The Lexical Semantics of Verbs III:
Semantic Determinants of Argument Realization

1   Background: How aspect has been said to figure in argument realization

Starting with Hopper & Thompson's (1980) work on transitivity, aspectual notions have increasingly been included among semantic determinants of argument realization, even if different researchers cite different, though overlapping, aspectual notions, including measure, delimiter, incremental theme, telicity, and accomplishment.

1.1   The basic claim: Aspect is what matters

• "Aspect, or event structure, is that part of a verb's meaning which is relevant for its interface with the syntax." (Arad 1998:59)

• Tenny (1987, 1994) proposes a strong and explicit role for aspect in argument realization.

(1)   THE ASPECTUAL INTERFACE HYPOTHESIS: The universal principles of mapping between thematic structure and syntactic argument structure are governed by aspectual properties. Constraints on the aspectual properties associated with direct internal arguments [=underlying objects], indirect internal arguments [=other arguments within VP], and external arguments [=underlying subjects] in syntactic structure constrain the kinds of event participants that can occupy these positions. Only the aspectual part of thematic structure is visible to the universal linking principles. (Tenny 1994:2)

1.2   Phenomena supporting the claim that aspect matters

• Hopper & Thompson (1980) list "telicity" and "punctuality" as transitivity components.

• Aspectual notions, particularly telicity, are implicated in unaccusative diagnostics
    (e.g., Centineo 1986; Dowty 1991; Van Valin 1990; Zaenen 1993), passive nominals
    (e.g., Fellbaum 1987; Tenny 1987, 1994), middle formation (e.g., Tenny 1987, 1994).

• van Hout (1996) proposes that many argument realization alternations are instances
    of event type-shifting—i.e., aspectual reclassification.

— Alternations between direct object and oblique realizations reflect alternations
    between telic and atelic uses of verbs (conative and accusative/partitive alternations);
— Alternate choices of direct object reflect alternate choices of argument which determines
    a sentence's telicity, i.e., incremental theme or measure (locative alternation).

(2)   Conative alternation: Taylor ate the apricot/Taylor ate at the apricot.

(3)   Locative alternation: Sam loaded the hay on the truck/loaded the truck with hay.

- Some studies (e.g., Ackerman & Moore 1999, 2001; Arad 1998) associate telicity with accusative case, citing accusative/partitive alternations associated with telicity shifts in Finnish and Estonian, as well as the use in some languages of oblique rather than accusative case for the second argument of atelic verbs.

- Dowty (1991) includes "incremental theme" among his Proto-Patient entailments; these, in turn, determine the most likely object, as well as unaccusative behavior. The INCREMENTAL THEME is the element involved in defining a homomorphism from properties of an argument to properties of the event it participates in.

1.3 Proposals about how aspect matters

- Verkuyl (1993) proposes a compositionality principle, the Plus Principle, which has the effect of requiring objects to contribute to bounding an event; as a result, basically atelic transitive verbs such as *push* must be analyzed as not being true transitives.

- More generally, a range of studies propose that direct object position is tied to a range of related aspectual notions, including telicity (Ritter & Rosen 1998; Sanz 1999; Slabakova 1998, 2001; Van Hout 1996), incremental theme (Rothstein 2000), measure (Tenny 1992, 1994), subject of result (Borer 1998), or subject of quantity (Borer 2005).

- A line of recent work even syntacticizes event structure (e.g., Arad 1998; Borer 1998; Erteschik-Shir & Rapoport 1997; Ritter & Rosen 1998; Slabakova 1997), motivating syntactic structure based on aspectual considerations: the inclusion of explicit Aspect or Event Phrases among functional realizations (e.g., Borer 1998, 2005; McClure 1993; Ramchand 1997; Travis 1991, 1999) or the association of AgrO with delimitation or telicity (e.g., Ritter & Rosen 1998; van Hout 1996). See Rosen (1999) for discussion.

THE NEXT STEP: Assessing the merits of claims that aspectual notions are determinants of argument realization and show they are problematic.

