
29. Frame Semantics

Jean Mark Gawron

San Diego State University

Department of Linguistics
5500 Campanile Drive
San Diego State University
San Diego, CA 92182-7727
(619)-594-0252

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Abstract. Frames are conceptual structures that provide context for elements of interpretation; their primary role in an account of text understanding is to explain how our text interpretations can leap far beyond what the text literally says. The present article explores the role of frames in providing a principled account of the openness and richness of word-meanings, distinguishing a frame-based account from classical approaches, such as accounts based on conceptual primitives, lexical fields, and connotation, and showing how they can play a role in the account of how word meaning interacts with syntactic valence.

For there exists a great chasm between those, on the one side, who relate everything to a single central vision, one system more or less coherent or articulate, in terms of which they understand, think and feel — a single, universal, organizing principle in terms of which alone all that they are and say has significance — and, on the other side, those who pursue many ends, often unrelated and even contradictory, connected, if at all, only in some de facto way, for some psychological or physiological cause, related by no moral or aesthetic principle.

Berlin (1957:1), cited by Minsky (1975)

1 Introduction

Two properties of word meanings contribute mightily to the difficulty of providing a systematic account.

One is the *openness* of word meanings. The variety of word meanings is the variety of human experience. Consider defining words such as *Tuesday*, *barber*, *alimony*, *seminal*, *amputate*, and *brittle*. One needs to make reference to diverse practices, processes, and objects in the social and physical world: repeatable calendar events, grooming and hair, marriage and divorce, discourse about concepts and theories, and events of breaking. Before this seemingly endless diversity, semanticists have in the past stopped short, excluding it from the semantic enterprise, and attempting to draw a line between a small linguistically significant set of primitive concepts and the openness of the lexicon.

The other problem is the closely related problem of the *richness* of word meanings. Words are hard to define, not so much because they invoke fine content specific distinctions, but because they invoke vast amounts of background information. The concept of buying presupposes the complex social fact of a commercial transaction. The concept of alimony presupposes the complex social fact of divorce, which in turn presupposes the complex social fact of marriage. Richness, too, has inspired semanticists simply to

21 stop, to draw a line, saying exact definitions of concepts do not matter for
22 theoretical purposes.

23 This boundary-drawing strategy, providing a response if not an answer to
24 the problems of richness and openness, deserves some comment. As linguistic
25 semanticists, the story goes, our job is to account for systematic, structurally
26 significant properties of meaning. This includes:

27 (1) a. the kinds of syntactic constructions lexical meanings are compat-
28 ible with.

29 i. the kinds of participants that become subjects and objects

30 ii. regular semantic patterns of oblique markings and valence al-
31 ternations

32 b. Regular patterns of inference licensed by category, syntactic con-
33 struction or closed class lexical item.

34 The idea is to carve off that part of semantics necessary for knowing and
35 using the syntactic patterns of the language. To do this sort of work, we do
36 not need to pay attention to every conceptually possible distinction. Instead
37 we need a small set of semantic primitives that make the distinctions that
38 linguistically matter; what is left over can be dealt with using some open
39 class of predicates or features whose internal details are not of concern.
40 Jackendoff (1990) is a good example of this kind of approach. The genera-

41 tive semantics program, especially as outlined in Lakoff (1972), is another.
42 Dowty (1979) has many of the same features, but in places expresses doubts
43 that the program can be completely carried out. The kind of analysis I
44 have in mind can be exemplified through Dowty's generative-semantics-like
45 analysis of causatives like *break.tr* (transitive *break*):

- 46 (2) a. John broke the glass.
47 b. DO(John, CAUSE(BECOME(*broken*(*glass*))))

48 Here the predicates in capitals (DO, CAUSE, BECOME) are from the inventory
49 of linguistically significant primitives, and the lower case predicates (*broken*,
50 *glass*) are from the open class predicates whose internal structure does not
51 matter. At most we need to know that one expresses a state (*broken*) and the
52 other a kind (*glass*). The details beyond that are linguistically insignificant.
53 Of course there are differences in truth-conditions between states like *broken*
54 and *dead*, but these have only minor selectional effects on the causative
55 inchoatives created from them (*break.tr* = DO ... CAUSE BECOME broken'
56 and *kill* = DO ... CAUSE BECOME dead'). I will refer to this view of lexical
57 semantics as the *classical view*.

58 In this paper I wish to consider a view of semantics in general and lexical
59 semantics in particular that is quite at odds with this classical picture: *frame*
60 *semantics* (Fillmore 1975, Fillmore 1978, Fillmore 1977b, Fillmore 1982,

61 Fillmore 1985). Someone wishing to contest the classical picture has two
62 options: first, contend that the wrong kinds of questions are being asked;
63 second, argue that the program as outlined is not very well-suited to at-
64 taining its goals. As we shall see, both kinds of objection motivate frame
65 semantics.

66 **2 Fillmorean frames**

67 **2.1 Motivations**

68 The version of frame semantics I will present here is largely the brainchild of
69 Charles J. Fillmore. Although frame semantics has sprouted off in a number
70 of directions and been applied to a number of problems, I will limit the
71 present discussion in two ways: First I will confine myself largely to fleshing
72 out the Fillmorean picture; second, I will confine myself mostly to questions
73 of the lexicon, lexicography, and the lexicon-syntax interface, leaving for
74 other work questions of discourse and text understanding to which frames
75 are also relevant. I will briefly consider the different roles frames play in the
76 account of sign meaning and discourse interpretation.

77 Although Fillmore has had many interesting things to say about the
78 kinds of problems listed in (1) in early and late works on Case Grammar, the

79 primary motivations given in Fillmore (1982, 1985) focus on frame semantics
80 as a contribution to a theory of *text understanding*. Consider for example,
81 the very different scenes evoked by the following pair of sentences, discussed
82 in Fillmore (1985):

- 83 (3) a. I can't wait to be on the ground again.
84 b. I can't wait to be on land again.

85 Sentence (3a) evokes a speaker who is in the air (on a plane), sentence (3b)
86 a speaker who is at sea (on a ship). This contrast is tied to some difference
87 between the words *land* and *ground*, yet, on the face of it, *land* and *ground*
88 denote very similar things. Fillmore would say *land* is understood within
89 a conceptual frame of sea travel, and within that frame it is opposed to
90 *sea*, while *ground* is understood within a conceptual frame of air travel, and
91 within that frame, it is opposed to *air*. Thus we can explain something that
92 is very difficult to explain in terms what the words in the sentence denote
93 by investigating the conceptual background against which the relevant word
94 senses are defined. That conceptual background is what Fillmore calls a
95 frame.

96 Frames are conceptual structures that provide context for elements of
97 interpretation; their primary role in an account of text understanding is to
98 explain how our text interpretations can (validly) leap far beyond what the

99 text literally says. Frames can be introduced into interpretation in a variety
100 of ways. They may be directly tied to word senses as in the example of *land*
101 and *ground* or they may be introduced by patterns among the facts the text
102 establishes. To use another example of Fillmore's (1985), 232:

103 (4) We never open our presents until morning.

104 This sentence *evokes* the Christmas frame by describing a situation that
105 matches salient facts of Christmas practice, even though no word in it is
106 specific to Christmas. If in fact the Christmas frame is the right one, that
107 evocation makes a significant contribution to the understanding of the sur-
108 rounding text.

