\mathbf{DP}) = \mathbf{N}, \text{ then } d([\mathbf{VP}' \mathbf{DP} \mathbf{VP}]) = \mathbf{v}^v + \mathbf{v}^{\mathbf{su}} \otimes \mathbf{N} \end{array}$$

- Hooking up descriptive contents to referents: Like Farkas & de Swart, we take number to add the speaker presupposition of a discourse referent. We add the condition that this referent realizes the description contributed by the noun’s vector (**R** a version of Carlson’s (1977) realization relation). Secondary Instantiation used as needed to copy the referent to the set of instantiated referents in the common ground. Determiners add nothing to descriptive content, though they may add extensional conditions on discourse referents.

$$(30) \quad \begin{array}{l} \text{a. } [\mathbf{NP}_z \mathbf{N}]: \langle \{\}, \{\mathbf{R}(u_z, d(\mathbf{NP}))\}, \{u_z\} \rangle \\ \text{b. } [\mathbf{DP} \textit{two} \mathbf{NP}_z]: \langle \{\}, \{\mathbf{R}(u_z, d(\mathbf{DP})), |u_z| \geq 2\}, \{u_z\} \rangle \end{array}$$

⁷ A matrix is a 2-dimensional vector. Intuitively, the matrix for a given verb (e.g., *pull*) has the effect of relating the vectors for words to the vectors for the phrase consisting of the verb plus those words (e.g., it will relate that for *strings* to that for *pull strings*, that for *candy* to that for *pull candy*, etc.).

- The treatment of verb phrases is similar (V_t is a transitive verb):

- (31) a. $[V_t]: \langle \{\}, \{\mathbf{R}(u_e, d(V_t))\}, \{u_e\} \rangle$
 b. $[_{VP} V_t DP_z]: \langle \{\}, \{\mathbf{R}(u_e, d(VP)), \mathbf{R}(u_z, d(DP_z))\}, \{u_e, u_z\} \rangle$
 c. $[_{VP'} DP_y [_{VP} V_t DP_z]]:$
 $\langle \{\}, \{\mathbf{R}(u_e, d(VP')), \mathbf{R}(z, d(DP_z)), \mathbf{R}(y, d(DP_y))\}, \{u_e, u_z, u_y\} \rangle$

The resulting relation between the conditions is somewhat loose in two respects.

- The discourse referents for events and their participants are not directly related to each other, but only indirectly via the fact that the descriptive content for the VP is modulated by the descriptive contents of its arguments, and the latter are connected to discourse referents for the event's participants.
- The descriptive content of any DP, though modulated in composition with that of the verb to which it serves as an argument, stands in relation to its discourse referent in unmodulated form.
- We tighten these aspects up by introducing thematic relations between the referent for the event described by the verb and each of its arguments.

- (32) a. $[_{VP} V_t DP_z]: \langle \{\}, \{\mathbf{R}(u_e, d(VP)), \mathbf{R}(u_z, d(DP_z)), \mathbf{Theme}(u_z, u_e)\}, \{u_e, u_z\} \rangle$
 b. $[_{VP'} DP_y [_{VP} V_t DP_z]]: \langle \{\}, \{\mathbf{R}(u_e, d(VP')), \mathbf{R}(z, d(DP_z)), \mathbf{R}(y, d(DP_y)), \mathbf{Theme}(u_z, u_e), \mathbf{Agent}(u_y, u_e)\}, \{u_e, u_z, u_y\} \rangle$

- In relating the discourse referents explicitly, we also tighten up the connection between the descriptive contents.

Example: Idiomatically combining expression:

- (33) a. $[_{Vt} pull]: \langle \{\}, \{\mathbf{R}(u_e, d(pull))\}, \{u_e\} \rangle$
 b. $[_{NPz} strings]: \langle \{\}, \{\mathbf{R}(u_z, d(strings))\}, \{u_z\} \rangle$
 c. $[_{VP} pull strings]: \langle \{\}, \{\mathbf{R}(u_e, d([_{VP} pull strings])), \mathbf{R}(u_z, d(strings)), \mathbf{Theme}(u_z, u_e)\}, \{u_e, u_z\} \rangle$

