

On Dowty’s ‘Thematic Proto-roles and Argument Selection’

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Semantic roles appear to offer immense promise in the explanation of a wide range of linguistic phenomena, yet they also seem to consistently fall short of fulfilling this promise. The lure of semantic roles is reflected in the repeated attempts to formulate sets of semantic roles dating back to the Sanskrit grammarian Pāṇini and continuing to current automatic semantic role labelling efforts. Dowty’s first goal in ‘Thematic Proto-roles and Argument Selection’ is to underscore the severity of these shortcomings, pointing to problems inherent in the traditional discrete concept of semantic role. In the bulk of the paper, Dowty’s aim is constructive: to show a way forward using a revised, prototype conception of semantic role in a domain which has seemed particularly amenable to explanation in terms of traditional semantic roles, but has nevertheless proved recalcitrant: predicting the syntactic realization of a verb’s arguments. Dowty (1991:560–562) argues that success is most likely in a limited domain such as argument realization or, as he calls it, argument selection. Furthermore, if this domain can be conquered, it should provide a stepping stone to other domains of interest.

This commentary presents highlights of Dowty’s paper (Sect. 1), critically reviews its contributions and limitations (Sect. 2), and considers its impact and further developments (Sect. 3).¹ Given space considerations, I focus on the central contributions; facets of the paper that I just touch on include the critique of semantic roles (1991:553–559), the discussion of the formal foundations of semantic roles, which reviews Dowty (1989), and the discussion of psycholinguistic implications (1991:600–605).

1 Proto-roles and the Argument Selection Principle: An Overview

Traditionally, semantic roles (also known as thematic relations or participant roles) are labels associated with the arguments of a verb by virtue of their part in the event denoted by the verb (Fillmore 1968, 2003, Levin and Rappaport Hovav 2005:Chapter 2). Each traditional semantic role is taken to be an unanalyzable notion with a discrete definition which picks out a natural class of arguments with respect to linguistic generalizations. The set of roles chosen should be small enough to allow for the statement of strong generalizations, yet large enough that every argument of every verb can be assigned a role from the set. However, it has proved difficult to find a set that meets these desiderata, as Dowty (1991:553–559) forcefully reviews.

¹There are many critical discussions of Dowty’s paper; they include Croft (1998:36–38), Davis (2001:61–73), Davis and Koenig (2000:74–76), Grimm (2011:519–522), Koenig and Davis (2001:80–84), Levin and Rappaport Hovav (2005:51–65, 112, 150), Newmeyer (2002:67–71), Primus (1999:33–60), and Tenny (1994:101–105). For comparisons to other ‘generalized semantic role’ approaches (see Sect. 3), see Van Valin (1997:385–388). For further references to proto-roles — and semantic roles in general — see Levin (2013).

Against this backdrop, Dowty introduces a revised conception of semantic roles by focusing on a key problem in argument realization: given a transitive verb, what determines which argument is its subject and which its object? To answer this question, Dowty re-envisions the notions of agent and patient, the two traditional semantic roles most closely tied to subject and object, as collections of semantic properties which contribute to subjecthood and objecthood, respectively. Dowty calls each property cluster a proto-role, a name purposefully evoking the notion of prototype. Section 1.1 introduces the two clusters of proto-role properties, and Sect. 1.2 describes how they figure in argument realization.

1.1 The Proto-role Properties

Dowty takes a truth-conditional semantic perspective on the argument realization problem, building on earlier work (Dowty 1989) which appraises the notion of semantic role from such a perspective. A verb imposes entailments on each of its arguments by virtue of the part that argument plays in the event that it describes. These are ‘lexical entailments’ in that they follow from the meaning of the verb alone (1991:552); that is, they hold of all its uses and are not influenced by context. Dowty is interested in those lexical entailments which recur across many verbs and, among these, those that figure in subject and object selection. This goal leads him to identify the two clusters of properties in (1) and (2), which he claims are comprised of precisely such lexical entailments.² Dowty refers to the clusters as Agent Proto-role and Patient Proto-role properties — or, for short, Proto-Agent and Proto-Patient properties — since each cluster includes properties that commonly figure in definitions of the traditional agent and patient roles, respectively.