109 Frames are motivated not just by words, then, but by stereotypes about
110 customs, practices, institutions, and games. Moreover, the kinds of cog-
111 nitive structures Fillmore has in mind have been proposed by a variety of
112 researchers for a variety of purposes. Fillmore has adopted the terminology
113 of AI researcher Minsky (1975) in calling them frames, but *schemata* in psy-
114 chology (Bartlett 1932, Rumelhart 1980) are getting at something very simi-
115 lar, as are *scripts* (Schank and Abelson 1977), *cognitive models* (Lakoff 1983),
116 *experiential gestalts* (Lakoff and Johnson 1980), *the base* (as opposed to the
117 profile) (Langacker 1984), and Fillmore's own notion of *scene* (Fillmore 1976,
118 Fillmore 1977a). More recently, in articulating a *simulation view* of concep-

119 tual processing, Barsalou (Barsalou 1992, Barsalou 1999) has proposed that
120 object conceptualization is processed through simulators of objects linked
121 to components of a variety of situation memories; one consequence is that
122 objects may activate components from different situations in different per-
123 ceptual contexts. In this theory, too, then, conceptualization is framed
124 against a background with components that help provide an interpretation
125 for scenes or objects. For more discussion, see Article 120 *Conceptual knowl-*
126 *edge, categorization, and meaning representation.*

127 As an approach to word meanings specifically, the starting point for
128 frame semantics is that the lexical semantics “problems” of openness and
129 richness are connected. Openness depends on richness. Openness does not
130 mean lack of structure. In fact, it presupposes structure. Most concepts are
131 interpretable or understandable or definable only against the background
132 of other concepts. Many backgrounds are rich enough to define a cluster
133 of concepts, in particular, a cluster of words. These backgrounds are the
134 frames. Thus because words are networked together through their shared
135 backgrounds, frames can provide an organizing principle for the openness of
136 the lexicon.

137 Consider one of the examples already discussed, discussed in Fillmore
138 (1982). The concept of alimony depends on the concept of divorce. The

139 concept of divorce in turn depends on the concept of marriage. The depen-
140 dency is definitional. Unless you define what a marriage is, you can't define
141 what a divorce is. Unless you define what a divorce is, you can't define
142 what alimony is. Thus there is a very real sense in which the dependencies
143 we are describing move us toward *simpler* concepts. Notice, however, that
144 the dependency is leading in a different direction than an analysis that de-
145 composes meanings into a small set of primitives like CAUSE and BECOME.
146 Instead of leading to concepts of increasing generality and abstractness, we
147 are being led to define the situations or circumstances which provide the
148 necessary *background* for the concepts we are describing. The concepts of
149 marriage and divorce are equally specific, but the institution of marriage
150 provides the necessary background for the institution of divorce.

151 Or consider the complex subject of Tuesdays (Fillmore 1985). We live in
152 a world of cyclic events. Seasons come and go and then return. This leads
153 to a cyclic calendar which divides time up into repeating intervals, which are
154 divided up further. Years are divided into months, which are divided into
155 weeks, which are divided into days, which have cyclic names. Each week
156 has a Sunday, a Monday, a Tuesday, and so on. Defining Tuesday entails
157 defining the notion of a cyclic calendar. Knowing the word *Tuesday* may not
158 entail knowing the word *Sunday*, but it does entail understanding at least

159 the concept of a week and a day and their relation, and that each week has
160 exactly one Tuesday.

161 We thus have words and background concepts. We will call the back-
162 ground concept the *frame*. Now the idea of a frame begins to have some
163 lexical semantic bite with the observation that a single concept may provide
164 the background for a set of words. Thus the concept of MARRIAGE provides
165 the background for words/suffixes/phrases such as *bride, groom, marriage,*
166 *wedding, divorce, -in-law, elope, fiancée, best man, maid-of-honor, honey-*
167 *moon, husband, and wife,* as well as a variety of basic kinship terms omitted
168 here for reasons of space. The concept of CALENDAR CYCLE provides the
169 frame for lexical items such as *week, month, year, season, Sunday, ..., Sat-*
170 *urday, January, ..., December, day, night, morning, and afternoon.* Notice
171 that a concept once defined may provide the background frame for further
172 concepts. Thus, DIVORCE itself provides the background frame for lexical
173 items such as *alimony, divorce, divorce court, divorce attorney, ex-husband,*
174 and *ex-wife.*

175 In sum, a frame may organize a vocabulary domain:

176 Borrowing from the language of gestalt psychology we could say
177 that the assumed background of knowledge and practices — the
178 complex frame behind this vocabulary domain — stands as a

179 common ground to the figure representable by any of the indi-
180 vidual words.

181 [Words belonging to a frame] are lexical representatives of some
182 single coherent schematization of experience or knowledge.

183 Fillmore (1985:223)

184 Now a premise of frame semantics is that the relation between lexical
185 items and frames is open ended. Thus one way in which the openness of
186 the lexicon manifests itself is in building concepts in unpredictable ways
187 against the backdrop of other concepts. The concept of marriage seems to
188 be universal or near-universal in human culture. The concept of alimony
189 is not. No doubt concepts sometimes pop into the lexicon along with their
190 defining frames (perhaps *satellite* is an example), but the usual case is to
191 try to build them up out of some existing frame (Thus *horseless carriage*
192 leading to *car* is the more usual model).

193 Summing up: openness does not mean structurelessness. Concepts and
194 their related words have certain unidirectional backgrounding relations that
195 frames capture

196 (5)	Words	Frames
	<i>bride, groom, marriage, wedding, divorce, -in-</i>	MARRIAGE
	<i>law, elope, fiancée, best man, maid-of-honor,</i>	
	<i>honeymoon, husband, wife</i>	
	<i>alimony, divorce court, divorce attorney, ex-</i>	DIVORCE
	<i>husband, and ex-wife</i>	
	<i>week, month, year, Sunday, ..., Saturday, Jan-</i>	CALENDAR CYCLE
	<i>uary, ..., December, morning, afternoon</i>	
	<i>freezing, cold, cool, tepid, lukewarm, warm,</i>	TEMPERATURE
	<i>hot, temperature, thermometer</i>	

197 All of this obviously points in exactly the opposite direction from the
 198 classical view, a few salient primitives, a hard distinction between linguistic
 199 and encyclopedic, and a large uninvestigated class of open class predicates.

200 But from the other direction, support for the classical view has been
 201 eroding even among those whose concerns have primarily departed from
 202 the problems in (1) such as Levin (1993) or from classic lexical semantic
 203 problems like polysemy (Pustejovsky 1995).

204 Consider the kind of problem Levin (1993) discusses in her seminal study
 205 of of English verb classes. A theory that does not posit a systematic differ-
 206 ence between the *broken* state of the verb *break* in (2) and the *dead* state in

207 the decomposition of *kill* cannot account for the following contrast:

208 (6) a. John broke the glass against the wall.

209 b. # John killed the cockroach against the wall.

210 Nor can it account for the fact that verbs in some sense close in meaning to
211 *break* (*shatter, smash, crack, flatten*) will follow pattern (a), while verbs in
212 some sense close to *kill* will follow pattern (b) (*strangle, murder, smother,*
213 *and drown*). The generalization at issue is (roughly) that state change or
214 directed action verbs whose effect is commonly achieved by moving one
215 object against another will allow pattern (a) when the object whose state
216 is changed or potentially changed is direct object. Other examples are *hit,*
217 *knock, rap, bang, and slam*. None of the kill-type verbs fit the bill.

218 Thus if valence patterns are part of what is to be explained, then a lan-
219 guage like English, with its rich inventory of prepositions and situationally
220 specific constructions (see for example the pattern lists in Levin 1993), will
221 require reference to a large inventory of concepts. It is difficult to see how a
222 principled line between open class and closed class concepts can be drawn in
223 carrying out this program. It is clear for example, that Levin's verbs of con-
224 tact, which include the verbs like *hit* and *slap* discussed above, overlap signi-
225 cantly with the verbs list for the IMPACT frame in FrameNet, a large compu-
226 tational instantiation of the ideas of frame semantics (Fillmore and Atkins

227 1994, Baker et al. 1998, Fillmore and Atkins 1998, Baker and Fillmore 2001,
228 Boas 2001, Boas 2005, Chang et al. 2002a, Chang et al. 2002b). At last
229 count the NSF Framenet project (Fillmore and Baker 2000) which is build-
230 ing a frame lexicon for English had over 800 frames for about 4500 words.
231 Thus the problems of openness and richness arise whether one starts from
232 text understanding or from syntax/semantics interface.

233 2.2 Basic Tools

234 We have thus far focused on the role of frames in a theory of word meanings.
235 Note that nothing in particular hangs on the notion *word*. Frames may also
236 have a conventional connection to a simple syntactic constructions or idiom;
237 *give someone the slip* probably belongs to the same frame as *elude*. Or
238 they may be tied to more complex constructions such as the Comparative
239 Correlative (cf. Article 97 *Constructional meaning and compositionality*)

240 (7) The more I drink the better you look.

