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29. Frame Semantics

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9 19. Frame semantics

10 1. Introduction

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18 Abstract

19 Frames are conceptual structures that provide context for elements of in-
20 terpretation; their primary role in an account of text understanding is to
21 explain how our text interpretations can leap far beyond what the text lit-
22 erally says. The present article explores the role of frames in providing a
23 principled account of the openness and richness of word-meanings, distin-
24 guishing a frame-based account from classical approaches, such as accounts
25 based on conceptual primitives, lexical fields, and connotation, and showing
26 how they can play a role in the account of how word meaning interacts with
27 syntactic valence.

28

29 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.

30

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

31 **1. Introduction**

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

34 One is the *openness* of word meanings. The variety of word meanings
35 is the variety of human experience. Consider defining words such as *Tues-*
36 *day*, *barber*, *alimony*, *seminal*, *amputate*, and *brittle*. One needs to make
37 reference to diverse practices, processes, and objects in the social and phys-
38 ical world: repeatable calendar events, grooming and hair, marriage and
39 divorce, discourse about concepts and theories, and events of breaking. Be-

40 fore this seemingly endless diversity, semanticists have in the past stopped
41 short, excluding it from the semantic enterprise, and attempting to draw a
42 line between a small linguistically significant set of primitive concepts and
43 the openness of the lexicon.

44 The other problem is the closely related problem of the *richness* of word
45 meanings. Words are hard to define, not so much because they invoke
46 fine content specific distinctions, but because they invoke vast amounts of
47 background information. The concept of buying presupposes the complex
48 social fact of a commercial transaction. The concept of alimony presupposes
49 the complex social fact of divorce, which in turn presupposes the complex
50 social fact of marriage. Richness, too, has inspired semanticists simply to
51 stop, to draw a line, saying exact definitions of concepts do not matter for
52 theoretical purposes.

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

- 57 (1) a. the kinds of syntactic constructions lexical meanings are compat-
58 ible with.
- 59 i. the kinds of participants that become subjects and objects

- 60 ii. regular semantic patterns of oblique markings and valence al-
61 ternations
- 62 b. Regular patterns of inference licensed by category, syntactic con-
63 struction or closed class lexical item.

64 The idea is to carve off that part of semantics necessary for knowing and
65 using the syntactic patterns of the language. To do this sort of work, we do
66 not need to pay attention to every conceptually possible distinction. Instead
67 we need a small set of semantic primitives that make the distinctions that
68 linguistically matter; what is left over can be dealt with using some open
69 class of predicates or features whose internal details are not of concern.
70 Jackendoff (1990) is a good example of this kind of approach. The genera-
71 tive semantics program, especially as outlined in Lakoff (1972), is another.
72 Dowty (1979) has many of the same features, but in places expresses doubts
73 that the program can be completely carried out. The kind of analysis I
74 have in mind can be exemplified through Dowty's generative-semantics-like
75 analysis of causatives like *break.tr* (transitive *break*):

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

78 Here the predicates in capitals (DO, CAUSE, BECOME) are from the inventory
79 of linguistically significant primitives, and the lower case predicates (*broken*,

80 *glass*) are from the open class predicates whose internal structure does not
81 matter. At most we need to know that one expresses a state (*broken*) and the
82 other a kind (*glass*). The details beyond that are linguistically insignificant.
83 Of course there are differences in truth-conditions between states like *broken*
84 and *dead*, but these have only minor selectional effects on the causative
85 inchoatives created from them (*break.tr* = DO ... CAUSE BECOME broken'
86 and *kill* = DO ... CAUSE BECOME dead'). I will refer to this view of lexical
87 semantics as the *classical view*.

88 In this paper I wish to consider a view of semantics in general and lexi-
89 cal semantics in particular that is quite at odds with this classical picture:
90 *frame semantics* (Fillmore 1975, 1977b, 1978, 1982, 1985). Someone wish-
91 ing to contest the classical picture has two options: first, contend that the
92 wrong kinds of questions are being asked; second, argue that the program
93 as outlined is not very well-suited to attaining its goals. As we shall see,
94 both kinds of objection motivate frame semantics.

95 **2. Fillmorean frames**

96 **2.1. Motivations**

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

106 Although Fillmore has had many interesting things to say about the
107 kinds of problems listed in (1) in early and late works on Case Grammar, the
108 primary motivations given in Fillmore (1982, 1985) focus on frame semantics
109 as a contribution to a theory of *text understanding*. Consider for example,
110 the very different scenes evoked by the following pair of sentences, discussed
111 in Fillmore (1985):

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

114 Sentence (3a) evokes a speaker who is in the air (on a plane), sentence (3b)
115 a speaker who is at sea (on a ship). This contrast is tied to some difference
116 between the words *land* and *ground*, yet, on the face of it, *land* and *ground*
117 denote very similar things. Fillmore would say *land* is understood within
118 a conceptual frame of sea travel, and within that frame it is opposed to
119 *sea*, while *ground* is understood within a conceptual frame of air travel, and
120 within that frame, it is opposed to *air*. Thus we can explain something that
121 is very difficult to explain in terms what the words in the sentence denote
122 by investigating the conceptual background against which the relevant word
123 senses are defined. That conceptual background is what Fillmore calls a
124 frame.