2 Uniformity in argument realization is not aspectual uniformity: Evidence from change of state verbs

The types of phenomena reviewed in section 1 have prompted theories of argument realization that incorporate the assumption that argument realization is aspectually driven.

A SOURCE OF EVIDENCE REGARDING THE VALIDITY OF THIS ASSUMPTION:
The argument realization properties of change of state (COS) verbs, especially when compared with those of aspectually-related verbs.

THE BOTTOM LINE: Verbs lexicalizing a change of state show uniform argument realization options, but do not show uniform aspectual properties.

COS verbs show a distinct argument realization pattern (Fillmore 1970, 1977; Levin 1993); it holds whether they are necessarily telic (e.g., *break*) or either telic or atelic (e.g., *dim*).

THE CRUCIAL PROPERTY:
The patient—the entity undergoing the change of state—MUST be realized and CAN ONLY be realized as a direct object.

• The patient must be realized: COS verbs aren't found with unspecified objects, nor with direct objects that are not patients—e.g., in nonsubcategorized NP resultatives or with *out*-prefixation.

(4)   * Pat broke/dimmed.

(5)   a.   * My kids broke me into the poorhouse.
      b.   * The stagehand dimmed the scene dark.

(6)   a.   * The two-year old outbroke the three-year old.
      b.   * The stagehand outdimmed the director.

• The patient must be realized as the direct object: It cannot be realized as an oblique, nor do these verbs participate in object alternations.

(7)   a.   Alex broke the vase
      b.   * Alex broke at the vase.

(8)   a.   Sam dimmed the lights
      b.   * Sam dimmed at/from the lights.

(9)   a.   Kelly broke my arm
      b.   * Kelly broke me on my arm. (cf. Kelly hit me on the arm)

(10) a.   Sam broke the fence with the stick.
      b.   Sam broke the stick against the fence. (not a paraphrase of (a))

• No other argument can be direct object, even when having an entailment (e.g., change of location) often associated with direct objecthood.

(11) a.   Sam broke the fence with the stick. (fence breaks; stick moves)
      b.   Sam broke the stick against the fence. (stick breaks; stick moves)

(12) a.   Sam hit the fence with a stick.
      b.   Sam hit a stick against the fence. (Fillmore 1977:75)

ASPECTUAL CHARACTERISTICS OF COS VERBS:
COS verbs lack a uniform aspectual characterization in terms of the traditional aspectual
      notions of telicity and punctuality.
When they take a definite, singular object, they can be necessarily telic or atelic,
      as well as telic and either punctual or durative.

(13) a.   NECESSARILY TELIC COS VERBS: break, dry, explode, flatten, shatter
             ATELIC/TELIC COS VERBS: cool, darken, dim, widen
      b.   PUNCTUAL COS VERBS: break, crack, explode, shatter
             DURATIVE COS VERBS: cool, darken, ripen, melt, widen

CONCLUSION: COS verbs share a constrained set of argument realization possibilities, but aren't uniform aspectually. Therefore, traditional lexical aspectual classification alone does not determine argument realization.

3 Further investigation of the contribution of aspect to argument realization: Verbs with incremental themes aren't uniform in argument realization

A COMMON CURRENT PROPOSAL: The aspectual notion relevant to argument realization is "incremental theme" (Dowty 1991) or one of its relatives (e.g., measure, subject of quantity).

PROBLEMS WITH THE INCREMENTAL THEME HYPOTHESIS:
The patient of a COS verb can be viewed as "incremental theme"; however, a comparison of COS verbs with other incremental theme verbs suggests it is not the patient in its aspectual role which determines the characteristic argument realization profile of these verbs.

3.1 Comparison with traditional incremental theme verbs

(14)   TRADITIONAL INCREMENTAL THEME VERBS: read, build, write, drink, eat, . . .