241 This construction has two “slots” requiring properties of quantity or de-
242 gree. The same issues of background situation and profiled participants
243 arise whether the linguistic exponent is a word or construction. The term
244 *sign*, used in exactly the same sense as it is used by construction grammar-
245 ians, will serve here as well.

246 As a theory of the conventional association of schematized situations and
247 linguistic exponents, then, frame semantics makes the assumption that there
248 is always some background knowledge relative to which linguistic elements
249 do some profiling, and relative to which they are defined. Two ideas are
250 central:

- 251 1. a background concept
- 252 2. a set of *signs* including all the words and constructions that utilize this
253 conceptual background.

254 Two other important frame theoretic concepts are *frame elements* and *pro-*
255 *filing*.

256 Thus far in introducing frames I have emphasized what might be called
257 the modularity of knowledge. Our knowledge of the the world can usefully
258 be divided up into concrete chunks. Equally important to the Fillmorean
259 conception of frames is the integrating function of frames. That is, frames
260 provide us with the means to integrate with other frames in context to
261 produce coherent wholes. For this function, the crucial concept is the notion
262 of a *frame element* (Fillmore and Baker 2000). A frame element is simply a
263 regular participant, feature, or attribute of the kind of situation described
264 by a frame. Thus, frame elements of the wedding frame will include the

265 husband, wife, wedding ceremony, wedding date, best man and maid of
266 honor, for example. Frame elements need not be obligatory; one may have a
267 wedding without a best man; but they need to be regular recurring features.

268 Thus, frames have slots, replaceable elements. This means that frames
269 can be linked to other frames by sharing participants or even by being
270 participants in other frames. They can be components of an interpretation.

271 In frame semantics, all word meanings are relativized to frames. But
272 different words select different aspects of the background to *profile* (we use
273 the terminology in Langacker 1984). Sometimes aspects profiled by different
274 words are mutually exclusive parts of the circumstances, such as the husband
275 and wife in the marriage frame, but sometimes word meanings differ not in
276 what they profile, but in how they profile it. In such cases, I will say words
277 differ in *perspective* (Fillmore 1977a). I will use Fillmore's much-discussed
278 commercial event example (Fillmore 1976) to illustrate:

- 279 (8) a. John sold the book to Mary for \$100.
280 b. Mary bought the book from John for \$100.
281 c. Mary paid John \$100 for the book.

282 Verbs like *buy*, *sell*, *pay*, have as background the concept of a commercial
283 transaction, an event in which a *buyer*, gives *money* to a *seller* in exchange for
284 some *goods*. Now because the transaction is an exchange it can be thought of

285 as containing what Fillmore calls two *subscenes*: a *goods_transfer*, in which
286 the goods is transferred from the seller to the buyer, and a *money_transfer*,
287 in which the money is transferred from the buyer to the seller. Here it is
288 natural to say that English has as a valence realization option for transfers
289 of possession one in which the object being transferred from one possessor to
290 another is realized as direct object. Thus verbs profiling the money transfer
291 will make the money the direct object (*pay* and *collect*) and verbs profiling
292 the goods transfer will make the goods the direct object (*buy* and *sell*). Then
293 the difference between these verb pairs can be chalked up to what is profiled.

294 But what about the difference between *buy* and *sell*? By hypothesis,
295 both verbs profile a goods transfer, but in one case the buyer is subject and
296 in another the seller is. Perhaps this is just an arbitrary choice. This is in
297 some sense what the thematic role theory of Dowty (1991) says: Since (8a)
298 and (8b) are mutually entailing, there can be no semantic account of the
299 choice of subject.

300 In frame semantics, however, we may attempt to describe the facts as
301 follows: in the case of *buy* the buyer is viewed as (*perspectivalized* as) agent,
302 in the case of *sell*, the seller is. There are two advantages to this descrip-
303 tion. First, it allows us to preserve a principle assumed by a number of
304 linguists, that cross-linguistically agents must be subjects. Second, it allows

305 us to interpret certain adjuncts that enter into special relations with agents:
306 instrumentals, benefactives, and purpose clauses.

- 307 (9) a. John bought the book from Mary with/for his last pay check.
308 [both *with* and *for* allow the reading on which the pay check pro-
309 vides the funds for the purchase.]
- 310 b. Mary sold the book to John ?with/for his last paycheck. [Only *for*
311 allows the reading on which the pay check provides the funds.]
- 312 c. John bought the house from Sue for Mary. [allows reading on
313 which Mary is ultimate owner, disallows the reading on which
314 Mary is seller and Sue is seller's agent]
- 315 d. Sue sold the house to John for Mary. [allows reading on which
316 Mary is seller and Sue is seller's agent; disallows reading on which
317 Mary is ultimate owner.]
- 318 e. John bought the house from Sue to evade taxes/as a tax dodge.
319 [tax benefit is John's]
- 320 f. Sue sold the house to John to evade taxes/as a tax dodge. [tax
321 benefit is Sue's]

322 But what does it mean to say that a verb takes a perspective which
323 "views" a particular participant as an agent? The facts are, after all, that
324 both the buyer and the seller are agents; they have all the entailment prop-

325 erties that characterize what we typically call agents; and this, Dowty's
326 theory of thematic roles tells us, is why verbs like *buy* and *sell* can co-exist.
327 I will have more to say on this point in Section 4; for the moment I will
328 confine myself to the following general observation on what frame semantics
329 allows: What is profiled and what is left out is not determined by the en-
330 tailment facts of its frame. Complex variations are possible. For example,
331 as Fillmore observes, the COMMERCIAL TRANSACTION frame is associated
332 with verbs that have no natural way of realizing the seller:

333 (10) John spent \$100 on that book.

334 Nothing in the valence marking of the verb *spend* suggests that what is being
335 profiled here is a possession transfer; neither the double object construction,
336 nor *from* nor *to* is possible for marking a core COMMERCIAL TRANSACTION
337 participant. Rather the pattern seems to be the one available for what one
338 might call *resource consumption* verbs like *waste*, *lose*, *use (up)*, and *blow*.
339 In this profiling, there is no room for a seller. Given that such variation
340 in what is profiled is allowed, the idea that the agenthood of a participant
341 might be part of what's included or left out does not seem so far-fetched.
342 As I will argue in Section 4, the inclusion of events into the semantics can
343 help us make semantic sense of what abstractions like this might mean.

344 These considerations argue that there can be more than one frame back-
345 grounding a single word meaning; for example, concepts of commercial event,
346 possession transfer, and agentivity simultaneously define *buy*. A somewhat
347 different but related issue is the issue of event structure. There is strong ev-
348 idence cross-linguistically at least in the form of productive word-formation
349 processes that some verbs — for example, causatives — represent complex
350 events that can only be expressed through a combination of two frames with
351 a very specific semantics. Article 119 *Mental Lexicon* examines additional
352 psycholinguistic evidence for complex events. So it appears that a word
353 meaning can simultaneously invoke a configuration of frames, with particu-
354 lars of the configuration sometimes spelled out morphologically.

355 The idea that any word meaning exploits a background is of use in the
356 account of polysemy. Different senses will in general involve relativization
357 to different frames. As a very simple example, consider the use of *spend* in
358 the following sentence:

359 (11) John spent 10 minutes fixing his watch.

360 How are we to describe the relationship of the use of *spend* in this example,
361 which basically describes a watch fixing event, with that in (10), which
362 describes a COMMERCIAL TRANSACTION? One way is to say that one sense
363 involves the COMMERCIAL TRANSACTION, and another involves a frame we

364 might call ACTION DURATION which relates actions to their duration, a frame
365 that would also be invoked by durative uses of *for*. A counter-proposal is
366 that there is one sense here, which involves an actor using up a resource.
367 But such a proposal runs up against the problem that *spend* really has rather
368 odd disjunctive selection restrictions:

369 (12) John spent 30 packs of cigarettes that afternoon.

370 Sentence (12) is odd except perhaps in a context (such as a prison or board-
371 ing school) where cigarette packs have become a fungible medium of ex-
372 change; what it cannot mean is that John simply used up the cigarettes (by
373 smoking them, for example). The point is that a single general resource
374 consumption meaning ought to freely allow resources other than time and
375 money, so a single resource consumption sense does not correctly describe
376 the readings available for (12); however, a sense invoking a COMMERCIAL
377 TRANSACTION frame constrained to very specific circumstances does. Note
378 also, that the fact that 30 packs of cigarettes can be the *money* participant
379 in the right context is naturally accommodated. The right constraint on the
380 money participant is not that it be cash (for which Visa and Mastercard can
381 be thankful), but that it be a fungible medium of exchange.