125 Frames are conceptual structures that provide context for elements of
126 interpretation; their primary role in an account of text understanding is to
127 explain how our text interpretations can (validly) leap far beyond what the
128 text literally says. Frames can be introduced into interpretation in a variety
129 of ways. They may be directly tied to word senses as in the example of *land*
130 and *ground* or they may be introduced by patterns among the facts the text
131 establishes. To use another example of Fillmore's (1985: 232):

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

133 This sentence *evokes* the Christmas frame by describing a situation that

134 matches salient facts of Christmas practice, even though no word in it is
135 specific to Christmas. If in fact the Christmas frame is the right one, that
136 evocation makes a significant contribution to the understanding of the sur-
137 rounding text.

138 Frames are motivated not just by words, then, but by stereotypes about
139 customs, practices, institutions, and games. Moreover, the kinds of cog-
140 nitive structures Fillmore has in mind have been proposed by a variety of
141 researchers for a variety of purposes. Fillmore has adopted the terminol-
142 ogy of AI researcher Minsky (1975) in calling them frames, but *schemata* in
143 psychology (Bartlett 1932, Rumelhart 1980) are getting at something very
144 similar, as are *scripts* (Schank & Abelson 1977), *cognitive models* (Lakoff
145 1983), *experiential gestalts* (Lakoff & Johnson 1980), *the base* (as opposed to
146 the profile) (Langacker 1984), and Fillmore's own notion of *scene* (Fillmore
147 1976, 1977a). More recently, in articulating a *simulation view* of conceptual
148 processing, Barsalou (1992, 1999) has proposed that object conceptualiza-
149 tion is processed through simulators of objects linked to components of a
150 variety of situation memories; one consequence is that objects may acti-
151 vate components from different situations in different perceptual contexts.
152 In this theory, too, then, conceptualization is framed against a background
153 with components that help provide an interpretation for scenes or objects.

154 For more discussion, see article 108 (Kelter & Kaup) *Conceptual knowledge,*
155 *categorization, and meaning.*

156 As an approach to word meanings specifically, the starting point for
157 frame semantics is that the lexical semantics “problems” of openness and
158 richness are connected. Openness depends on richness. Openness does not
159 mean lack of structure. In fact, it presupposes structure. Most concepts are
160 interpretable or understandable or definable only against the background
161 of other concepts. Many backgrounds are rich enough to define a cluster
162 of concepts, in particular, a cluster of words. These backgrounds are the
163 frames. Thus because words are networked together through their shared
164 backgrounds, frames can provide an organizing principle for the openness of
165 the lexicon.

166 Consider one of the examples already discussed, discussed in Fillmore
167 (1982). The concept of alimony depends on the concept of divorce. The
168 concept of divorce in turn depends on the concept of marriage. The depen-
169 dency is definitional. Unless you define what a marriage is, you can’t define
170 what a divorce is. Unless you define what a divorce is, you can’t define
171 what alimony is. Thus there is a very real sense in which the dependencies
172 we are describing move us toward *simpler* concepts. Notice, however, that
173 the dependency is leading in a different direction than an analysis that de-

174 composes meanings into a small set of primitives like CAUSE and BECOME.
175 Instead of leading to concepts of increasing generality and abstractness, we
176 are being led to define the situations or circumstances which provide the
177 necessary *background* for the concepts we are describing. The concepts of
178 marriage and divorce are equally specific, but the institution of marriage
179 provides the necessary background for the institution of divorce.

180 Or consider the complex subject of Tuesdays (Fillmore 1985). We live in
181 a world of cyclic events. Seasons come and go and then return. This leads
182 to a cyclic calendar which divides time up into repeating intervals, which are
183 divided up further. Years are divided into months, which are divided into
184 weeks, which are divided into days, which have cyclic names. Each week
185 has a Sunday, a Monday, a Tuesday, and so on. Defining Tuesday entails
186 defining the notion of a cyclic calendar. Knowing the word *Tuesday* may not
187 entail knowing the word *Sunday*, but it does entail understanding at least
188 the concept of a week and a day and their relation, and that each week has
189 exactly one Tuesday.

190 We thus have words and background concepts. We will call the back-
191 ground concept the *frame*. Now the idea of a frame begins to have some
192 lexical semantic bite with the observation that a single concept may provide
193 the background for a set of words. Thus the concept of MARRIAGE provides

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

222 Summing up: openness does not mean structurelessness. Concepts and
223 their related words have certain unidirectional backgrounding relations that
224 frames capture.

225 (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>	

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

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

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

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

- 237 (6) a. John broke the glass against the wall.
238 b. # John killed the cockroach against the wall.

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

247 Thus if valence patterns are part of what is to be explained, then a lan-
248 guage like English, with its rich inventory of prepositions and situationally
249 specific constructions (see for example the pattern lists in Levin 1993), will
250 require reference to a large inventory of concepts. It is difficult to see how
251 a principled line between open class and closed class concepts can be drawn
252 in carrying out this program. It is clear for example, that Levin's verbs of
253 contact, which include the verbs like *hit* and *slap* discussed above, overlap
254 significantly with the verbs list for the IMPACT frame in FrameNet, a large
255 computational instantiation of the ideas of frame semantics (Fillmore &

256 Atkins 1994, Baker, Fillmore & Lowe 1998, Fillmore & Atkins 1998, Baker
257 & Fillmore 2001, Boas 2001, 2005, Chang, Narayanan & Petruck 2002a,
258 2002b). At last count the NSF Framenet project (Fillmore & Baker 2000)
259 which is building a frame lexicon for English had over 800 frames for about
260 4500 words. Thus the problems of openness and richness arise whether one
261 starts from text understanding or from syntax/semantics interface.

