Struggling with English Prepositional Verbs

Nathan Schneider
July 21, 2015 ▪ ICLC ▪ Newcastle
The aliens will destroy Earth unless we accept, meet, obey, agree to, accede to, conform to, yield to, give in to, comply with, cooperate with, go along with their demands.
English Prepositional Verbs

1. High-level Vague definition
   ‣ Advantages of a CxG framework

2. Wanted: a simple and reproducible criterion

3. Ideas
PrepVs in English

(CGEL, ch. 4)

• Verb+preposition combinations where the selection of the preposition is idiomatic:
  - come across
  - refer to
  - decide on
  - look at
  - look for

  ‣ Syntactically: \([V \ [PP \ P \ Obj]]\)

• Distinguished from verb-particle constructions like
  - wake up
  - make out
  - pull off

  ‣ \([V \ Part \ Obj] \leftrightarrow \ [V \ Obj \ Part]\)
  ‣ particle can be analyzed as an intransitive preposition
Prepositional verbs are idiomatic—knowing how to use them correctly involves a mix of lexically-specific and general-syntactic knowledge.

Construction Grammar hypothesizes continuity between lexicon and grammar. Lexical items, highly productive syntactic patterns, and idiomatic patterns are described as form-function mappings (constructions) at different levels of abstraction.
PrepV constructions

(Agent) CHOOSE Theme

meaning

form

decide on construction

Chang 2011

decide on

P
X

VP
PP
Limited productivity

• Not just look at: glance at, stare at, take a gander at

• Not just look for: search for, hunt for, turn the house upside down for...

• agree/accede/yield/give in to

• depend/rely/count on

• Even decide on ‘choose’ (considered “frozen” by Chang) has a close relative, settle on
Limited productivity

• In CxG, we can account for these as a productive V+P construction that is schematic with respect to the particular verb.

• (Or: a sense of the preposition that is limited to certain classes of verbs)
PrepV constructions

(Chang 2011)

<intentional_visual_perception> at construction: look/glance/peer/… at
English Prepositional Verbs

1. High-level Vague definition
   ▪ Advantages of a CxG framework

2. Wanted: a simple and reproducible criterion
   ▪ Failure of purely syntactic tests
   ▪ Challenge of partial productivity

3. Ideas
based on COCA list of 5000 most frequent English words
Corpus annotation for NLP

• For applications like machine translation, we want the system to **choose or interpret the verb and preposition in combination** (for PrepVs).

• To support this, we want to build a **semantic analyzer for preposition meanings**. And we want it to indicate where that meaning is tied to the verb.

• In order to build a statistical (machine learning) analyzer, we need a manually annotated **corpus**.

• In order to annotate a corpus, we need an **annotation scheme** that is **simple**, **reproducible**, and **broad-coverage**.
Central question

• In order to annotate a corpus, we need an annotation scheme that is simple, reproducible, and broad-coverage.

How do we decide which verb+preposition combinations should count as prepositional verbs?
  ‣ Or: multiple subphenomena?
Syntactic tests

• Despite many attempts to characterize the category of prepositional verbs by syntactic tests, different tests give conflicting and intuitively unsatisfying results (Tseng 2000, reviewing Kruisinga, Quirk et al., etc.).
  ‣ E.g., **prepositional passive** test over- and under-predicts
  ‣ Vestergaard (1977): clusters of tests support 5 degrees of preposition attachment

• In practice, these tests can be **difficult to apply**:

  She disagreed with my observation
  → ??My observation was **disagreed with** (by her)

  I talked to a manager → ??A manager was **talked to** (by me)
Studies of preposition semantics

- **Polysemy networks** for *over* (e.g., Brugman 1981, Lakoff 1987, Dewell 1994, Tyler & Evans 2003, Deane 2005) and other English prepositions (Lindstromberg 1998/2010)

- **Cognitive Grammar** (Zelinsky-Wibbelt 1993)

- Many other studies focusing on **spatial** and **temporal** usages

- **The Preposition Project** (fine-grained sense resource; Litkowski & Hargraves 2005)
Distribution in our corpus

N = 4073

- Spatial: 25%
- Temporal: 13%
- Neither: 62%
- of: 12%

Semantic distribution of all prepositions (not just verb-headed)
Dr. Obina told me that his office closed at noon and that I should call him on Monday.