- (1) 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)

- (2) 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)

Given Dowty’s goals, the proto-roles include only recurring lexical entailments that bear on subject and object selection, whether or not they are pertinent to any traditional semantic role (1991:562). Indeed, the majority of the proto-role entailments overlap with

²Dowty (1991:552) notes some of the relevant properties might be presuppositions rather than entailments, but does not find it important to distinguish between the two. Following him, I simply refer to ‘entailments’.

notions referenced in definitions of semantic roles or mentioned in the literature as semantic determinants of argument realization (e.g., Fillmore 1977:102, Hopper and Thompson 1980, Lakoff 1977:245, Mohanan 1994:28). An exception is ‘incremental theme’.

Several properties deserve comment, although see Primus (1999:36–43) for extensive elaboration on all the proto-role properties. First, movement, since it involves a change, might have been expected to be a Proto-Patient entailment, yet ‘movement relative to the position of another participant’ is listed as a Proto-Agent entailment, with its counterpart ‘stationary relative to the movement of another participant’ listed as a Proto-Patient entailment.³ Dowty includes it to deal with transitive verbs like *cross*, *enter*, and *pass*, as in *The runner crossed the finish line*; he comments that ‘movement usually only counts as a relevant change of state when described as to or from a specific location’ (1991:574). Second, the notion of sentience involves more than being a sentient entity (1991:573); Dowty’s intent is perhaps well-captured by Wechsler’s (1995:35–40) ‘having a notion of’. Third, traditional semantic roles are not aspectual in nature, yet the incremental theme Proto-Patient entailment is. It holds of an event participant whose spatial extent defines a homomorphism with the progress of the event; it ‘measures out’ the event, to quote Tenny (1992, 1994). Its inclusion reflects the increased interest at the time that Dowty’s paper was published in grounding semantic determinants of argument realization aspectually, perhaps in part because aspectual notions seemed more amenable to rigorous, formal definition than traditional semantic roles.⁴ Fourth, both proto-role clusters include an entailment referencing independent existence, listed in parentheses. Dowty (1991:572), who adopts this entailment from Keenan (1976), uses this typographical device because he is unsure whether this entailment is actually relevant to the discourse associations of subject.⁵

As the labels suggest, Dowty takes each proto-role to be a concept with a prototype structure (Rosch 1973, Rosch and Mervis 1975). When a verb entails most, if not all, of the properties of either the Proto-Agent or the Proto-Patient of one of its arguments, then that argument corresponds to a ‘good’ example of the corresponding traditional role. For instance, the verb *assassinate* entails all the Proto-Agent entailments of its subject, and its subject is indeed considered an uncontroversial agent. An argument with only some entailments of a given proto-role would qualify as a less good example of the relevant role and might even be assigned another traditional role. For example, the perceiver argument of *see* or other perception verbs has the sentience Proto-Agent entailment, but lacks the volitionality and causer entailments (Dowty 1991:573); concomitantly, despite its realization as a subject, it is often said to be an experiencer rather than an agent. In fact, an argument of a verb need not be associated with any of the proto-role entailments at all (although presumably it is still associated with some entailment by its verb). Thus, an ar-

³As Dowty notes, in assessing whether the movement-related properties hold, it may be that a second object is only considered to ‘be ‘stationary’ with respect to the faster first object’s perspective’ (1991:573). That is, both event participants could be in motion (e.g., the verbs *overtake* or *pass*).

⁴For discussion of aspectual vs. causal conceptualizations of events and their contribution to argument realization see Levin and Rappaport Hovav (2005:Chapter 4).

⁵The notion of existence does not figure in most proposed semantic role lists. An exception is Fillmore, who recognizes a ‘factive’ (1968:25) or ‘result’ (1971:376) role assigned to ‘effected objects’, i.e. created entities. For discussion of whether effected objects are implicated in argument realization see Hopper (1985) and Martínez Vázquez (1998).

gument of a verb may have all, some, one, or none of the entailments from a given cluster. Further, it might even have entailments from both clusters. For example, the object of the experiencer-object psych-verb *frighten* has the Proto-Agent entailment of sentience and the Proto-Patient entailment of undergoing a change of state in its cause-a-change-of-state use (Dowty 1991:579–580). Arguments, then, can show ‘degrees of membership’ in a proto-role; thus, the problems of unclear boundaries and role fragmentation that plague traditional semantic roles are sidestepped.