262 **2.2. Basic Tools**

263 We have thus far focused on the role of frames in a theory of word meanings.
264 Note that nothing in particular hangs on the notion *word*. Frames may also
265 have a conventional connection to a simple syntactic constructions or idiom;
266 *give someone the slip* probably belongs to the same frame as *elude*. Or
267 they may be tied to more complex constructions such as the Comparative
268 Correlative (cf. article 86 (Kay & Michaelis) *Constructional meaning*).

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

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

275 As a theory of the conventional association of schematized situations and
276 linguistic exponents, then, frame semantics makes the assumption that there
277 is always some background knowledge relative to which linguistic elements
278 do some profiling, and relative to which they are defined. Two ideas are
279 central:

- 280 1. a background concept
- 281 2. a set of *signs* including all the words and constructions that utilize this
282 conceptual background.

283 Two other important frame theoretic concepts are *frame elements* and *pro-*
284 *filings*.

285 Thus far in introducing frames I have emphasized what might be called
286 the modularity of knowledge. Our knowledge of the the world can usefully
287 be divided up into concrete chunks. Equally important to the Fillmoreian
288 conception of frames is the integrating function of frames. That is, frames
289 provide us with the means to integrate with other frames in context to
290 produce coherent wholes. For this function, the crucial concept is the notion
291 of a *frame element* (Fillmore & Baker 2000). A frame element is simply a
292 regular participant, feature, or attribute of the kind of situation described
293 by a frame. Thus, frame elements of the wedding frame will include the

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

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

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

- 308 (8) a. John sold the book to Mary for \$100.
309 b. Mary bought the book from John for \$100.
310 c. Mary paid John \$100 for the book.

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

314 as containing what Fillmore calls two *subscenes*: a *goods_transfer*, in which
315 the goods is transferred from the seller to the buyer, and a *money_transfer*,
316 in which the money is transferred from the buyer to the seller. Here it is
317 natural to say that English has as a valence realization option for transfers
318 of possession one in which the object being transferred from one possessor to
319 another is realized as direct object. Thus verbs profiling the money transfer
320 will make the money the direct object (*pay* and *collect*) and verbs profiling
321 the goods transfer will make the goods the direct object (*buy* and *sell*). Then
322 the difference between these verb pairs can be chalked up to what is profiled.

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

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

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

336 (9) a. John bought the book from Mary with/for his last pay check.

337 [both *with* and *for* allow the reading on which the pay check pro-
338 vides the funds for the purchase.]

339 b. Mary sold the book to John ?with/for his last paycheck. [Only *for*
340 allows the reading on which the pay check provides the funds.]

341 c. John bought the house from Sue for Mary. [allows reading on
342 which Mary is ultimate owner, disallows the reading on which
343 Mary is seller and Sue is seller's agent]

344 d. Sue sold the house to John for Mary. [allows reading on which
345 Mary is seller and Sue is seller's agent; disallows reading on which
346 Mary is ultimate owner.]

347 e. John bought the house from Sue to evade taxes/as a tax dodge.
348 [tax benefit is John's]

349 f. Sue sold the house to John to evade taxes/as a tax dodge. [tax
350 benefit is Sue's]

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

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

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

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

373 These considerations argue that there can be more than one frame back-
374 grounding a single word meaning; for example, concepts of commercial event,
375 possession transfer, and agentivity simultaneously define *buy*. A somewhat
376 different but related issue is the issue of event structure. There is strong ev-
377 idence cross-linguistically at least in the form of productive word-formation
378 processes that some verbs — for example, causatives — represent complex
379 events that can only be expressed through a combination of two frames
380 with a very specific semantics. Article 107 (Libben & de Almeida) *Mental*
381 *lexicon* examines additional psycholinguistic evidence for complex events.
382 So it appears that a word meaning can simultaneously invoke a configura-
383 tion of frames, with particulars of the configuration sometimes spelled out
384 morphologically.

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

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

390 How are we to describe the relationship of the use of *spend* in this example,
391 which basically describes a watch fixing event, with that in (10), which
392 describes a COMMERCIAL TRANSACTION? One way is to say that one sense

393 involves the COMMERCIAL TRANSACTION, and another involves a frame we
394 might call ACTION DURATION which relates actions to their duration, a frame
395 that would also be invoked by durative uses of *for*. A counter-proposal is
396 that there is one sense here, which involves an actor using up a resource.
397 But such a proposal runs up against the problem that *spend* really has rather
398 odd disjunctive selection restrictions:

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

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

412 Summarizing:

- 413 1. Frames are motivated primarily by issues of understanding and con-
414 verge with various schema-like conceptions advanced by cognitive psy-
415 chologists, AI researchers, and cognitive linguists. They are experien-
416 tially coherent backgrounds with variable components that allow us to
417 organize families of concepts.
- 418 2. The concept of frames has far reaching consequences when applied to
419 lexical semantics, because a single frame can provide the organizing
420 background for a set of words. Thus frames can provide an organizing
421 principle for a rich open lexicon. FrameNet is an embodiment of these
422 ideas.
- 423 3. In proposing an account of lexical semantics rich enough for a theory of
424 understanding, frame semantics converges with other lexical semantic
425 research which has been bringing to bear a richer set of concepts on
426 problems of the syntax semantics interface.