THE CRUCIAL DIFFERENCE:
Traditional incremental theme verbs systematically lack the argument realization properties characteristic of COS verbs: They are more flexible in the options they allow.
— Verbs of consumption (e.g., *eat, drink*)
— Verbs of creation (e.g., *build, draw, write*)
— Representation-source theme verbs (Dowty 1979, 1991; e.g., *copy, memorize, recite*).

• Their incremental theme need not be realized; they permit unspecified objects and
   allow nonsubcategorized NPs as direct objects, in resultative constructions or via *out*-prefixation.

(15)   Dana read/ate/wrote.

(16)   a.   The teacher read us into a stupor.

   b.   My kids ate me into the poorhouse.

   c.   I wrote myself out of a job.

(17)   Pat outread/outate/outwrote Chris.

• The argument normally considered the incremental theme need not be realized as direct object,
   though it is then no longer an incremental theme.

(18)   a.   Dana read the book./Dana read from the book.

   b.   Chris ate the apple./Chris ate from/of the apple.

   c.   I wrote my book./I wrote at my book.

(NOTE: Potential—or latent (Tenny 1992)—incremental theme verbs fit this pattern (RH&L 2005). This class is exemplified by surface contact verbs (e.g., *wipe, rub, scratch, comb, sweep, shovel*); their "normal" object is a "location" (Fillmore 1970) or "force recipient" (Croft 1991, RH&L 2001): Their object may be analyzed as an incremental theme or not, even when quantized.)

3.2 The upshot of the COS/traditional incremental theme verb comparison

• The distinctive argument realization profile of COS verbs is specific to this verb class and does not generalize to other classes which are given parallel aspectual semantic analyses.

• Specifically, there must be more than the patient of a COS verb's aspectual role as "incremental theme" which determines the characteristic argument realization profile of these verbs.

4 Towards a comparative assessment of the causal and aspectual approaches: Dowty's (1991) proto-role entailments

Dowty's proto-roles provide a good domain for assessing the relative contribution of aspectual and causal approaches to argument realization, as both types of notions figure in their characterization.

Dowty characterizes the semantic determinants as lexical entailments that a verb imposes on its arguments by virtue of the part they play in the event the verb describes. Building on this idea, he posits two proto-roles, each associated with its own set of lexical entailments.

The entailments making up the proto-roles are among the best known sets of semantic determinants of argument realization; furthermore, they include many commonly posited semantic determinants.

The Agent proto-role—or Proto-Agent—includes properties that figure in typical descriptions of the traditional "agent" role; the Patient proto-role—or Proto-Patient—includes properties that figure in descriptions of the "patient" role, with the exception of the aspectual notion "incremental theme".

(19) Contributing properties for the Agent Proto-Role (Dowty 1991:572, (27)):
— volitional involvement in the event or state
— sentience (and/or perception)
— causing an event or change of state in another participant
— movement (relative to the position of another participant)
— (exists independently of the event named by the verb)

(20) Contributing properties for the Patient Proto-Role (Dowty 1991:572, (28)):
— undergoes change of state
— incremental theme
— causally affected by another participant
— stationary relative to movement of another participant
— (does not exist independently of the event, or not at all)

Proto-Agent and Proto-Patient figure in subject and object selection, respectively. The contributing properties of each one can be seen as semantic determinants of subjecthood and objecthood.

Proto-roles avoid many of the problems that plague semantic roles as they are prototype notions.

4.1 Basic properties of proto-roles

These sets of entailments "unpackage" the content of the traditional notions "agent" and "patient" into more basic components. They contribute to the degree to which an argument can be understood as an agent or a patient without being jointly necessary and sufficient in defining either of these notions or in determining their syntactic realization as subject or object.

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Thus, proto-roles overcome problem of unclear boundaries facing traditional semantic roles.