Although the names ‘Proto-Agent’ and ‘Proto-Patient’ evoke traditional semantic roles, no argument is actually assigned either label; further, the labels themselves do not figure in any grammatical generalizations. Nevertheless, some subsequent work (Alsina 1996, Davis and Koenig 2000) does ‘reify’ the proto-roles, to use Davis and Koenig’s (2000:74, 75) term, treating certain arguments as if they were either a Proto-Agent or a Proto-Patient and stating generalizations that make reference to these labels.

Dowty’s approach offers insight into why traditional semantic roles emerge: these roles simply label certain recurring subsets of proto-role entailments (Dowty 1991:577). For instance, causation and movement without sentience correspond to the notion of instrument, while sentience without volition and causation defines an experiencer. Relatedly, the thematic hierarchy, which is often appealed to in the explanation of argument realization and other linguistic phenomena, also emerges from the proto-role clusters (Dowty 1991:578). Nested sets of Agent (or Patient) Proto-role entailments can be ranked according to the decreasing number of such entailments they encompass. That is, agent outranks experiencer because it has volition and causation entailments that an experiencer lacks, although both share sentience and independent existence. Further, the proto-role approach easily allows for the statement of generalizations of different grain-size: a generalization that makes reference to just one or two entailments will apply more broadly than one that makes reference to a larger number of entailments. However, this option is not available with a set of discrete semantic roles.

1.2 Proto-role Entailments in Argument Realization

Dowty takes a nonderivational approach to argument selection: argument selection reflects constraints on possible verb meanings. In particular, a verb must lexicalize a meaning consistent with his Argument Selection Principle. This principle states that for a given verb, the argument with the most Proto-Agent entailments is lexicalized as its subject, and the one with the most Proto-Patient entailments as its object (1991:576, (31)). For example, the verb *build* conforms to this principle since its subject has all the Proto-Agent entailments, but no Proto-Patient entailments, while its object has all the Proto-Patient entailments, but no Proto-Agent entailments (1991:577).

Since the Proto-Agent and Proto-Patient entailments figure in subject and object selection, respectively, the contributing properties of each qualify as semantic determinants of subjecthood and objecthood. The Argument Selection Principle, taken in conjunction with the entailments subsumed by the Proto-Agent and Proto-Patient, explains why arguments

which meet the traditional criteria for agent and patient are always subjects and objects, respectively, in active sentences, and, more generally, why verbs that describe an agent acting on and changing the state of a patient are invariably transitive across languages (Andrews 1985:68, DeLancey 1984, Dixon 1979:103, 1994:114-118, Hopper and Thompson 1980). However, on Dowty's approach there is no single determinant of subjecthood or objecthood. Arguments qualify as subjects precisely because they have Proto-Agent entailments, but the subject of one verb and the subject of a second could fail to share certain Proto-Agent entailments (and similarly for objects and Proto-Patient entailments). Independent existence aside, the subject of *fear* has the sentence Proto-Agent entailment, while the subject of *enter* has the entailment of movement with respect to another participant.

Dowty introduces two corollaries to the Argument Selection Principle. First, if the two arguments of a verb have roughly equal numbers of Proto-Agent and Proto-Patient properties entailed of them, then either may be the subject or alternatively the object (1991:576, (32)); that is, the verb exhibits 'argument selection indeterminacy' (1991:579–581). As support for this corollary, Dowty points to psych-verb doublets such as *fear* and stative *frighten*, which have the same semantic content but differ as to whether the stimulus is the subject and the experiencer is the object as with *frighten* or vice versa as with *fear*. The other corollary, which applies to three-argument verbs, states that the nonsubject argument with the greater number of Proto-Patient entailments is the direct object and the one with fewer Proto-Patient entailments is an oblique or a prepositional object (1991:576, (33)). Dowty supports this corollary through case studies of the verbs *break* and *hit*, as well as verbs manifesting the locative alternation and the *with/against* alternation.