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

431 **3. Related conceptions**

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

436 **3.1. Frames versus relations: profiling and saliency**

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

443 For Fillmore, frames describe the factual basis for relations. In this
444 sense they are “pre-”relational. To illustrate, Fillmore (1985) cites Mill’s
445 (1847) discussion of the words *father* and *son*. Although there is a single
446 history of events which establishes both the father- and the son- relation,
447 the words *father* and *son* pick out different entities in the world. In Mill’s
448 terminology, the words *denote* different things, but *connote* a single thing,
449 the shared history. This history, which Mill calls the *fundamentum relatio-*

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

453 Thus, a frame defines not a single relation but, minimally, a structured
454 set of relations.

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

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

461 The RISK frame has at least 3 distinct participants, (a) the bad thing that
462 may happen, (b) the valued thing that may be lost, and (c) the activity
463 that may cause the bad thing to happen. All can be realized in the direct
464 object position, as (13) shows. Since there are three distinct relations here, a
465 theory that identifies lexical meanings with relations needs to say there are 3
466 meanings as well. Frame semantics would describe this as one frame allowing
467 3 distinct profilings. It is the structure of the frame together with the

468 profiling options the language makes available which makes the 3 alternatives
469 possible.

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

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

473 b. Sue copied the film poster.

474 c. The truck and the car collided.

475 d. The truck collided with the car.

476 e. John mixed the soup.

477 f. John mixed the paste into the soup.

478 g. John mixed the paste and the flour.

479 In each of these cases the natural frame semantics account would be to
480 say the frame remains constant while the profilings or perspective changes.
481 Thus, under a frame semantics approach, verbal valence alternations are to
482 be expected, and the possibility of such alternations provides motivation for
483 the idea of a background frame with a range of participants and a range of
484 profiling options.

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

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

490 3.2. Frames versus lexical fields

491 Because frames define lexical sets, it is useful to contrast the concept of
492 frames with an earlier body of lexical semantic work which takes as central
493 the identification of lexical sets. This work develops the idea of *lexical fields*
494 (Weisgerber 1962, Coseriu 1967, Trier 1971, Geckeler 1971, Lehrer & Kittay
495 1992). Lexical fields define sets of lexical items in mutually defining relations,
496 in other words, lexical semantic paradigms. The classic example of a lexical
497 field is the set of German labels used for evaluating student performance
498 (Weisgerber 1962: 99):

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

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

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

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

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

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

513 The general hypothesis of lexical field theory is that the lexicon can
514 be carved up into a number of (sometimes overlapping) lexical sets, each
515 of which functions as a closed system. To this extent, there is agreement
516 with the conception of frames, and in fact, the lexical sets associated with
517 frames can include lexemes in paradigmatic, mutually defining relations.
518 For example, we identified the TEMPERATURE frame in section 2, and this
519 includes the lexical field of temperature words like *cold*, *cool*, *lukewarm*,
520 *warm*, and *hot*.

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

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

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

540 Thirdly, because of the notion of mutual definition, lexical fields come
541 with strict criteria of individuation. In contrast, as we saw in section 2,
542 frames of arbitrary specificity make sense. Thus, we have very general
543 frames of TEMPERATURE and HEIGHT. But we also have a set of specific
544 frames that recover the traditional mutually defining sets that preoccupied
545 lexical field theorists, a specialization of HEIGHT that includes just the polar
546 adjectives, a specialization of TEMPERATURE that includes just the set *cold*,

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

549 **3.3. Minskian frames**

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

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

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

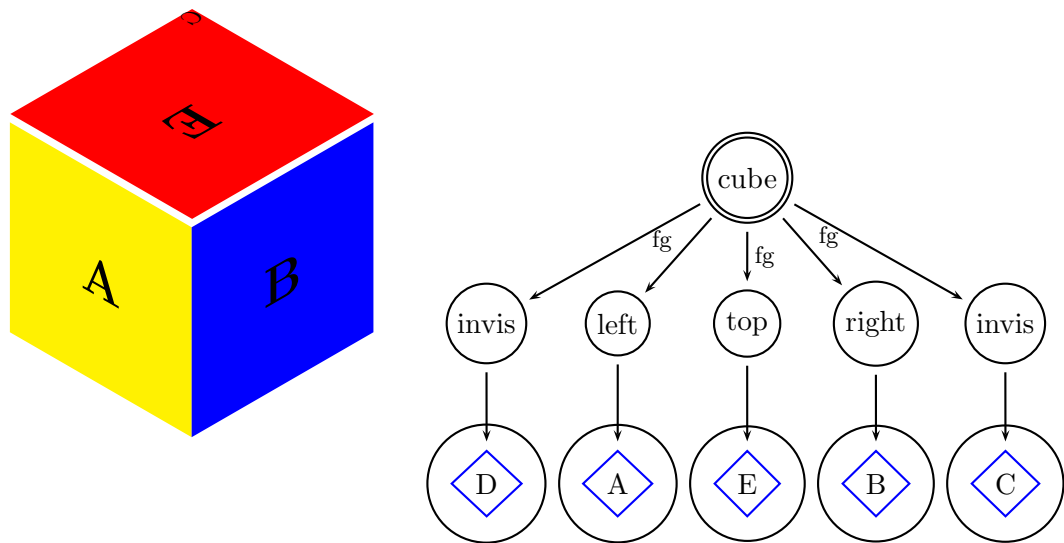


Fig. 29.1: View of cube together with simplified cube frame representing that view. Links marked “fg” lead to foregrounded slots; slots marked “invis” are backgrounded. Faces D and C are out of view.