• An NP that meets most, if not all, the criteria for either Proto-Agent or Proto-Patient corresponds to a "good" example of the relevant role, as in *Brutus assassinated Caesar.*

• Examples satisfying only one entailment of each proto-role to the exclusion of the others:

(21)   a.   the subject of *John sees/fears Mary* only possesses the sentience Proto-Agent entailment (Dowty 1991: 572, (29b))

      b.   the object of *John erased the error* only possesses the change of state Proto-Patient entailment (Dowty 1991: 572, (30a))

• Some pairs of subject NPs or object NPs have no shared proto-role entailments at all.

• A single NP may have some Proto-Agent and some Proto-Patient entailments.

AN EXAMPLE: the object of *frighten* psych-verbs with a change of state interpretation has the Proto-Agent entailment of sentience and the Proto-Patient entailment of undergoing a change of state (Dowty 1991: 579–80).

• An argument of a verb need not be associated with any of these entailments (though presumably every argument is associated with some entailment by its verb).

4.2   Proto-role entailments in argument realization

(22)   ARGUMENT SELECTION PRINCIPLE: In predicates with grammatical subject and object, the argument for which the predicate entails the greatest number of Proto-Agent properties will be lexicalized as the subject of the predicate; the argument having the greatest number of Proto-Patient entailments will be lexicalized as the direct object. (Dowty 1991:576, (31))

(23)   COROLLARY 1: If two arguments of a relation have (approximately) equal numbers of entailed Proto-Agent and Proto-Patient properties, then either or both may be lexicalized as the subject (and similarly for objects). (Dowty 1991:576, (32))

(24)   COROLLARY 2: With a three-place predicate, the nonsubject argument having the greater number of entailed Proto-patient properties will be lexicalized as the direct object and the nonsubject argument having fewer entailed Proto-Patient properties will be lexicalized as an oblique or prepositional object (and if two nonsubject arguments have approximately equal numbers of entailed P-Patient properties, either or both may be lexicalized as direct object). (Dowty 1991:576, (33))

• AN EXAMPLE: Subject/object selection in *Chris built a house* (Dowty 1991: 577)

(25)   a.   *Chris* is subject: volition, sentience, causation, movement, independent existence Proto-Agent entailments, but no Proto-Patient entailments.

      b.   *a house* is object: Proto-Patient entailments of change, causally affected, incremental theme, stationary, dependent existence, but no Proto-Agent entailments.

• An explanation for the existence of psych-verb doublets such as *fear* and *frighten*

(26)   Two classes of psych-verbs:

      a.   Experiencer-subject *fear* verbs: My cousin fears spiders.

      b.   Experiencer-object *frighten* verbs: Spiders frighten my cousin.

On their stative use, verbs of both types have a Proto-Agent entailment associated with both
      their stimulus and experiencer arguments: sentience/experiencer and causation/stimulus.
As no other proto-role entailments distinguish between the arguments of these verbs,
      the argument selection principle doesn't unambiguously determine subject and object.
Two pairings are compatible with these rules: (i) experiencer/subject and stimulus/object
      and (ii) stimulus/subject and experiencer/object
Appropriate pairing is determined verb-by-verb or, possibly, language-by-language.
      (Dowty 1991:579-580, 586-587)

Another property of psych-verbs also follows on Dowty's approach:
Most *frighten* verbs show a nonstative change of state reading, as well as the stative meaning.
When the experiencer is entailed to undergo a change of state, it is associated with a Proto-
      Patient entailment, creating an asymmetry between the experiencer and stimulus,
      which forces the experiencer to be selected as object.

(27)   a.   Nonstative change of state reading: The loud noise frightened me.

      b.   Stative reading: Ghosts frighten me.

4.3   Do all proto-role entailments contribute equally?

Dowty's proposal assumes no priorities among proto-role entailments in argument realization; it is simply the number of entailments that counts.

Yet, Dowty himself acknowledges that perhaps not all proto-role entailments contribute equally to subject and object selection. In fact, there is empirical evidence that this is so.

The priorities that emerge illuminate the respective contribution of the causal and aspectual approaches to argument realization.