382 Summarizing:

- 383 1. Frames are motivated primarily by issues of understanding and con-
384 verge with various schema-like conceptions advanced by cognitive psy-
385 chologists, AI researchers, and cognitive linguists. They are experien-
386 tially coherent backgrounds with variable components that allow us to
387 organize families of concepts.
- 388 2. The concept of frames has far reaching consequences when applied to
389 lexical semantics, because a single frame can provide the organizing
390 background for a set of words. Thus frames can provide an organizing
391 principle for a rich open lexicon. FrameNet is an embodiment of these
392 ideas.
- 393 3. In proposing an account of lexical semantics rich enough for a theory of
394 understanding, frame semantics converges with other lexical semantic
395 research which has been bringing to bear a richer set of concepts on
396 problems of the syntax semantics interface.

397 Having sketched the basic idea, I want in the next two sections to briefly
398 contrast the notion frame with two other ideas that have played a major
399 role in semantics, the idea of a relation, as incorporated via set theory and
400 predicate logic into semantics, and the idea of a lexical field.

401 **3 Related conceptions**

402 In this section I compare the idea of frames with two other concepts of major
403 importance in theories of lexical semantics, relations and lexical fields. The
404 comparison offers the opportunity to develop some other key ideas of frame
405 semantics, including profiling and saliency.

406 **3.1 Frames versus relations: profiling and saliency**

407 Words (most verbs, some nouns, arguably all degreeable adjectives) describe
408 relations in the world. Love and hate are relations between animate experi-
409 encers and objects. The verb *believe* describes a relation between an animate
410 experiencer and a proposition. These are commonplace views among philoso-
411 phers of language, semanticists, and syntacticians, and they have provided
412 the basis for much fruitful work. Where do frames fit in?

413 For Fillmore, frames describe the factual basis for relations. In this
414 sense they are “pre-”relational. To illustrate, Fillmore (1985) cites Mill’s
415 (1847) discussion of the words *father* and *son*. Although there is a single
416 history of events which establishes both the father- and the son- relation,
417 the words *father* and *son* pick out different entities in the world. In Mill’s
418 terminology, the words *denote* different things, but *connote* a single thing,
419 the shared history. This history, which Mill calls the *fundamentum relatio-*

420 *nis* (the foundation of the relation), determines that the two relations bear
421 a fixed structural relation to each other. It is the idea of a determinate
422 structure for a set relations that Fillmore likens to the idea of a frame.

423 Thus, a frame defines not a single relation but, minimally, a structured
424 set of relations.

425 This conception allows for a natural description not just of pairs of words
426 like *father* and *son*, but also of single words which do not in fact settle on
427 a particular relation. Consider the verb *risk*, discussed in Fillmore and
428 Atkins (1998), which seems to allow a range of participants into a single
429 grammatical “slot”. For example,

430 (13) Joan risked $\left\{ \begin{array}{l} \text{a.} \text{ censure.} \\ \text{b.} \text{ her car.} \\ \text{c.} \text{ a trip down the advanced ski slope.} \end{array} \right.$

431 The RISK frame has at least 3 distinct participants, (a) the bad thing that
432 may happen, (b) the valued thing that may be lost, and (c) the activity
433 that may cause the bad thing to happen. All can be realized in the direct
434 object position, as (13) shows. Since there are three distinct relations here, a
435 theory that identifies lexical meanings with relations needs to say there are 3
436 meanings as well. Frame semantics would describe this as one frame allowing
437 3 distinct profilings. It is the structure of the frame together with the

438 profiling options the language makes available which makes the 3 alternatives
439 possible.

440 Other verbs with a similar indeterminacy of participant are *copy*, *collide*,
441 and *mix*:

442 (14) a. Sue copied her costume (from a film poster).

443 b. Sue copied the film poster.

444 c. The truck and the car collided.

445 d. The truck collided with the car.

446 e. John mixed the soup.

447 f. John mixed the paste into the soup.

448 g. John mixed the paste and the flour.

449 In each of these cases the natural frame semantics account would be to
450 say the frame remains constant while the profilings or perspective changes.
451 Thus, under a frame semantics approach, verbal valence alternations are to
452 be expected, and the possibility of such alternations provides motivation for
453 the idea of a background frame with a range of participants and a range of
454 profiling options.

455 Now on a theory in which senses are relations, all the verbs in (14) must
456 have different senses. This is, for example, because the arguments in (14a)
457 and (14b) fill different roles. Frame semantics allows another option. We

458 can say the same verb sense is used in both cases. The differences in inter-
459 pretation arise because of differences in profiling and perspectivalization.

460 3.2 Frames versus lexical fields

461 Because frames define lexical sets, it is useful to contrast the concept of
462 frames with an earlier body of lexical semantic work which takes as cen-
463 tral the identification of lexical sets. This work develops the idea of *lexical*
464 *fields* (Weisgerber 1962, Coseriu 1967, Trier 1971, Geckeler 1971, Lehrer and
465 Kittay 1992). Lexical fields define sets of lexical items in mutually defining
466 relations, in other words, lexical semantic paradigms. The classic example
467 of a lexical field is the set of German labels used for evaluating student
468 performance (Weisgerber 1962:99):

469 (15) *sehr gut, gut, genügend* and *mangelhaft*

470 The terms are mutually defining because the significance of a single evalu-
471 ation obviously depends on knowing the entire set and the relations of the
472 terms in the set. Thus *gut* means one thing in a school system with the 4
473 possibilities in (15) and quite another if the possibilities are:

474 (16) *sehr gut, gut, befriedigend ausreichend, mangelhaft* and *ungenügend*

475 Fillmore also cites the example of the tourist industry use of the term *first*
476 *class* in their categorization of hotels; to many travelers, *first class* sounds

477 pretty good; in fact, the top ranked class of hotels is *luxury* and *first class*
478 is fourth from the top. The misunderstanding here seems exactly like a case
479 of applying the wrong frame in the process of understanding.

480 Domains in which lexical fields have provided fruitful analyses include
481 color, temperature, furniture and artifacts, kinship relations, intelligence,
482 livestock, and terrain features (Fillmore 1985:227).

483 The general hypothesis of lexical field theory is that the lexicon can
484 be carved up into a number of (sometimes overlapping) lexical sets, each
485 of which functions as a closed system. To this extent, there is agreement
486 with the conception of frames, and in fact, the lexical sets associated with
487 frames can include lexemes in paradigmatic, mutually defining relations.
488 For example, we identified the TEMPERATURE frame in Section 2, and this
489 includes the lexical field of temperature words like *cold*, *cool*, *lukewarm*,
490 *warm*, and *hot*.

491 However, the idea of a frame is distinct from the idea of a lexical field.
492 To start with, the idea of a one-word lexical field is incoherent: How can
493 a word have a function in a field in which there is nothing for it to be
494 opposed to? However, there is no inherent difficulty with the idea of a one-
495 word frame. Fillmore (1985) cites the example of *hypotenuse*, which requires
496 for its background the concept of a right triangle. There appear to be no

497 other English lexical items specific to right triangles (the term *leg* in the
498 relevant sense seems to apply to triangle sides in general); and that is neither
499 surprising nor problematic. The notion mutually defining is not necessary
500 for lexical frame sets because words in frames are defined in contrast to or in
501 terms of the frame alone. The frame, not its lexical instantiations, provides
502 the background necessary to identify a semantic function. The primitive
503 notion is not *defined in opposition to* but *profiled from the background of*.

504 A second way in which frames differ from lexical fields is that, even when
505 there is more than one word, there is no requirement that words in the set
506 function in paradigmatic opposition to one another. Thus the TEMPER-
507 ATURE frame cited above also contains the noun *temperature*, just as the
508 HEIGHT frame containing polar adjectives like *tall* and *short* will contain the
509 noun *height*.