Given the formulation of the Argument Selection Principle, the number of Proto-Agent properties entailed of an argument matters to subject selection, but not their identity (and similarly for Proto-Patient properties and object selection). Support for this prediction is provided by 'partially symmetric interactive predicates' (Dowty 1991:583–586). Such predicates show two argument realization options in English and many other languages. In the first, illustrated by (3a) and (4a), the verb has a collective or conjoined subject, while in the second, illustrated by (3b) and (4b), the verb takes a subject and either an object or oblique complement.

- (3) a. Smith and Jones debated.
 b. Smith debated Jones.
- (4) a. Smith and Jones talked.
 b. Smith talked with Jones.

Although the alternate argument realizations are truth-conditionally equivalent for *debate* and *talk*, they are not for verbs such as *hug* and *collide*. In the (b) sentences in (5) and (6) *Kim* has a Proto-Agent entailment that *Sandy* lacks, while in the (a) sentences, which have a conjoined subject, *Sandy* as well as *Kim* has this entailment. The exact entailment depends on the verb: volitionality in (5) and movement with respect to another participant in (6).

- (5) a. Kim and Sandy hugged.
 b. Kim hugged Sandy.
- (6) a. Kim and Sandy collided.
 b. Kim collided with Sandy.

This alternation, then, conforms to the Argument Realization Principle, but would be difficult to capture using a traditional all-or-nothing definition of agent.

Dowty (1991:605–613) further suggests that proto-role entailments provide insight into some of the challenges around the phenomenon of unaccusativity (Burzio 1986, Levin and Rappaport Hovav 1995, Perlmutter 1978, 1986, Sorace 2000). Dowty proposes that the core unaccusative verbs are those intransitive verbs that entail the incremental theme Proto-Patient entailment (or, more generally, telicity) of their subject, while the core unergative verbs are those intransitive verbs that entail the volition Proto-Agent entailment of their subject. Such verbs are consistently unaccusative or unergative across languages. The proto-role entailments offer insight into the crosslinguistic variation observed in the class membership of certain verbs (Rosen 1984, Sorace 2000). Many such verbs, which include *sneeze* and *snore*, describe eventualities which may or may not be construed as having a volitional argument; the verb’s classification, then, depends on whether it lexicalizes volitionality. Further, Dowty proposes that proto-roles offer insight into why unaccusative diagnostics differ as to the sets of verbs they pick out (Levin and Rappaport Hovav 1995, L. Levin 1986): such ‘unaccusative mismatches’ arise because different phenomena may be sensitive to distinct contributing properties of a particular proto-role.

2 Critical Comments

Most critical comments about Dowty’s paper address either the proto-role entailments or the Argument Selection Principle. I consider each in turn.

2.1 The Proto-role Entailments

The success of Dowty’s theory of argument selection depends to a large extent on the entailments it is built on. Dowty argues that a plus of his entailments is that they involve ‘distinctions in kinds of events found ‘out there’ in the real world’ (1991:575) that are ‘significant to human life’ (1991:575); they are notions that are salient beyond language independently identified in work in cognitive psychology and language acquisition. Dowty argues this property means ‘there is no reason to believe that all such classes must have discrete boundaries’ (1991:575). For instance, he suggests that sentience is a matter of degree, pointing to computers and intelligent animals (1991:574). For this reason, he (1991:575) argues that the proto-role entailments are not open to criticism in the way that unclear boundaries have made traditional semantic roles vulnerable to criticism.

Optimally, the entailments in each proto-role cluster would be expected to be independent of each other (cf. Wilks 1987:759 on primitive predicates). Indeed, Dowty (1991:572) cites verbs intended to show that his entailments meet this desideratum. For example, the object of *need* only has the lack of independence existence Proto-Patient entailment (1991:573–574, (30e)). Nevertheless, the entailments in each proto-role cluster are not all fully independent of each other. Dowty (1991:573) himself notes that the independent existence Proto-Agent entailment is presupposed by the other Proto-Agent entailments. Further, the volitionality and sentience Proto-Agent entailments overlap in that volitionality presupposes sentience: only sentient entities can be volitional (1991:607). Among the Proto-Patient entailments, ‘causally affected by another participant’ and ‘undergoes a change of state’ might overlap, depending on exactly how the notion of affectedness is understood. Does affectedness require a change of state in the relevant argument or is it a weaker notion of impingement, corresponding perhaps to the notion of force recipient (Rappaport Hovav and Levin 2001:786), inspired by causal chain models of events (Croft 1991)? As this example shows, it is not always clear precisely what Dowty intends by some of the entailments.