566 to new frame states. A frame also included a set of *participants* whose sta-
 567 tus changed under these operations; those moving into certain distinguished
 568 slots are *foregrounded*. Thus, for example, in the simplified version of Min-
 569 sky’s *cube frame*, shown before and after a rotation in figures 29.1 and 29.2,
 570 a frame state encodes a particular view of a cube and the participants are
 571 cube faces. One possible operation is a rotation of the cube, defined to place
 572 new faces in certain view-slots, and move old faces out and possibly out of
 573 view. The faces that end up in view are the foregrounded participants of the
 574 resulting frame state. Thus the cube frame offers the tools for representing
 575 particular views or *perspectives* on a cube, together with the operations that

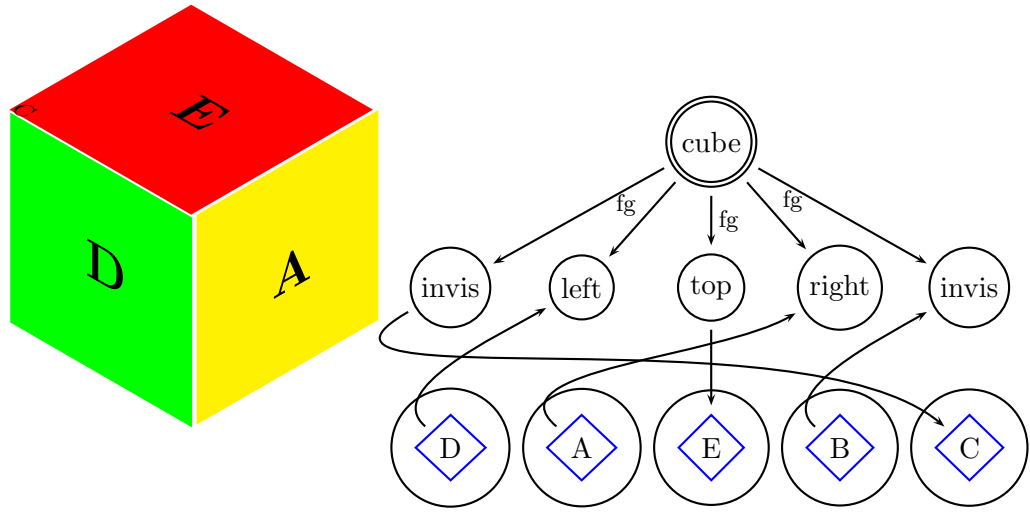


Fig. 29.2: Cube frame after counterclockwise rotation. Faces D and A are now foregrounded, B has moved out of view.

576 may connect them in time.

577 Fillmore's innovation, then, was to apply this Minskian idea in the do-
 578 main of word meaning, importing not only the idea of chunked modular
 579 knowledge units, but also the idea of operations that take perspectives on
 580 such chunks. I used the terms profiling and perspectivalization to describe
 581 such operations in section 2. Although Fillmore himself does not attempt a
 582 formalization of these operations, I believe it is possible to clearly describe
 583 what is at issue using some ideas from event semantics (Davidson 1967, 1980,
 584 Parsons 1990), building on the event-based approach to frames in Gawron
 585 (1983).

586 4. Events, profiling, and perspectivalization

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

591 A rather natural account of the interface between frames and composi-
592 tional semantics becomes available if we make use of neo-Davidsonian event-
593 semantics (Davidson 1967, 1980, Parsons 1990). On a neo-Davidsonian ac-
594 count, we have, as the schematic semantics for *John bought the book on*
595 *sale*:

$$596 \quad \exists e[\text{buy}'(e) \wedge \text{agent}(e) = j \wedge \text{patient}(e) = b \wedge \text{on-sale}(e, b)]$$

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

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

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

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

613 (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**)

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

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

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

$$631 \quad (18) \quad \left[\begin{array}{ll} \text{AGENT PATIENT} & \\ \text{agent} & \mathbf{animate} \\ \text{source} & \mathbf{entity} \\ \text{goal} & \mathbf{entity} \\ \text{patient} & \mathbf{entity} \end{array} \right]$$

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

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

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

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

645 (19)
$$\left[\begin{array}{ll} \text{POSSESSION TRANSFER} & \\ \text{donor} & \mathbf{animate} \\ \text{possession} & \mathbf{entity} \\ \text{recipient} & \mathbf{animate} \end{array} \right]$$

646 Now both *give* and *acquire* will be defined in terms of the POSSESSION TRANS-
 647 FER frame, but *give* and *acquire* differ in that with *give* the *donor* becomes
 648 subject and with *acquire* the *recipient* does. (Compare the difference be-
 649 tween *buy* and *sell* discussed in section 2.2.)