510 Thirdly, because of the notion of mutual definition, lexical fields come
511 with strict criteria of individuation. In contrast, as we saw in Section 2,
512 frames of arbitrary specificity make sense. Thus, we have very general
513 frames of TEMPERATURE and HEIGHT. But we also have a set of specific
514 frames that recover the traditional mutually defining sets that preoccupied
515 lexical field theorists, a specialization of HEIGHT that includes just the polar
516 adjectives, a specialization of TEMPERATURE that includes just the set *cold*,

517 *cool, warm, hot*, and so on. This level of specificity in fact roughly describes
518 the granularity of FrameNet.

519 **3.3 Minskian frames**

520 As described in Fillmore (1982), the term *frame* is borrowed from Marvin
521 Minsky. It will be useful before tackling the question of how profiling and
522 perspectivalization work to take a closer look at this precursor.

523 In Minsky's original frames paper (Minsky 1975), frames were put forth
524 as a solution to the problem of *scene interpretation* in vision. Minsky's pro-
525 posal was in reaction to those who, like the Gestalt theorists (Koffka 1963),
526 viewed scene perception as a single holistic process governed by principles
527 similar to those at work in electric fields. Minsky thought scenes were as-
528 sembled in independent chunks, constituent by constituent, in a series of
529 steps involving interpretation and integration. To describe this process, a
530 model factoring the visual field into a number of discrete chunks, each with
531 its own model of change with its own discrete phases, was needed.

532 A frame was thus a dynamic model of some specific kind object with
533 specific participants and parameters. The model had built-in expectations
534 about ways in which the object could change, either in time or as a viewer's
535 perspective on it changed, formalized as operations mapping old frame states

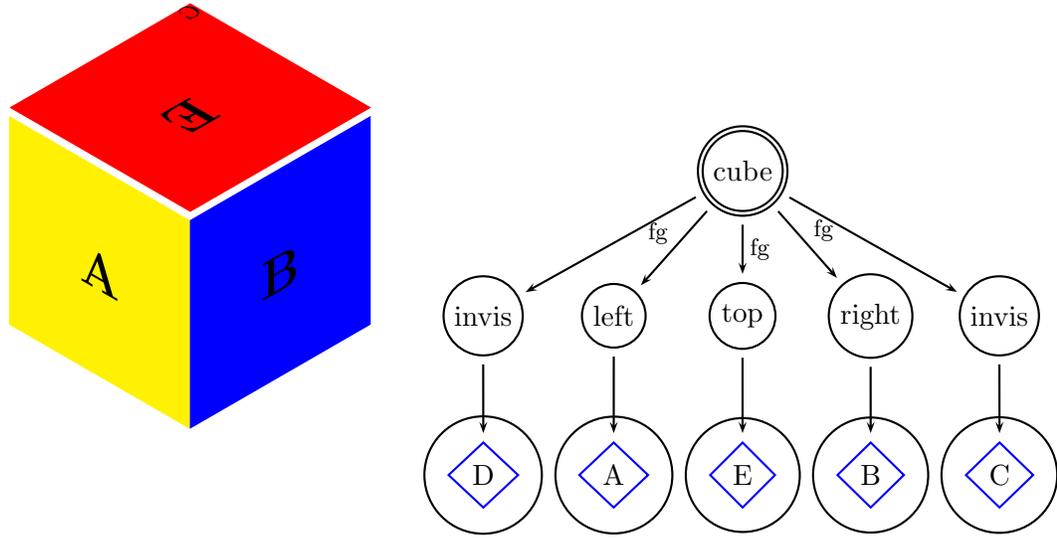


Figure 1: View of cube together with simplified cube frame representing that view. Links marked “fg” lead to foregrounded slots; slots marked “invis” are backgrounded. Faces D and C are out of view.

536 to new frame states. A frame also included a set of *participants* whose sta-
 537 tus changed under these operations; those moving into certain distinguished
 538 slots are *foregrounded*. Thus, for example, in the simplified version of Min-
 539 sky’s *cube frame*, shown before and after a rotation in Figures 1 and 2,
 540 a frame state encodes a particular view of a cube and the participants are
 541 cube faces. One possible operation is a rotation of the cube, defined to place
 542 new faces in certain view-slots, and move old faces out and possibly out of
 543 view. The faces that end up in view are the foregrounded participants of the
 544 resulting frame state. Thus the cube frame offers the tools for representing
 545 particular views or *perspectives* on a cube, together with the operations that

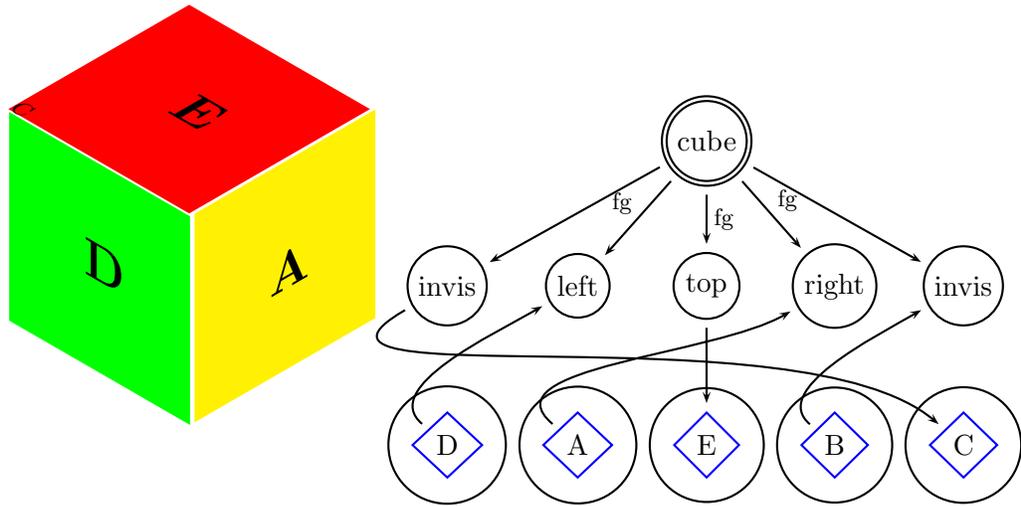


Figure 2: Cube frame after counterclockwise rotation. Faces D and A are now foregrounded, B has moved out of view.

546 may connect them in time.

547 Fillmore's innovation, then, was to apply this Minskian idea in the do-
 548 main of word meaning, importing not only the idea of chunked modular
 549 knowledge units, but also the idea of operations that take perspectives on
 550 such chunks. I used the terms profiling and perspsectivalization to describe
 551 such operations in Section 2. Although Fillmore himself does not attempt a
 552 formalization of these operations, I believe it is possible to clearly describe
 553 what is at issue using some ideas from event semantics (Davidson 1967,
 554 Davidson 1980, Parsons 1990), building on the event-based approach to
 555 frames in Gawron (1983).

556 4 Events, profiling, and perspectivalization

557 To spell out a bit better how word senses might invoke multiple frames, let
558 us return to the case of the COMMERCIAL TRANSACTION frame discussed
559 in Section 2. The following development takes up and extends the ideas of
560 Gawron (1983).

561 A rather natural account of the interface between frames and compo-
562 sitional semantics becomes available if we make use of neo-Davidsonian
563 event-semantics (Davidson 1967, Davidson 1980, Parsons 1990). On a neo-
564 Davidsonian account, we have, as the schematic semantics for *John bought*
565 *the book on sale*:

$$\exists e[\text{buy}(e) \wedge \text{agent}(e) = j \wedge \text{patient}(e) = b \wedge \text{on-sale}(e, b)]$$

566 We call e in the above representation the *lexical event*.

567 I assume that Fillmorean frames classify events. That is, there is such a
568 thing as a COMMERCIAL TRANSACTION event. Further, I assume that lexi-
569 cal predicates like *give* and *buy* are predicates true of events. These lexical
570 events cannot be directly identified with Fillmorean frame events. Rather
571 the lexical events are perspectivalizations of Fillmorean frame events. Thus,
572 for example, buying will be associated with three events, one *perspectivaliz-*

573 *ing* event that is directly related to syntactic realization, a second *profiling*
574 event that is a profiling of a third COMMERCIAL TRANSACTION (or Fill-
575 morean frame event). I will call this latter the *circumstance* event. Perspec-
576 tivalizing, profiling, and circumstance events will be related by functions.