Example: 3 options for a putatively non-combining idiom: learned phrase (34), “weak definite”-type analysis (35), compositional analysis (36):

- (34) a. $d(kick-the-bucket): \langle \mathbf{KICK-THE-BUCKET}^v, \mathbf{KICK-THE-BUCKET}^{su} \rangle$
 b. $[_{VP} kick the bucket]: \langle \{\}, \{\mathbf{R}(u_e, d(kick-the-bucket))\}, \{u_e\} \rangle$

- (35) a. $[_{Vt} kick]: \langle \{\}, \{\mathbf{R}(u_e, d(kick))\}, \{u_e\} \rangle$
 b. $[_{DP} the bucket]: \langle \{\}, \{d(bucket)\}, \{\} \rangle$
 c. $[_{VP} kick the bucket]: \langle \{\}, \{\mathbf{R}(u_e, d([_{VP} kick the bucket]))\}, \{u_e\} \rangle$

- (36) a. $[_{Vt} kick]: \langle \{\}, \{\mathbf{R}(u_e, d(kick))\}, \{u_e\} \rangle$
 b. $[_{DP} the bucket]: \langle \{\}, \{\mathbf{R}(u_z, d(bucket)), |u_z|=1\}, \{u_z\} \rangle$
 c. $[_{VP} kick the bucket]: \langle \{\}, \{\mathbf{R}(u_e, d([_{VP} kick the bucket])), \mathbf{R}(u_z, d(bucket)), |u_z|=1, \mathbf{Theme}(u_z, u_e)\}, \{u_e, u_z\} \rangle$

Comments:

- (33) and (36) do not by themselves distinguish literal from idiomatic interpretations.

- Might initially look too weak at best, and problematic at worst, but we hypothesize that it is what is needed in combination with the right theory of language use (see e.g. Glucksberg 2001 on the role of inference in idiom interpretation).

4.3.1. Factors involved in determiner variability

Initial question: How is the event type described on the idiomatic reading is related to the interpretation on the non-idiomatic reading?

- In all cases, we assume that some form of analogical reasoning or *ad hoc* categorization supports association of idiomatic descriptive content with whatever is described.
- Event structure is a major source of analogy (Glasbey 2003, 2007, Mateu & Espinal 2010).
- Some additional variation (esp. with definites) due to anaphora, requirements of other expressions (e.g. *same*).

Unique participants:

- (37) a. kick the bucket
b. bend X's ear

- (38) a. Far more people pass on, push up daisies, kick **buckets**, visit Davy Jones' locker, or journey to the great beyond, than simply die. (Everaert 2017)
b. bend **a few** receptive ears⁸

Incremental theme participants:

- (39) a. to blow off steam
b. blow off **a lot of** steam

Bruening et al.'s (2018) examples revisited:

- (40) a. rock the boat: "This'll rock **some** boats"
b. bark up the wrong tree: "Have you ever barked up **a** wrong tree?"; "you're barking up **another** wrong tree".
- (41) a. smell a rat: "Do we all smell **many** rats connected with this legislation?"
b. to beat a dead horse: "it's moronic for a public figure to beat **that** dead horse of a joke"
- (42) [In a forum discussing a scam] Great that you smelled the rat.⁹
- (43) a. close up shop: "international banks have not totally closed up **the credit** shop"
b. eat humble pie: "Obama might eat **some** humble pie"
c. make head or tail of: "He spoke so rapidly that I could make **no** head or tail of his speech"
- (44) a. to build castles in the air: "Mother Meade had built **many** castles in the air."
b. to cut corners: "This is What Happens When Companies Cut Too **Many** Corners and Don't Give a Damn".

⁸ http://www.bbc.co.uk/blogs/adamcurtis/2011/03/goodies_and_baddies.html.

⁹ <https://www.paypal-community.com/t5/Fraud-phishing-and-spoof-Archive/Scam/td-p/68280/page/4>.

- c. make tracks: “so me and Walker made **some quick** tracks to the truck while Ben held rear guard for us”
- (45) Every company occasionally has reason to cut **some** corners.¹⁰

- Other sources of analogy – reduced determiner variability.