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

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

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

(b) $agent \circ acquisition = recipient$

(c) $patient \circ acquisition = possession$

(d) $source \circ acquisition = donor$

657 The first line defines *acquisition* as a mapping from the sort **possession_**
658 **transfer** to the sort **agent_patient**, that is as a mapping from POSSESSION
659 TRANSFER eventualities to AGENT PATIENT eventualities. The mapping is
660 total; that is, each POSSESSION TRANSFER is guaranteed to have an AGENT
661 PATIENT eventuality associated with it. In the second line, the symbol \circ
662 stands for *function composition*; the composition of the *agent* function with
663 the *acquisition* function (written $agent \circ acquisition$) is the same function
664 (extensionally) as the *recipient* relation. Thus the filler of the *recipient* role
665 in a possession transfer must be the same as the filler of the *agent* role in the
666 associated AGENT PATIENT eventuality. And so on, for the other axioms.
667 Summing up AVM style:

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

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

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

671 With the *acquisition* and *donation* mappings defined, the predicates *give*

672 and *acquire* can be defined as compositions with *donation* and *acquisition*:

$$673 \quad \text{give}' = \text{POSSESSION TRANSFER} \circ \text{donation}^{-1}$$

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

674 donation^{-1} is an inverse of *donation*, a function from AGENT PATIENT even-

675 tualities to POSSESSION TRANSFERS defined only for those AGENT PATIENT

676 events related to POSSESSION TRANSFERS. Composing this with the POS-

677 SESSION TRANSFER predicate makes *give* a predicate true of those AGENT

678 PATIENT events related to possession transfers, whose agents are donors and
679 whose patients are possessions. The treatment of *acquire* is parallel but
680 uses the *acquisition* mappings. For more extensive discussion, see Gawron
681 (2008).

682 Summarizing:

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

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

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

693 (23)

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

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

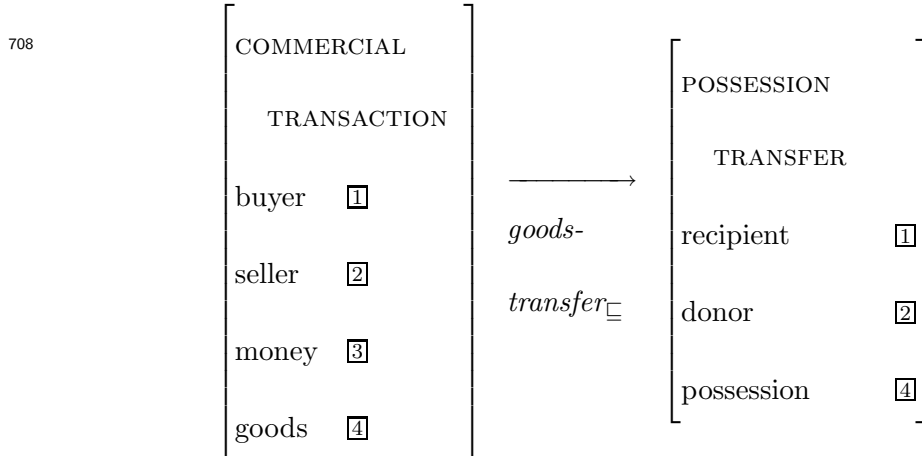
698 Our picture of profiling and perspectivalization can be extended to the
 699 more complex cases of commercial transaction predicates with one more
 700 composition. For example, we may define buy' as follows:

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

702 What this says is that the relation buy' is built in a series of steps, out of 3
 703 functions:

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

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



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

710
$$(acquisition \circ goods_transfer)^{-1}$$

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

712 4. COMMERCIAL TRANSACTION: a sortal predicate true of commercial
 713 transactions.

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

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

720 the function which determines subject and object — the perspectivalizing
721 function. The role of the the perspectivalizing function is to select a syntactic
722 realization.

723 A profiling function like *goods_transfer*: has two independent motiva-
724 tions:

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

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

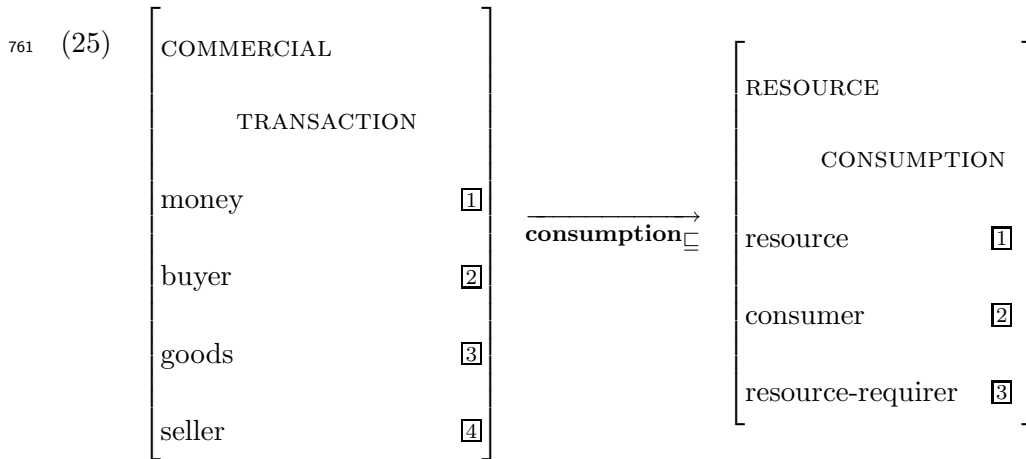
740 we derive an argument projection for commercial transactions.