577 Borrowing the machinery of sorted logic (Carpenter 1992, Smolka 1992,
578 Rounds 1997), I will assume that all predicates are *sorted*; that is, it is
579 a property of predicates and relations that in all models, for any given
580 argument position, there is a sort of individuals for which that argument
581 position is *defined*. I will write sorts in boldface and predicates in roman.

582 (17) AGENT PATIENT : **agent_patient** \mapsto **truth-values**

agent : **agent_patient** \mapsto **animate**

patient : **agent_patient** \mapsto **entity**

source : **agent_patient** \mapsto (**entity**)

goal : **agent_patient** \mapsto (**entity**)

583 These declarations just say, in roughly standard mathematical notation that
584 agent and patient are functions from one set to another. For example, the
585 first declaration says that AGENT PATIENT is a function from the set (sort)
586 to truth-values;. the second says *agent* is a function from the set (sort) of
587 AGENT PATIENT events to animates; *patient* from the set of AGENT PATIENT
588 events to the set of things (the domain of entities). The parentheses in

589 the source and goal role definitions may be taken to mean that the role is
 590 optional (or the function is *partial*). Not every AGENT PATIENT event has a
 591 source or a goal, but some do.

592 I assume the declarations (or axioms) in (17) are sufficient to define a very
 593 simple kind of frame. The first axiom defines a predicate AGENT PATIENT
 594 that is true of events of that sort; the rest define a set of roles for that sort of
 595 event. Thus a minimal frame is just an event sort defined for a set of roles.
 596 I will call AGENT PATIENT an *argument frame* because syntactic arguments
 597 of a verb will need to directly link to the roles of argument frames (such as
 598 *agent* and *patient*). We can represent this set of axioms as an attribute-value
 599 matrix (AVM):

$$600 \quad (18) \quad \left[\begin{array}{ll} \text{AGENT PATIENT} & \\ \text{agent} & \mathbf{animate} \\ \text{source} & \mathbf{entity} \\ \text{goal} & \mathbf{entity} \\ \text{patient} & \mathbf{entity} \end{array} \right]$$

601 Henceforth I use AVM notation for readability, but the reader should bear
 602 in mind that it is merely a shorthand for a set of axioms like those in (17),
 603 constraining partial functions and relations on sorts.

604 I will call AGENT PATIENT an *argument frame* because syntactic argu-

605 ments of a verb will need to directly link to the roles of argument frames
 606 (such as *agent* and *patient*). The AGENT PATIENT frame is very general,
 607 too general to be of much semantic use. In order to use it a lexical item
 608 must specify some circumstance frame in which participant roles are further
 609 specified with further constraints.

610 The connection between an argument frame like AGENT PATIENT and
 611 simple circumstance frames can be illustrated through the example of the
 612 POSSESSION TRANSFER frame (related to verbs like *give*, *get*, *take*, *receive*,
 613 *acquire*, *bequeath*, *loan*, and so on). Represented as an AVM, this is:

614 (19)
$$\left[\begin{array}{ll} \text{POSSESSION TRANSFER} & \\ \text{donor} & \mathbf{animate} \\ \text{possession} & \mathbf{entity} \\ \text{recipient} & \mathbf{animate} \end{array} \right]$$

615 Now both *give* and *acquire* will be defined in terms of the POSSESSION TRANS-
 616 FER frame, but *give* and *acquire* differ in that with *give* the *donor* becomes
 617 subject and with *acquire* the *recipient* does. (Compare the difference be-
 618 tween *buy* and *sell* discussed in in Section 2.2.)

619 We will account for this difference by saying that *give* and *acquire* have
 620 different mappings from the AGENT PATIENT frame to their shared circum-
 621 stance frame (POSSESSION TRANSFER). This works as follows.

622 We define the relation between a circumstance and argument frame via
623 a *perspectivalizing function*. Here are the axioms for what we will call the
624 *acquisition* function, on which the recipient is agent:

625 (20) (a) $acquisition : \mathbf{possession_transfer} \rightarrow \mathbf{agent_patient}$

(b) $agent \circ acquisition = recipient$

(c) $patient \circ acquisition = possession$

(d) $source \circ acquisition = donor$

626 The first line defines *acquisition* as a mapping from the sort **possession_**
627 **transfer** to the sort **agent_patient**, that is as a mapping from POSSESSION
628 TRANSFER eventualities to AGENT PATIENT eventualities. The mapping is
629 total; that is, each POSSESSION TRANSFER is guaranteed to have an AGENT
630 PATIENT eventuality associated with it. In the second line, the symbol \circ
631 stands for *function composition*; the composition of the *agent* function with
632 the *acquisition* function (written $agent \circ acquisition$) is the same function
633 (extensionally) as the *recipient* relation. Thus the filler of the *recipient* role
634 in a possession transfer must be the same as the filler of the *agent* role in the
635 associated AGENT PATIENT eventuality. And so on, for the other axioms.
636 Summing up AVM style:

$$\begin{array}{c}
637 \quad (21) \quad \left[\begin{array}{l} \text{POSSESSION TRANSFER} \\ \text{donor} \\ \text{recipient} \\ \text{possession} \end{array} \right. \begin{array}{l} \boxed{1} \\ \boxed{2} \\ \boxed{3} \end{array} \xrightarrow{\text{acquisition}} \left. \begin{array}{l} \text{AGENT} \\ \text{PATIENT} \\ \text{agent} \\ \text{source} \\ \text{patient} \end{array} \right] \begin{array}{l} \\ \\ \boxed{2} \\ \boxed{1} \\ \boxed{3} \end{array}
\end{array}$$

638 I will call the mapping that makes the *donor* agent *donation*.

$$\begin{array}{c}
639 \quad (22) \quad \left[\begin{array}{l} \text{POSSESSION TRANSFER} \\ \text{donor} \\ \text{recipient} \\ \text{possession} \end{array} \right. \begin{array}{l} \boxed{1} \\ \boxed{2} \\ \boxed{3} \end{array} \xrightarrow{\text{donation}} \left. \begin{array}{l} \text{AGENT} \\ \text{PATIENT} \\ \text{agent} \\ \text{goal} \\ \text{patient} \end{array} \right] \begin{array}{l} \\ \\ \boxed{1} \\ \boxed{2} \\ \boxed{3} \end{array}
\end{array}$$

640 With the *acquisition* and *donation* mappings defined, the predicates *give*
641 and *acquire* can be defined as compositions with *donation* and *acquisition*:

$$\text{give} = \text{POSSESSION TRANSFER} \circ \text{donation}^{-1}$$

$$\text{acquire} = \text{POSSESSION TRANSFER} \circ \text{acquisition}^{-1}$$

642 donation^{-1} is an inverse of *donation*, a function from AGENT PATIENT even-
643 tualities to POSSESSION TRANSFERS defined only for those AGENT PATIENT
644 events related to POSSESSION TRANSFERS. Composing this with the POS-
645 SESSION TRANSFER predicate makes *give* a predicate true of those AGENT

646 PATIENT events related to possession transfers, whose agents are donors and
647 whose patients are possessions. The treatment of *acquire* is parallel but
648 uses the *acquisition* mappings. For more extensive discussion, see Gawron
649 (2008).

650 Summarizing:

- 651 a. an argument frame AGENT PATIENT, with direct consequences for syn-
652 tactic valence (agents become subject, patients direct object, and so on).
- 653 b. a circumstance frame POSSESSION TRANSFER, which captures the circum-
654 stances of possession transfer.
- 655 c. *perspectivalizing* functions *acquisition* and *donation* which map partici-
656 pants in the circumstances to argument structure.

657 This is the basic picture of perspectivalization. The picture becomes more
658 interesting with a richer example.

659 In the discussion that follows, I assume a commercial transaction frame
660 with at least the following frame elements:

661 (23)

$$\left[\begin{array}{l} \text{COMMERCIAL} \\ \text{TRANSACTION} \\ \text{buyer} \quad \mathbf{animate} \\ \text{seller} \quad \mathbf{animate} \\ \text{money} \quad \mathbf{fungible} \\ \text{goods} \quad \mathbf{entity} \end{array} \right]$$

662 This is a declaration that various functions from event sorts to truth values
 663 and entity sorts exist, a rather austere model for the sort of rich back-
 664 grounding function we have assumed for frames. We will see how this model
 665 is enriched below.