There are suggestions that certain entailments might be refined or that the sets of entailments might be amended. Davis and Koenig (2000:72) and Primus (1999:54–55) argue for the addition of paired Proto-Agent and Proto-Patient entailments related to possession to deal with *give* and comparable verbs. Ackerman and Moore (2001:89–127) argue for an additional Proto-Patient entailment, bounding entity, to handle accusative–partitive case alternations in Finnish and Estonian. Recent work on argument realization suggests that ‘undergoes change of state’ might be reformulated as ‘undergoes scalar change’, a notion which Rappaport Hovav (2008) and Rappaport Hovav and Levin (2010) argue is critical for objecthood. Grimm (2011:522) unifies the existence and change of state entailments, taking them to be two forms of a property he calls ‘persistence’. Further, some entailments, such as affectedness and causation, involve complex notions that can be broken down further (Grimm 2011:520).

Dowty’s inclusion of affectedness and incremental theme among the Proto-Patient entailments has inspired considerable discussion of these notions and the relation between them. Tenny (1994) argues that affectedness could be reduced to ‘measuring out’, a ‘cousin’ of incremental theme and that more generally, the Proto-Patient entailments follow from her Aspectual Interface Hypothesis (Tenny 1992:21–22). Beavers (2011) argues against Tenny’s position. He identifies several different degrees of affectedness which are characterized by ‘monotonically weakening truth conditions’ (2011:359), which he defines formally over scales of change.

As Dowty (1991:574) and others (Croft 1998:37, Koenig and Davis 2001:83, Primus 1999:52–53) note, three of the Proto-Agent properties are necessarily paired with Proto-Patient properties in that they identify event participants in an asymmetric semantic relation. For example, the Proto-Agent entailment ‘causing an event or change of state in another participant’ necessarily co-occurs with the Proto-Patient entailment ‘undergoes change of state’. In each pair the Proto-Patient entailment is dependent on the Proto-Agent entailment. Davis and Koenig (2000:73) and Primus (1999:352) see the relations instantiated in

the pairs as instances of a more general ‘control’ relation. That is, as Davis and Koenig (2000:73) propose, the Proto-Agent entailments ‘might then reduce to a general entailment roughly paraphrasable as ‘has control over the unfolding of the situation’’. Instead, Primus (2006:56–59) proposes that the dependencies can all be viewed as causal in nature, so the causation-related proto-role entailments are unnecessary. Recognizing dependence between entailments vitiates another criticism levelled at proto-roles: why the entailments cluster as they do rather than in some other way (Croft 1998:37, Tenny 1994:103). Grimm (2011:521–522) takes a different approach to these pairings. Rather than reducing them to a single more general relation, he reformulates Dowty’s entailments as privative oppositions in which properties of agents are taken as basic.

Some researchers recast additional traditional semantic roles as proto-roles. Primus (1999:54–55, 137–138) introduces a Recipient Proto-role to deal with phenomena involving ditransitive verbs, benefactives, and addressees. This proto-role combines Proto-Agent and Proto-Patient properties. Rissman and Rawlins (2017:532) propose that the notion of instrument is best understood as a proto-role rather than a traditional role. They identify two characteristic properties of instruments, intentionality on the part of the agent using the instrument and being ‘a direct extension of the force initiated by the agent’ (2017:532), but argue neither is necessary for instrumenthood. Their conclusions are interesting given that Schlesinger (1989, 1995) introduces an even broader notion, the C-role, a notion like a proto-role which subsumes the traditional instrument and comitative roles. Additionally, Barker and Dowty (1993) extend the notion of proto-role to the nominal domain; they propose there are two sets of lexical entailments that nouns may impose on their arguments, which they label Proto-Part and Proto-Whole. Going even further, Winter (2018) proposes an account of the partially symmetric interactive predicates discussed in Sect. 1.2 which builds on a notion of proto-predicate.