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

743 There is an analogy between how profiling and perspectivalization work
744 and the way the original Minskyan frames work. A Minskyan frame enables
745 the integration of scene components in view with underlying objects by spec-
746 ifying, for example, how the faces of the cube in view relate to the cube as
747 a whole. A Fillmorian perspective enables the integration of the realized
748 elements of a text with an underlying text interpretation by specifying how
749 syntactically realized frame components relate to frames as a whole. In both
750 cases there are operations that mediate between rich representations and a
751 constrained (perspectivalized) representation that belongs to an external
752 representational system. Minskyan rotation operations mediate between 3D
753 representations and the 2D representations of a scene, ultimately necessary
754 because the human retina is a screen. Fillmorian profilings and perspecti-
755 valizations mediate between unlinearized representations in which there is
756 no fixed individuation of participants and linearizable argument structure,
757 ultimately necessary because the syntax of human language forces us to
758 linearize participants.

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

760 *spend*.



762 As discussed in section 2, the verb *spend* views a commercial transaction as
763 a RESOURCE CONSUMPTION, where RESOURCE CONSUMPTION is the frame
764 used by verbs like *waste*, *lose*, *use (up)*, and *blow*. The profiling of the verb
765 *spend* includes the seller and goods but leaves the seller out. The profiling of
766 the verb *sell* includes the buyer and the goods, as well as the seller. The two
767 subscenes overlap in participants but choose distinct, incompatible event
768 types, which lead to distinct realization possibilities in the syntactic frame.

769 The frame-based picture of commercial transactions is schematized in
770 figure 29.3.

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

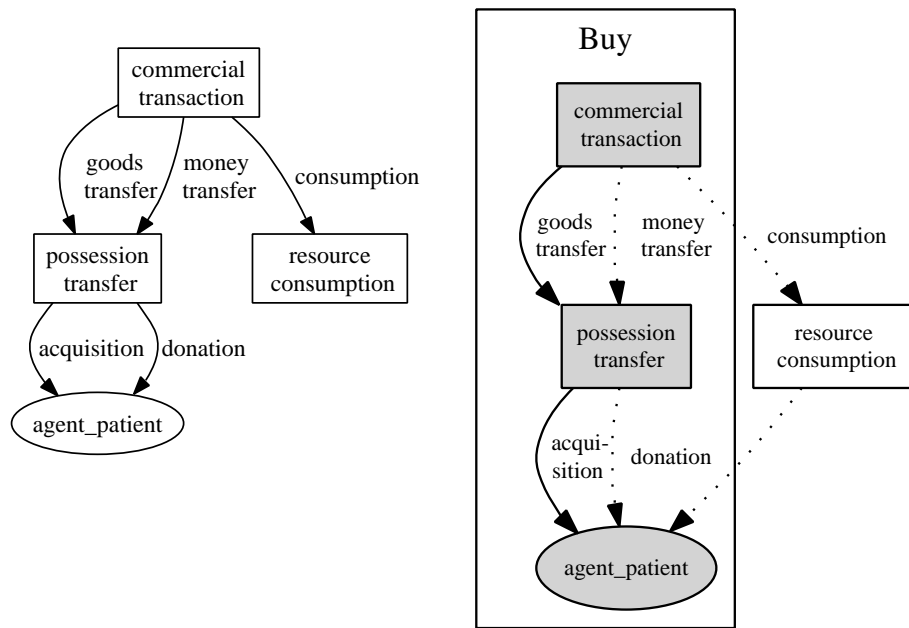


Fig. 29.3: Left: Lexical network for COMMERCIAL TRANSACTION. Right: Same network with the perspectivalization chosen by *buy* in the boxed area.

774 its definitions are linked by solid lines; the functions left out are in dashes;
775 the boxed regions contains those frames that are used in the definition. If
776 as is suggested in article 108 (Kelter & Kaup) *Conceptual knowledge, cate-*
777 *gorization, and meaning*, concepts and word meanings need to be different
778 knowledge structures, the picture in figure 29.3 may provide one way of
779 thinking about how they might be related, with the frame nodes playing
780 the role of concepts and a configuration of links between them the role of a
781 word meaning.

782 We have called *goods_transfer* and *consumption* profiling functions. We
783 might equally well have called them *subscene roles*, because they are func-
784 tions from events to entities. Note that subscene roles don't attribute a
785 fixed hierarchical structure to a frame the way DO ... CAUSE BECOME .. in
786 Dowty's system attributes a fixed structure to causatives of inchoatives. As
787 these examples show, a frame may have subscene roles which carve up its
788 constituents in incompatible ways. Now this may seem peculiar. Shouldn't
789 the roles of a frame define a fixed relation between disjoint entities? I sub-
790 mit that the answer is no. The roles associated with each sort of event
791 are regularities that help us classify an event as of that sort. But such
792 functions are not guaranteed to carve up each event into non-overlapping,
793 hierarchically structured parts. Sometimes distinct roles may select over-

794 lapping constituents of events, particularly when independent individuation
795 criteria are not decisive, as when the constituents are collectives, or shape-
796 less globs of stuff, or abstract things such as events or event types. Thus we
797 get the cases discussed above like *collide*, *mix*, and *risk*, where different ways
798 of profiling the frames give us distinct, incompatible sets of roles. We may
799 choose to view the colliders as a single collective entity (X and Y collided),
800 or as two (X collided with Y). We may choose to separate a figure from a
801 ground in the mixing event (14f), or lump them together (mix X and Y), or
802 just view the mixed substance as one (14f). Finally, risks involve an action
803 (13c) and a potential bad consequence (13a), and for a restricted set of cases
804 in which that bad consequence is a loss, a lost thing (13b).