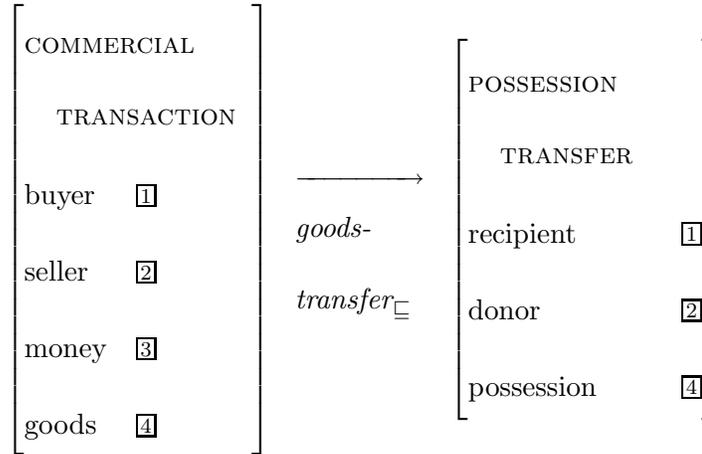
666 Our picture of profiling and perspectivalization can be extended to the
 667 more complex cases of commercial transaction predicates with one more
 668 composition. For example, we may define buy as follows:

669 (24) $\text{buy} = \text{COMMERCIAL TRANSACTION} \circ (\text{acquisition} \circ \text{goods_transfer})^{-1}$

670 What this says is that the relation buy is built in a series of steps, out of 3
 671 functions:

- 672 1. *acquisition*: the function from possession transfer events to AGENT_PATIENT
 673 events already introduced.

2. *goods_transfer*: a new function from commercial events to possession transfers in which the goods is transferred:



3. The inverse of the composition of *goods_transfer* with *acquisition*

$$(\text{acquisition} \circ \text{goods_transfer})^{-1}$$

674 is a function from agent patient events to commercial transactions.

675 4. COMMERCIAL TRANSACTION: a sortal predicate true of commercial
676 transactions.

677 5. The predicate *buy* is therefore true of AGENT PATIENT events that
678 are related in certain fixed ways to a POSSESSION TRANSFER and a
679 COMMERCIAL TRANSACTION

680 The novelty in the definition above is the *goods_transfer* function. We will
681 call this the *profiling function* because it selects the parts of the COMMERCIAL
682 TRANSACTION event which the verb highlights. We will call *acquisition* —

683 the function which determines subject and object — the perspectivalizing
684 function. The role of the the perspectivalizing function is to select a syntactic
685 realization.

686 A profiling function like *goods_transfer*: has two independent motiva-
687 tions:

688 a. It enriches our rather impoverished model of COMMERCIAL TRANSAC-
689 TION. We started out in (23) with little more than the assumption that
690 there were 4 sorted participants we were calling buyer, seller, money, and
691 goods. Now with the assumption of the *goods_transfer* function, a pos-
692 session transfer p is entailed (because the function is total) in which the
693 possession is the goods. Thus *goods_transfer* can be viewed as part of an
694 enriched definition of the COMMERCIAL TRANSACTION frame. There will
695 be other total functions enriching the definition further, for example, a
696 *money_transfer* function of use in defining verbs like *pay* and *collect*, in
697 which the money is transferred.

698 b. Both MONEY_TRANSFER and GOODS_TRANSFER are projections from com-
699 mercial events to possession transfers; and possession transfer is a frame
700 for which we have a pre-defined perspectivalization, independently moti-
701 vated for other verbs like *acquire* and *get*. By composing a commercial
702 event subscene projection with a possession transfer argument projection

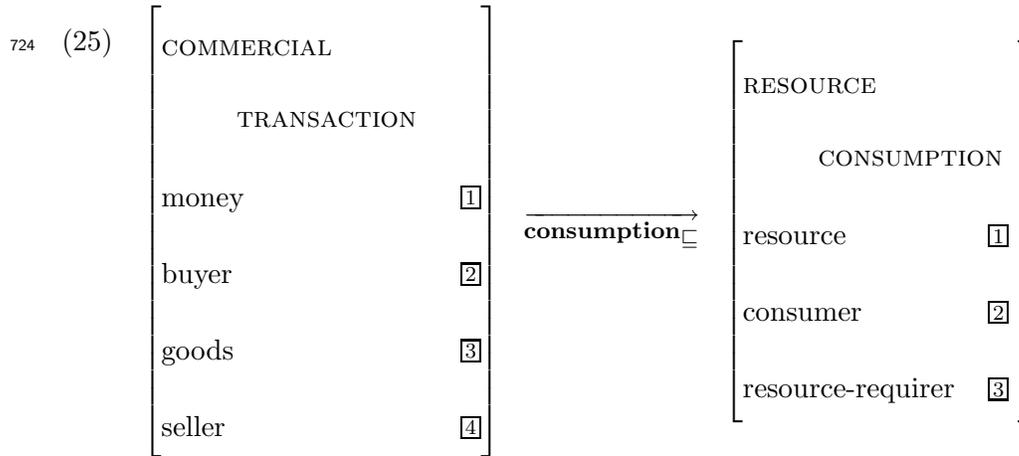
703 we derive an argument projection for commercial transactions.

704 Thus the *good transfer* function simultaneously serves knowledge represen-
705 tation needs (a) and valence theory needs (b).

706 There is an analogy between how profiling and perspectivalization work
707 and the way the original Minskyan frames work. A Minskyan frame enables
708 the integration of scene components in view with underlying objects by spec-
709 ifying, for example, how the faces of the cube in view relate to the cube as
710 a whole. A Fillmorian perspective enables the integration of the realized
711 elements of a text with an underlying text interpretation by specifying how
712 syntactically realized frame components relate to frames as a whole. In both
713 cases there are operations that mediate between rich representations and a
714 constrained (perspectivalized) representation that belongs to an external
715 representational system. Minskyan rotation operations mediate between 3D
716 representations and the 2D representations of a scene, ultimately necessary
717 because the human retina is a screen. Fillmorian profilings and perspecti-
718 valizations mediate between unlinearized representations in which there is
719 no fixed individuation of participants and linearizable argument structure,
720 ultimately necessary because the syntax of human language forces us to
721 linearize participants.

722 Now consider a profiling which leaves things out. This is the case of

723 *spend*.



725 As discussed in Section 2, the verb *spend* views a commercial transaction as
726 a RESOURCE CONSUMPTION, where RESOURCE CONSUMPTION is the frame
727 used by verbs like *waste*, *lose*, *use (up)*, and *blow*. The profiling of the verb
728 *spend* includes the seller and goods but leaves the seller out. The profiling of
729 the verb *sell* includes the buyer and the goods, as well as the seller. The two
730 subscenes overlap in participants but choose distinct, incompatible event
731 types, which lead to distinct realization possibilities in the syntactic frame.

732 The frame-based picture of commercial transactions is schematized in
733 Figure 3.

734 The picture on the left shows what we might call the *commercial trans-*
735 *action neighborhood* as discussed here. The picture on the right shows that
736 portion of the neighborhood that is activated by *buy*; the functions used in its

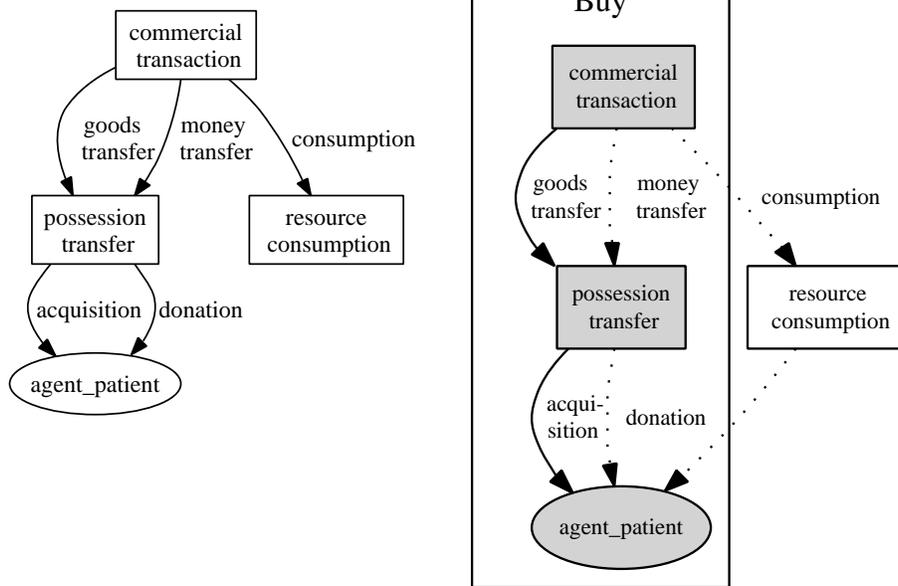


Figure 3: Left: Lexical network for COMMERCIAL TRANSACTION. Right: Same network with the perspectivalization chosen by *buy* in the boxed area.