- (46) a. to shoot the breeze \approx to converse idly
b. to chew the fat \approx to make friendly familiar conversation

- (47) a. have a ball \approx to have fun
b. Remember **the** ball/fun we had at the party?

- We expect some limits to determiner variability:

- (48) a. smell every rat
b. (??)smell all rats

- (49) a. We’re raised not to rock the boats that men are clearly the captains of. But fuck that. I’ll rock every boat. I can swim.¹¹
b. We don’t have to beat every dead horse to a pulp.¹²

Summarizing: With access to both referential (event structural) and general descriptive information, we gain traction on determiner variability.

4.3.2. Towards an account of intervening modifiers: The case of external modification

- We focus on external modification as 1) more challenging, and 2) exemplifying a technique that should extend to internal modification.
- Ernst’s (1981) external modifiers are either relational adjectives (RAs) or noun modifiers.

- (50) a. Carter doesn’t have an **economic** leg to stand on.
b. We need to blow off a little **theoretical** steam here.
c. To the old men in the Kremlin, beset with problems, the world is far from a **Soviet** oyster.

- (51) a. He denied that the Saudis, angry over *Death of a Princess*, were seeking some **celluloid** revenge with a movie of their own.
b. Our team is not as good as last year’s, but we aren’t going to drop out of the **soccer** picture.
c. He broke new **inkwell** ground with his invention.

- We adopt a basic analysis of RAs as involving a contextually specified relation R between modifier and a kind-level modifiee (see McNally & Boleda 2004, Arsenijević et al. 2014).

- (52) *political*: $\lambda P_k \lambda x_k [P_k(x_k) \wedge R(x_k, \text{politics})]$

¹⁰ <https://dev.to/isaacandsuch/comment/1o5o>.

¹¹ <https://twitter.com/thecherness/status/984492308795199488>

¹² <http://www.readingeagle.com/news/article/letter-socialism-threatens-american-way-of-life>.

- Ernst (1981) assumes that external modification can be paraphrased adverbially.

(53) **Economically**, Carter doesn't have a leg to stand on.

- Adverbial paraphrase is reminiscent of frequency adjectives (FAs, e.g. *occasional*, *frequent*, *yearly*; see Gehrke & McNally 2014, 2015 and references therein). Types of FA modification vary; we focus on the special case in (55), which is subject to the condition that the described event be individuated by one object participant per event.

(55) a. She wrote me frequent letters. \approx Frequently, she wrote me a letter.
 b. She baked frequent cakes. \approx Frequently, she baked a cake.
 c. She drank frequent cups of coffee. \approx Frequently, she drank a cup of coffee.

- Gehrke & McNally (2014): temporal FAs are always event modifiers; nominals can contribute a contextually determined relation R_θ to an event, resolved by the nominal argument's thematic relation to the event (55c, where * indicates plural predication).

(56) a. *frequent*: $\lambda e[\mathbf{frequent}(e)]$
 b. *cakes*: $\lambda z\lambda e[\mathbf{cake}^*(z) \wedge R_\theta(z, e)]$
 c. *frequent cakes*: $\lambda z\lambda e[\mathbf{cake}^*(z) \wedge \mathbf{frequent}(e) \wedge R_\theta(z, e)]$

- Under pseudo-incorporation-like composition, the event variable in (56c) can be identified with the one described by the verb. Thus, what is technically (internal) modification of the nominal ends up having an effect paraphrasable as external modification.

(57) a. *bake*: $\lambda y\lambda x\lambda e.\mathbf{bake}(x, y, e)$
 b. *bake frequent cakes*: $\lambda y\lambda x\lambda e[\mathbf{bake}(x, y, e) \wedge \mathbf{cake}^*(y) \wedge \mathbf{frequent}(e) \wedge R_\theta(y, e)]$

- We adapt the above to idioms as in (59) (e/x subscript signals sortal non-specificity).

(58) He kicked the political bucket.
 \approx He kicked the bucket in the political domain.