805 What of relations? Formally, in this frame-based picture, we have re-
806 placed relations with event predicates, each of which is defined through some
807 composed set of mappings to a set of events that will be defined only for
808 some fixed set of roles. Clearly, for every lexical predicate, there is a corre-
809 sponding relation, namely one defined for exactly the same set of roles as the
810 predicate. Thus in the end the description of the kind of lexical semantic en-
811 tity which interfaces with the combinatorial semantics is not very different.
812 However the problems has, I believe, been redefined in an interesting way.
813 Traditionally, discussion of the lexical-semantic/syntax interface starts with

814 a relation with a predefined set of roles. This is the picture for example,
815 that motivates the formulation of Chomsky's (1981) Θ -Criterion. However,
816 a major point of frame semantics is that, for many purposes, it is useful to
817 look at a set of relations structured in a particular way. This is the domain
818 of frames.

819 **5. Lexicography**

820 A word about the application of frames to lexicography is in order. Any set
821 of frames imposes a certain classificational scheme on the lexicon. Other ex-
822 amples of such a classificational scheme are Roget's Thesaurus, Longman's
823 valence classes, and Wordnet (Fellbaum 1998). Frames differ from all three
824 in that they are not primarily oriented either to the task of synonym-classes
825 or syntactic frame classes. One expects to find synonyms and antonyms in
826 the same frame, of course, and many examples of valence similarity, but
827 neither trend will be a rule. As we saw in section 2, near synonyms like *land*
828 and *ground* may belong to different frames, and understanding those frames
829 is critical to proper usage. As we saw in our investigations of profiling and
830 perspective, differences of both kinds may result in very different valence
831 options for verbs from the same frame. The value of the frame idea for lex-
832 icography is that it seems the most promising idea if the goal is to organize

833 words according to usage. This of course is a hypothesis. FrameNet (Fill-
834 more & Baker 2000) is a test of that hypothesis. Accordingly, frame entries
835 are connected with rich sets of examples gleaned from the British National
836 Corpus illustrating frame element realizations in a variety of syntactic con-
837 texts. Interested readers will find a tour of the web site far more persuasive
838 than any discussion here.

839 **6. Discourse understanding**

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

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

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

848 It is at least arguably the case that this contrast can be made without the
849 help of a lexical stipulation. If movement can be a default or at least a
850 highly prototypical way of breaking something, and not a highly prototypi-

851 cal way of killing something, then something like the default logic of Asher
852 & Lascarides (1995) or abduction as in Hobbs et al. (1993), both of which
853 have been applied successfully to a number of problems of discourse inter-
854 pretation, could infer causality in (a) and not in (b). However, this still
855 falls somewhat short of predicting the genuine oddity of (b). Notice, too,
856 that when discourse coherence alone is at issue, both causality inferences go
857 through:

- 858 (27) a. The glass was hurled against the wall and broke.
859 b. The cockroach was hurled against the wall and died.

860 Thus the defaults at play in determining matters of “valence” differ from
861 those in discourse. We can at least describe the contrasts in (26) — not
862 explain it — by saying movement is an optional component of the breaking
863 frame through which the denotation of the verb *break* is defined, and not a
864 component of the killing frame; or in terms of the formal picture of section
865 4: Within the conventional lexical network linking frames in English there
866 is a partial function from breaking events to movement subscenes; there is
867 no such function for killing events.

868 In contrast Fillmore’s (1985: 232) discussed in section 2.1:

- 869 (28) We never open our presents until morning.

870 The point of this example was that it evoked Christmas without containing
871 a single word specific to Christmas. How might an automatic interpretation
872 system simulate what is going on for human understanders? Presumably by
873 a kind of application of Occam's razor. There is one and only one frame
874 that explains both the presence of presents and the custom of waiting until
875 morning, and that is the Christmas frame. Thus the assumption that gets
876 us the most narrative bang for the buck is Christmas. In this case the frame
877 has to be evoked by dynamically assembling pieces of information activated
878 in this piece of discourse.

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

884 **7. Conclusion**

885 The logical notion of a relation, which preserves certain aspects of the lin-
886 earization syntax forces on us, has at times appeared to offer an attractive
887 account of what we grasp when we grasp sign meanings. But the data we
888 have been looking at in this brief excursion into frame semantics has pointed

889 another way. Lexical senses seem to be tied to the same kind schemata that
890 organize our perceptions and interpretations of the social and physical world.
891 In these schemata participants are neither linearized nor uniquely individ-
892 uated, and the mapping into the linearized regime of syntax is constrained
893 but underdetermined. We see words with options in what their exact par-
894 ticipants are and how they are realized. Frames offer a model that is both
895 specific enough and flexible enough to accommodate these facts, while of-
896 fering the promise of a firm grounding for lexicographic description and an
897 account of text understanding.

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