737 definitions are linked by solid lines; the functions left out are in dashes; the
738 boxed regions contains those frames that are used in the definition. If as is
739 suggested in Article 120 *Conceptual knowledge, categorization, and meaning*
740 *representation*, concepts and word meanings need to be different knowledge
741 structures, the picture in Figure 3 may provide one way of thinking about
742 how they might be related, with the frame nodes playing the role of concepts
743 and a configuration of links between them the role of a word meaning.

744 We have called *goods_transfer* and *consumption* profiling functions. We
745 might equally well have called them *subscene roles*, because they are func-
746 tions from events to entities. Note that subscene roles don't attribute a
747 fixed hierarchical structure to a frame the way DO ... CAUSE BECOME .. in
748 Dowty's system attributes a fixed structure to causatives of inchoatives. As
749 these examples show, a frame may have subscene roles which carve up its
750 constituents in incompatible ways. Now this may seem peculiar. Shouldn't
751 the roles of a frame define a fixed relation between disjoint entities? I sub-
752 mit that the answer is no. The roles associated with each sort of event
753 are regularities that help us classify an event as of that sort. But such
754 functions are not guaranteed to carve up each event into non-overlapping,
755 hierarchically structured parts. Sometimes distinct roles may select over-
756 lapping constituents of events, particularly when independent individuation

757 criteria are not decisive, as when the constituents are collectives, or shape-
758 less globs of stuff, or abstract things such as events or event types. Thus we
759 get the cases discussed above like *collide*, *mix*, and *risk*, where different ways
760 of profiling the frames give us distinct, incompatible sets of roles. We may
761 choose to view the colliders as a single collective entity (X and Y collided),
762 or as two (X collided with Y). We may choose to separate a figure from a
763 ground in the mixing event (14f), or lump them together (mix X and Y), or
764 just view the mixed substance as one (14f). Finally, risks involve an action
765 (13c) and a potential bad consequence (13a), and for a restricted set of cases
766 in which that bad consequence is a loss, a lost thing (13b).

767 What of relations? Formally, in this frame-based picture, we have re-
768 placed relations with event predicates, each of which is defined through some
769 composed set of mappings to a set of events that will be defined only for
770 some fixed set of roles. Clearly, for every lexical predicate, there is a corre-
771 sponding relation, namely one defined for exactly the same set of roles as the
772 predicate. Thus in the end the description of the kind of lexical semantic en-
773 tity which interfaces with the combinatorial semantics is not very different.
774 However the problems has, I believe, been redefined in an interesting way.
775 Traditionally, discussion of the lexical-semantic/syntax interface starts with
776 a relation with a predefined set of roles. This is the picture for example,

777 that motivates the formulation of Chomsky's (1981) Θ -Criterion. However,
778 a major point of frame semantics is that, for many purposes, it is useful to
779 look at a set of relations structured in a particular way. This is the domain
780 of frames.

781 **5 Lexicography**

782 A word about the application of frames to lexicography is in order. Any set
783 of frames imposes a certain classificational scheme on the lexicon. Other ex-
784 amples of such a classificational scheme are Roget's Thesaurus, Longman's
785 valence classes, and Wordnet (Fellbaum 1998). Frames differ from all three
786 in that they are not primarily oriented either to the task of synonym-classes
787 or syntactic frame classes. One expects to find synonyms and antonyms in
788 the same frame, of course, and many examples of valence similarity, but
789 neither trend will be a rule. As we saw in Section 2, near synonyms like
790 *land* and *ground* may belong to different frames, and understanding those
791 frames is critical to proper usage. As we saw in our investigations of pro-
792 filing and perspective, differences of both kinds may result in very different
793 valence options for verbs from the same frame. The value of the frame idea
794 for lexicography is that it seems the most promising idea if the goal is to
795 organize words according to usage. This of course is a hypothesis. FrameNet

796 (Fillmore and Baker 2000) is a test of that hypothesis. Accordingly, frame
797 entries are connected with rich sets of examples gleaned from the British
798 National Corpus illustrating frame element realizations in a variety of syn-
799 tactic contexts. Interested readers will find a tour of the web site far more
800 persuasive than any discussion here.

801 **6 Discourse understanding**

802 In this section I propose to raise the issue of frames in discourse under-
803 standing, not to try to give the subject an adequate treatment, for which
804 there is no space, but to talk a bit about how the role of frames in discourse
805 understanding is related to their role in interpreting signs.

806 Let us return to the example of verbs conventionally connected with
807 effects caused by movement:

- 808 (26) a. John broke the glass against the wall.
809 b. # John killed the cockroach against the wall.

810 It is at least arguably the case that this contrast can be made without
811 the help of a lexical stipulation. If movement can be a default or at least a
812 highly prototypical way of breaking something, and not a highly prototypical
813 way of killing something, then something like the default logic of Asher

814 and Lascarides (1995a) or abduction as in Hobbs et al. (1993), both of
815 which have been applied successfully to a number of problems of discourse
816 interpretation, could infer causality in (a) and not in (b). However, this still
817 falls somewhat short of predicting the genuine oddity of (b). Notice, too,
818 that when discourse coherence alone is at issue, both causality inferences go
819 through:

820 (27) a. The glass was hurled against the wall and broke.

821 b. The cockroach was hurled against the wall and died.

822 Thus the defaults at play in determining matters of “valence” differ from
823 those in discourse. We can at least describe the contrasts in (26) — not
824 explain it — by saying movement is an optional component of the breaking
825 frame through which the denotation of the verb *break* is defined, and not a
826 component of the killing frame; or in terms of the formal picture of Section 4:
827 Within the conventional lexical network linking frames in English there is
828 a partial function from breaking events to movement subscenes; there is no
829 such function for killing events.

830 In contrast Fillmore’s (1985), 232 discussed in Section 2.1:

831 (28) We never open our presents until morning.

832 The point of this example was that it evoked Christmas without containing

833 a single word specific to Christmas. How might an automatic interpretation
834 system simulate what is going on for human understanders? Presumably by
835 a kind of application of Occam's razor. There is one and only one frame
836 that explains both the presence of presents and the custom of waiting until
837 morning, and that is the Christmas frame. Thus the assumption that gets
838 us the most narrative bang for the buck is Christmas. In this case the frame
839 has to be evoked by dynamically assembling pieces of information activated
840 in this piece of discourse.

841 These two examples show that frames will function differently in a theory
842 of discourse understanding than they will in a theory of sign-meanings in
843 at least two ways. They will require a different notion of default, and they
844 will need to resort to different inferencing strategies, such as inference to the
845 most economical explanation.

846 **7 Conclusion**

847 The logical notion of a relation, which preserves certain aspects of the lin-
848 earization syntax forces on us, has at times appeared to offer an attractive
849 account of what we grasp when we grasp sign meanings. But the data we
850 have been looking at in this brief excursion into frame semantics has pointed
851 another way. Lexical senses seem to be tied to the same kind schemata that

852 organize our perceptions and interpretations of the social and physical world.
853 In these schemata participants are neither linearized nor uniquely individ-
854 uated, and the mapping into the linearized regime of syntax is constrained
855 but underdetermined. We see words with options in what their exact par-
856 ticipants are and how they are realized. Frames offer a model that is both
857 specific enough and flexible enough to accommodate these facts, while of-
858 fering the promise of a firm grounding for lexicographic description and an
859 account of text understanding.

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