(59) a. *political*: $\langle \{\}, \{R(u_{e/x}, d(\mathit{politics})), \{u_{e/x}\}\rangle$
 b. [*political bucket*]: $\langle \{\}, \{\mathbf{R}(u_z, d(\mathit{bucket})), R_\theta(u_z, u_e), R(u_e, d(\mathit{politics}))\}, \{u_z, u_e\}\rangle$
 c. [_{DP} *the political bucket*]: $\langle \{\}, \{\mathbf{R}(u_z, d(\mathit{bucket})), |u_z|=1, R_\theta(u_z, e), R(u_e, d(\mathit{politics}))\}, \{u_z, u_e\}\rangle$
 d. [_{VP} *kick the political bucket*]: $\langle \{\}, \{\mathbf{R}(u_e, d([\sub{VP} \mathit{kick the political bucket}))), \mathbf{R}(u_z, d(\mathit{bucket})), |u_z|=1, R_\theta(u_z, e), \mathbf{Theme}(u_z, u_e), R(u_e, d(\mathit{politics})), u_e = u_e\}, \{u_e, u_z, u_e\}\rangle$

5. Conclusion

- We use the challenges posed by idioms as an argument for a semantics that 1) explicitly separates descriptive content composition from the composition of reference-related components of meaning, and 2) exploits representations for descriptive content that go beyond lexical entailment.

- Journal of Pragmatics* 42.5: 1397-1411.
- Everaert, Martin (2017). Idioms: What you see is what you get? Handout from a talk presented at The Syntax of Idioms Workshop, Utrecht University.
- Farkas, Donka & Henriëtte de Swart (2003). *The Semantics of Incorporation: From Argument Structure to Discourse Transparency*. Stanford, CA: CSLI Publications.
- Fellbaum, Christiane (2015). Is there a grammar of idioms? Slides from a talk presented at BCGL 8, Brussels.
- Fox, Danny (2002). Antecedent contained deletion and the copy theory of movement. *Linguistic Inquiry* 33: 63-96.
- Garrette, Dan, Katrin Erk & Raymond Mooney (2011). Integrating logical representations with probabilistic information using Markov logic. *Proceedings of IWCS 2011*.
- Gehrke, Berit & Louise McNally (2014). Event individuation by objects: Evidence from frequency adjectives. In U. Etxeberria, A. Falaus, A. Irurtzun & B. Leferman (eds), *Proceedings of Sinn und Bedeutung 18*, 146-163.
- Gehrke, Berit & Louise McNally (2015). Distributional modification: The case of frequency adjectives. *Language* 91.4: 837-870.
- Glasbey, Sheila R. (2003). *Let's paint the town red for a few hours*: Composition of aspect in idioms. In A.M. Wellington (ed.), *Proceedings of the ACL Workshop: The Lexicon and Figurative Language*, 42-48.
- Glasbey, Sheila R. (2007). Aspectual composition in idioms. In L. de Saussure, J. Moeschler & G. Puskas (eds.), *Recent Advances in the Syntax and Semantics of Tense, Aspect and Modality*. Berlin: Mouton de Gruyter, 71-87.
- Glucksberg, Sam (2001). *Understanding Figurative Language: From Metaphor to Idioms*. Oxford: Oxford University Press.
- Hogeweg, Lotte (to appear). Suppression in interpreting adjective noun combinations and the nature of the lexicon. *Journal of Semantics*.
- Jackendoff, Ray (1997). *The Architecture of the Language Faculty*. Cambridge, MA: MIT Press.
- Koenig, Jean-Pierre & Gail Mauner (1999). A-definites and the discourse status of implicit arguments. *Journal of Semantics* 16:207-236.
- Ladusaw, William A. (1988). A proposed distinction between levels and strata. In S.-D. Kim (ed.), *Linguistics in the Morning Calm 2*. Seoul: Hanshin, 37-51.
- Landauer, Thomas K. & Susan T. Dumais (1997). A solution to Plato's problem: The latent semantic analysis theory of acquisition, induction, and representation of knowledge. *Psychological Review*, 104.2: 211-240.
- Lenci, Alessandro (2018). Distributional Models of Word Meaning. *Annual Review of Linguistics* 4.1: 151-171.
- Lebani, Gianluca E., Marco S.G. Senaldi & Alessandro Lenci (2016). Modeling idiom variability with entropy and distributional semantics. *Proceedings of QITL 6*. Available at <https://publikationen.uni-tuebingen.de/xmlui/handle/10900/64864>.
- Lewis, M. & M. Steedman. 2013. Combined distributional and logical semantics. *Transactions of the Association for Computational Linguistics* 1: 179-192.
- Liu, Pengfi, Kaiyu Qian, Xipeng Qiu & Xuanjing Huang. (2017). Idiom-aware compositional distributed semantics. *Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing*, 1204–1213.
- McClure, Scott (2011). Modification in non-combining idioms. *Semantics and Pragmatics* 4: 1-7.
- McNally, Louise (2017). Kinds, descriptions of kinds, concepts, and distributions. In K. Balogh and W. Petersen (eds.), *Bridging Formal and Conceptual Semantics. Selected Papers of BRIDGE-14*. Düsseldorf: dup, 39-61.