I had been a patient of Dr. Olbina for 9 years and had spent thousands of dollars on crowns etc.
Preposition Supersenses

(Schneider et al. 2015)

http://tiny.cc/prepwiki
Preposition Supersenses

Temporal
- Duration
- Time
- Frequency
- RelativeTime
  - StartTime
  - EndTime
  - DeicticTime
  - ClockTimeCxn
- Attribute
- Age
Another sentence

Pay extra attention to the appetizers - the next time I go there I'm planning on ordered a few instead of an entree.
Limited productivity

• Not just look at: glance at, stare at, take a gander at

• Not just look for: search for, hunt for, turn the house upside down for...

• agree/accede/yield/give in to

• depend/rely/count on

• Even decide on ‘choose’ (considered “frozen” by Chang) has a close relative, settle on
Limited productivity

• **How limited** does it have to be to count as a prepositional verb?

• What about
  
  ‣ talk/speak/lecture/… to?
  
  ‣ talk/speak/chat/… with?
  
  ‣ meet/play/dine/… with?

• Maybe we want to call these “case-marking”, but not verb-specific, preposition functions?
English Prepositional Verbs

1. High-level Vague definition
   ‣ Advantages of a CxG framework

2. Wanted: a simple and reproducible criterion
   ‣ Failure of purely syntactic tests
   ‣ Challenge of partial productivity

3. Ideas
   ‣ Integral vs. nonintegral distinction
   ‣ Argument/adjunct distinction
   ‣ Frame semantics
“Integral” prepositions

• Our current approach takes a narrow view of “semantically inseparable”. Conservative test of omissibility:

In response to a declarative sentence with the verb+preposition combination, is there a natural way to query the circumstances of the verbal event using the verb, but not the preposition?

— I came across a nice restaurant.  
— #When did you come?  
— I know I can rely on that restaurant.  
— *Why can you rely?

— We decided on a restaurant.  
— How long did it take you to decide?  
— I went to look for a nice restaurant.  
— Where did you look?
“Integral” prepositions

• If the preposition is required (not omissible in the question), we say it is **integral** to the verb.

  ‣ In many such cases, the verb is polysemous and would have another reading without the preposition (e.g. *come in* *come across*)

  ‣ Preliminary study: Two judges applied the test to verb-preposition pairs previously marked as multiword expressions. Agreed on 69/77 = 90%.

• Related to (but simpler and narrower than) a test proposed by Tseng (2000), adapted from one in Quirk et al. (1985)

• Details: [https://github.com/nschneid/nanni/wiki/Prepositional-Verb-Annotation-Guidelines](https://github.com/nschneid/nanni/wiki/Prepositional-Verb-Annotation-Guidelines)
Sample of decisions

**Integral** (28 total)
- belong to
- come from ‘be born at’
- come with ‘characteristically include’
- consist of
- count on
- deal with (counterpart or problem)
- fall for (hoax)
- get away with ‘get by with’
- keep from
- make up for ‘compensate for; balance out’
- put up with
- refer to (resource)

**Nonintegral** (48 total)
- argue with
- ask for ‘request’
- beware of
- bother with
- buy from
- care about
- check on
- compliment on
- cope with
- disagree with
- enroll in
- introduce to
- listen to
- look at
- look for ‘search’
- meet with ‘have a meeting with’
- nibble on
- pay for
- plan on
- reek of
- save from
- suck at (activity)
- talk to
- talk with
- treat s.o. to s.t.
- wait for
- work for
- work on
- work with
- yell at
Perception_active

Definition:

This frame contains perception words whose perceivers intentionally direct their attention to some entity or phenomenon in order to have a perceptual experience. For this reason we call the perceiver role in this frame Perceiver_agentive.

She GAZED upon him fondly.

Comparing the Perception_active frame to the Perception_experience frame, we note that for some modalities there are different lexical items in each frame. For instance, whereas Perception_active contains the verb phrase look at, Perception_experience contains see. For other sense modalities, we find the same lexical item in both frames. To illustrate, consider the verb smell. This first sentence exemplifies the Perception_active use of the verb smell:

SMELL this to see if it's fresh.