4.4   Causers have priority in subject selection

There is evidence that one Proto-Agent entailment is more important than the others in subject selection: causation outranks the other Proto-Agent entailments (Davis & Koenig 2000:75-76): if an argument has the causer entailment, it is subject.

(28)   "… for all verbs that denote causal events, the only proto-agent entailment that we need to
      consider is whether the participant causally affects another participant in the event. … Sim-
      ilarly, among non-causative verbs, sentience is sufficient to ensure mapping to subject …
      Volitional involvement in the event is also sufficient to ensure mapping to subject position in
      non-causative verbs. Finally, for all verbs for which being in motion counts as a proto-agent
      entailment, the NP denoting the moving object is mapped onto subject position."
      (Koenig & Davis 2001:82-83)

• In languages with productive morphological causatives, the introduced causer is invariably the causative subject, regardless of the causee's Proto-Agent entailments (e.g., sentience, volition).

(29)   a.   Ha-b'dixa   hicxika   oti.
                the-joke   laugh.CAUS   I.ACC
                'The joke made me laugh.' (Hebrew)

       b.   Uutinen   puhu-tt-i   nais-i-a   pitkään.
                news.item   talk-CAUS-PAST woman-PL-PART   long-ILL
                'The news made the women talk for a long time.'
                (Finnish; Davis & Koenig 2000:75, (26))

• Causation also takes priority over the Proto-Agent entailment, sentience:
    a sentient participant is subject only when there is no causer (Dowty 1991).

(30)   a.   The toddler (*deliberately) feared the lion.

       b.   The lion (deliberately) frightened the toddler.

• And causation again takes priority over the Proto-Agent entailment, motion:
    a moving participant is subject only when there is no causer (Dowty 1991).

(31)   a.   The train passed/crossed the border.

       b.   The wind blew the napkin off the table.

• Also relevant is Tsunoda's (1985) observation that accidental killing is as effective as intentional killing: the killer is the causer whether or not the killing is volitional.

WHY SHOULD CAUSATION OUTRANK OTHER PROTO-AGENT ENTAILMENTS?

Causative verbs (e.g., *break*, *kill*) have been attributed a complex event structure (Dowty 1979, McCawley 1971, Morgan 1969, von Stechow 1995, 1996).

(32)   [[x ACT] CAUSE [BECOME [y *<STATE>*]]]

When a two-argument verb has a complex event structure, comprised of one event embedded in a second, an argument of the higher event is less embedded than an argument of the lower event and should be more prominent semantically and, thus, also syntactically.

Causers have priority as subjects due to the structure of event structure.

4.5   Entities that change state have priority in object selection

• The same idea could be carried over to Dowty's Proto-Patient entailments and object selection: Among these entailments, "changes state" outranks the others in determining objecthood.

— A stationary entity cannot be the object in the presence of an entity that changes state.

(33)   a.   Pat broke the bat against the window.
           (window is stationary and does not change state; bat changes state)

        b.   Pat broke the window with a bat.
           (window is stationary, but does change state)

(34)   The parade passed the queen's window.
       (window is stationary; no argument changes state)

— An entity that changes state has priority in object selection over an entity that is simply affected, but does not necessarily change state.

(35)   Pat broke the bat against the window.
       (window is causally affected, but may or may not change state; bat changes state)

— Hard to evaluate the place of "incremental theme" as it is hard to separate from a change of state.

• Localist theories conceptualize changes of state as changes of location (Gruber 1965, Jackendoff 1976, 1983), but an entity lexically entailed to undergo a change of state MUST be the direct object, while an entity lexically entailed to undergo movement CAN be an object, but need not be.

EVIDENCE: A moving entity can't be object in the presence of an entity that changes state.

(36)   a.   Pat broke the window with a bat.
           (bat moves, but does not change state; window changes state)

        b.   Pat broke the bat against the window.
           (bat moves and changes state; window may or may not change state)

(37)   a.   Pat hit the window with a bat.
           (bat moves; window may or may not change state)

        b.   Pat hit the bat against the window.
           (bat moves; window may or may not change state)

(38)   The waiter filled the glass with water./*The waiter filled water into the glass.
       (glass changes state; water moves)

• Object alternations are only found with means/manner verbs, presumably, another reflection of the necessary association of entities that change state with objecthood.