- McNally, Louise & Gemma Boleda (2004). Relational adjectives as properties of kinds. In O. Bonami & P. Cabredo Hofherr (eds), *Empirical Issues in Formal Syntax and Semantics 5*, 179-196. <http://www.cssp.cnrs.fr/eiss5>.
- McNally, Louise & Gemma Boleda (2017). Conceptual vs. referential affordance in concept composition. In Y. Winter & J. Hampton (eds), *Compositionality and Concepts in Linguistics and Psychology*. Berlin: Springer, 245-267.
- Nicolas, Tim (1995). Semantics of Idiom Modification. In M. Everaert, E.-J. van der Linden, A. Schenk & R. Schreuder (eds.), *Idioms: Structural and Psychological Perspectives*. Hillsdale, NJ: Lawrence Erlbaum Associates, 233-252.
- Nunberg, Geoffrey, Ivan A. Sag & Thomas Wasow (1994). Idioms. *Language* 70.3: 491-538.
- Paperno, Denis, Nghia The Pham & Marco Baroni (2014). A practical and linguistically-motivated approach to compositional distributional semantics. *Proceedings of ACL*, 90-99.
- Pollard, Carl & Ivan A. Sag (1994). *Head-Driven Phrase Structure Grammar*. Stanford, CA: CSLI Publications.
- Potts, Christopher (2005). *The Logic of Conventional Implicatures*. Oxford: Oxford University Press.
- Romoli, Jacopo (2015). A structural account of conservativity. *Semantics-Syntax Interface* 2.1: 28-57.
- Rubio Fernández, Paula (2006). Delimiting the power of suppression in lexical processing: the question of below-baseline performance. *UCL Working Papers in Linguistics* 18: 119-37.
- Sailer, Manfred (2004). Local Semantics in Head-Driven Phrase Structure Grammar. In O. Bonami & P. Cabredo Hofherr (eds.), *Empirical Issues in Syntax and Semantics 5*, 197-214. <http://www.cssp.cnrs.fr/eiss5>.
- Sauerland, Uli (2004). The interpretation of traces. *Natural Language Semantics* 12: 63-127.
- Senaldi, Marco S.G., Gianluca E. Lebani & Alessandro Lenci (2016). Lexical variability and compositionality: Investigating idiomaticity with Distributional Semantic Models. *Proceedings of the 12th Workshop on Multiword Expressions*, 21-31.
- Sportiche, Dominique (2005). Division of labor between Merge and Move: Strict locality of selection and apparent reconstruction paradoxes. Ms. UCLA.
- Stathi, K. (2007). A corpus-based analysis of adjectival modification in German idioms. In C. Fellbaum (ed.), *Idioms and Collocations: Corpus-based Linguistic and Lexicographic Studies*. London/New York: Continuum, 81-108.
- Svenonius, Peter (2005). Extending the Extension Condition to discontinuous idioms. *Linguistic Variation Yearbook* 5: 227-263.
- Swinney, David (1979). Lexical access during sentence comprehension: (Re)consideration of context effects. *Journal of Verbal Learning and Verbal Behavior* 18: 645-660.
- Titone, Debra A. & Cynthia M. Conine (1999). On the compositional and noncompositional nature of idiomatic expressions. *Journal of Pragmatics* 31.12: 1655-1674.
- Weinreich, Uriel (1969). Problems in the analysis of idioms. In J. Puhvel (ed.) *Substance and Structure of Language*. Berkeley, CA: University of California Press, 23-81.