This second sentence exemplifies its Perception_experience sense:

I SMELL something rotten.
Perception_active

Definition:

This frame contains perception words whose perceivers intentionally direct their attention to some entity or phenomenon in order to have a perceptual experience. For this reason we call the perceiver role in this frame **Perceiver_agentive**.

Comparing the Perception_agentive frame to the Perception_experience frame we note that for some modalities there are differences. In this frame words are typically used to describe the act of focusing one's attention. To illustrate this use of the frame consider the sentence: She gazed upon him and I smell something rotten.

...perception words whose perceivers intentionally direct their attention to some entity or phenomenon...
...perception words whose perceivers intentionally direct their attention to some entity or phenomenon...
Perception_active

Definition:

This frame contains perception words whose perceivers intentionally direct their attention to some entity or phenomenon in order to have a perceptual experience. For this reason we call the perceiver role in this frame Perceiver_agentive.

Comparing the Perception frame to the Perception frame of experience, note that for each modality, there are different perception words that differ in meaning.

This second example illustrates the difference between a perception word that marks the Phenomenon and a perception word that does not mark the Phenomenon.

Lexical Units:

(admire.v, attend.v, eavesdrop.v, eye.v, feel.v, gape.v, gawk.v, gaze.n, gaze.v, glance.n, glance.v, gape.v, look.v, observation.n, observe.v, palpate.v, peek.n, peek.v, peep.v, peer.v, savour.v, smell.v, sniff.n, stare.n, stare.v, taste.n, taste.v, view.v, watch.v)

(most use at to mark the Phenomenon!)

FEs:

Perceiver_agentive [per]
Semantic Type: Sentient

Phenomenon [Phen]

The Perceiver_agentive performs some action in order to have a perceptual experience. It is expressed as an External Argument:

The waiter SMELLED the milk to see if it was fresh.

Phenomenon indicates the entity or phenomenon to which the Perceiver_agentive directs his or her attention in order to have a perceptual experience. Typically, it is expressed as an Object with verbs.

The waiter SMELLED the milk to see if it was fresh.
Arguments vs. Adjuncts

• Perhaps the literature on the argument/adjunct distinction will be helpful to characterize verb+preposition combinations.

• Hypothesis: Adjunct-marking prepositions never belong to a prepositional verb.

• But how do we know which PPs are adjuncts?

  put it [on the shelf]?  
  boo him [off the stage]?  
  yell [at your mother]?  
  set off [for college]?
Arguments vs. Adjuncts

- Unfortunately, though there are clear prototypes of arguments vs. adjuncts, the distinction is fraught. (Literature review: Hwang 2011)
  - Syntactic and/or semantic?
  - Binary, or more than 2 kinds?

- Goldberg (2006, pp. 42–43) suggests that a phrase can be an argument (or not) w.r.t. the verb, and w.r.t. the argument structure construction (ASC).
  - Does this account for limited productivity? (When do prepositions qualify as part of an ASC?)
FrameNet

• FrameNet makes a 3-way semantic coreness distinction: **core**, **peripheral**, **extra-thematic**. Roughly:

  ‣ **core** = conceptually necessary to understand a scene (may be expressed overtly, or implicit)

  ‣ **peripheral** = minor characteristics within a scene (time, place, manner, etc.)

  ‣ **extra-thematic** = extrinsic to the scene itself—assumed to have been introduced constructionally (e.g., frequency of repeated event)

• Determining coreness of a role crucially depends on the definition of the frame (and how specific it is).
**Perception_active**

**Definition:**

This frame contains perception words whose perceivers intentionally direct their attention to some entity or phenomenon in order to have a perceptual experience. For this reason we call the perceiver role in this frame **Perceiver_agentive**.

*She GAZED upon him fondly.*

Comparing the Perception_active frame to the Perception_experience frame, we note that for some modalities there are different lexical items in each frame. For instance, whereas Perception_active contains the verb phrase look at, Perception_experience contains see. For other sense modalities, we find the same lexical item in both frames. To illustrate, consider the verb smell. This first sentence exemplifies the Perception_active use of the verb smell:

*SMELL this to see if it's fresh.*

This second sentence exemplifies its Perception_experience sense:

*I SMELL something rotten.*

**Lexical Units:**

**FEs:**

- admire.v, attend.v, eavesdrop.v, eye.v, feel.v, gape.v, gawk.v, gaze.n, gaze.v, glance.n, glance.v, look.v, observation.n, observe.v, palpate.v, peek.n, peek.v, peep.v, peer.v, savour.v, smell.v, sniff.v, stare.n, stare.v, taste.n, taste.v, view.v, watch.v

**Core:**

- **Perceiver_agentive** [per]

  The **Perceiver_agentive** performs some action in order to have a perceptual experience.