4.6 Identifying asymmetric relations between arguments

Subject and object selection implicitly involves imposing (semantic) prominence relations on pairs of arguments and the contributing properties of Dowty's proto-roles implicitly point to a way of doing this.

PAIRING OF ENTAILMENTS: Some Proto-Agent and Proto-Patient properties come in pairs.
    (Dowty 1991:574, Croft 1998:37, Koenig & Davis 2001:83, Primus 1999:52-53):

(39) a. Proto-Agent "causing an event or change of state in another participant"
          and Proto-Patient "undergoes change of state"

     b. Proto-Agent "movement (relative to the position of another participant)"
          and Proto-Patient "stationary relative to movement of another participant".

     c. Proto-Agent "exists independently of the event named by the verb"
          and Proto-Patient "does not exist independently of the event, or not at all".

Paired entailments identify participants in a semantic relation. In each pair the Proto-Patient entail-ment is dependent on the Proto-Agent entailment. Thus, they reflect an asymmetric relation between event participants, and, thus, implicitly define a ranking of arguments (Primus 1999).

What is the nature of the semantic relation defining the pairings?
Primus (1999:36-37) sees the pairings as entailments of a more general "control" relation;
          a similar idea is introduced by Davis & Koenig (2000:73):

> "Finally, note that although it is difficult to provide a unifying characterization for each set of entailments, the ACTOR entailments relate to initiating an event and affecting other participants, while the UNDERGOER entailments typify affected participants. The entailments characteristic of the ACTOR attribute might then reduce to a general entailment roughly paraphrasable as 'has control over the unfolding of the situation'"

This notion is reminiscent of "asymmetric force transmission".

A relation of control could help impose a ranking on pairs of arguments and thus determine
          subject vs. object realization where event structure alone is insufficient.

Other researchers tend to state semantic determinants in terms of a series of oppositions that can be used in subject and object assignment (Mohanan 1994:28, Fillmore 1977:102).

What is particularly interesting is that the semantic notions they make reference to overlap consid-erably with Dowty's proto-role entailments, with incremental theme being the major omission.

(40) FILLMORE'S SALIENCY HIERARCHY:

     a. An active element outranks an inactive element.

     b. A causal element outranks a noncausal element.

     c. A human (or animate) experiencer outranks other elements.

     d. A changed element outranks a nonchanged element.

     e. A complete or individuated element outranks a part of an element.

     f. A 'figure' outranks a 'ground'.

     g. A 'definite' element outranks an 'indefinite' element.

     (Fillmore 1977:102)

(41) a. ... since every sentence has to have a subject, the scene entity that has the highest rank will be realized as the subject ...

     b. If it is a verb that can take either of two things as direct object, the one that outranks the other on the Saliency Hierarchy wins out.

     (Fillmore 1977:102)

(42)   The intention is that this hierarchy is to be consulted in the order in which these statements are listed, Thus, an active element outranks everything else, a causal element outranks everything but an active element; and so on. (Fillmore 1977:102)

5   Conclusion

• Verb meanings are bipartite, consisting of an event structure, defining event type, associated with a root typed by ontological category, and these two, in turn, constrain argument realization.

• The means/manner vs. result verb dichotomy is important for understanding the organization of the verb inventories of languages, constraints on possible verb meanings, and possible argument realization options.

• Certain causal notions figure in argument realization, including "causative", "externally caused event" and "force recipient".

• Traditional aspectual classes of verbs do not constitute natural classes from the perspective of argument realization.

• Traditional aspectual notions, such as telicity, are still important, but their contribution is in
— the computation of entailments, e.g., those figuring in aspectual class diagnostics, and
— the assignment in some languages of morphological case to arguments (accusative/oblique),
      but not necessarily their grammatical function.

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