  It is expressed as an External Argument:

  *The waiter SMELLED the milk to see if it was fresh.*

- **Phenomenon** [Phen]

  **Phenomenon** indicates the entity or phenomenon to which the **Perceiver_agentive** directs his or her attention in order to have a perceptual experience. Typically, it is expressed as an Object with verbs.

  *The waiter SMELLED the milk to see if it was fresh.*
Non-Core:

**Depictive [State]**

*State* is used for predicate expressions that apply to the *Phenomenon*, providing some information about the state it is in while the perceiver's attention is directed to it:

The detective **WATCHED** the suspect **fleeing**.

Pat **TASTED** the cookie dough **raw**.

**Duration [Dur]**

*Semantic Type: Duration*

This FE identifies the *Duration* of time for which the Perception takes place.

I **WATCH** them for **quite a while**.

**Expected_entity [exp]**

An entity or state-of-affairs that the *Perceiver_agentive* hopes, fears, or expects to find within the *Phenomenon*.

**WATCH** for little errors with hand position.

While Bertha was n't looking, he carefully **SMELT** the soup for any trace of the poison.

**Ground [Ground]**

*Ground* is the perceptual background against which the *Phenomenon* is experienced by the *Perceiver_agentive*.

Kim **LOOKED** at the cloud **against the blue sky**.

**Location_of_protagonist [Loc]**

This FE is the position of the Perceiver during the act of perception. Typically, it is expressed in a from-PP.

We **WATCHED** the parade **from the roof**.
Maybe “prepositional verb” conflates several things

- **Integral** prepositions: come across
- **Verb-selected** prepositions: comply with
- **Frame-selected** prepositions: look at, depend on
- **Core-marking** prepositions: Co-Agent with
- A semantically-motivated alternative to Vestergaard?
Open question

• Can we identify (beyond integral/nonintegral distinction) clear subcategories of prepositional verbs?

• With broad coverage

• Without relying on
  ‣ fuzzy tests,
  ‣ complex and incomplete resources like FrameNet, or
  ‣ a full account of argument structure constructions?
(Unsatisfying) conclusions

- Verb+preposition combinations can be idiomatic, but difficult to cleanly separate them

- Seems related to the argument/adjunct distinction, but that is similarly difficult to pin down

- Maybe there are several kinds of verb+preposition idiomaticity
  - Preliminary test for narrow category of “integral” prepositions

- We need a better understanding of “ordinary” preposition meanings and compositionality (argument structure, frame semantics) to recognize the extraordinary!
  - Not limited to verb-headed prepositions
Thanks

• Fellow preposition-wranglers: Jena Hwang, Meredith Green, Martha Palmer (University of Colorado at Boulder) & Vivek Srikumar (University of Utah)

• Everyone who helped with annotation and pilot annotation of preposition supersenses: Carnegie Mellon University & CU Boulder

• Michael Ellsworth (Berkeley FrameNet), Ken Litkowski, Orin Hargraves, colleagues at Edinburgh
Syntactic tests

• Several attempts to formulate syntactic tests to distinguish prepositional vs. non-prepositional verbs. (Kruisinga, Quirk et al., etc. reviewed in Tseng 2000 and dismissed as inadequate; also Vestergaard 1977, who ultimately proposed 5 degrees of PP attachment). Most famous test is the **prepositional passive**:

  ✓ The pardons were **decided on** by the president
  ✓ *The restaurant was **eaten at** by many guests
  ✗ *Several parts are **consisted of** by their plan;
  ✗ I had the feeling I was being **walked behind** (Tseng 2000)

• In practice, these tests can be difficult to apply:

  She disagreed with my observation
  → ??My observation was **disagreed with** (by her)
  I talked to a manager → ??A manager was **talked to** (by me)