One advantage of proto-roles is that they involve ‘smaller’ meaning components than the traditional agent and patient roles. In fact, certain approaches to traditional semantic roles ‘unpackage’ their contents using a small set of meaning components — or features — which together define the set of possible roles (Reinhart 2001, 2002, 2016, Rozwadowska 1988, 1989). Interestingly, the best known of these approaches, Reinhart’s, uses two features, [c] (‘cause change’) and [m] (‘mental state’), which are reminiscent of Dowty’s causation and sentience Proto-Agent entailments. However, existing feature-based approaches still assume that each semantic role is defined by a specific, fixed combination of features; that is, they are not prototype-based. Thus, from Dowty’s (1991:574, 598–599) perspective they suffer from the same drawbacks as typical semantic role approaches.

Finally, as Dowty’s goal is simply to identify the facets of meaning that matter to argument realization, he does not concern himself with a particular theory of lexical semantic representation. Rather, he assumes that his approach is compatible with various approaches to such representations, and, in fact, some subsequent work grounds the proto-role entailments in predicate decompositions (Davis and Koenig 2000, Primus 1999). Since these decompositions often involve two-argument predicates, they provide an explanation for the existence of paired proto-role entailments.

2.2 Argument Selection

Dowty does not deal with changes in valence or voice that come about through morphosyntactic operations, yet a full theory of argument realization should. Even setting these aside, Dowty's Argument Selection Principle has a major limitation: it presupposes that a verb's transitivity is known before its application (Croft 1998:37, Davis 2001:64, Davis and Koenig 2000:74–75, Grimm 2011:520, Levin and Rappaport Hovav 2005:60, Primus 1999:47). That is, it simply determines which argument of a transitive verb is its subject and which its object. Yet, a theory of argument realization and its semantic determinants should make predictions about whether a two-argument verb is transitive in the first place.⁶ As mentioned in Sect. 1.2, agent-act-on-patient verbs are stably transitive across languages; however, although crosslinguistic variability is observed outside this semantic class as to whether a two-argument verb is transitive, verbs in certain semantic classes are more likely to be transitive across languages than those in others (Malchukov 2005, Tsunoda 1981, 1985, 2015). Tsunoda (1985:388–389) captures the systematic, though differential likelihood that the members of semantic classes of two-argument verbs figure among the transitive verbs of a language with an implicational hierarchy. In simplified form, it is: causative change of state verbs > surface contact verbs > perception/cognition/emotion verbs. Tsunoda suggests that the hierarchy is organized in terms of a decrease in affectedness (in the sense of Hopper and Thompson 1980). Malchukov (2005:81) splits Tsunoda's hierarchy into two hierarchies, one according to degree of agenthood and the other according to degree of patienthood. Relatedly, among non-transitive two-argument verbs, the appropriate argument must be chosen as subject, and as Davis (2001:65–66) and Davis and Koenig (2000:74–75) discuss, the argument with the most Proto-Agent entailments qualifies as subject.

Dowty's Argument Selection Principle embodies the assumption that there are no priorities among the entailments in either proto-role cluster with respect to subject or object selection; only number of entailments matters. Yet Dowty (1991:574, 581, 607) acknowledges that perhaps not all proto-role entailments contribute equally. He cites causation as the Proto-Agent entailment with the most weight for subject selection, and suggests that incremental theme is often the most significant for object selection (1991:607). Ackerman and Moore (2001:52), Davis (2001:66–72), and Davis and Koenig (2000:74–76) argue that the causation entailment outranks the other Proto-Agent entailments in subject selection: an argument with the cause entailment is always subject (cf. the transitivity of agent-act-on-patient verbs). Dowty does not offer insight into why causes have the highest priority, but approaches using predicate decompositions or other structured event structures do: causes are structurally more prominent than entities that change state. Koenig and Davis (2001:82–83) further propose that sentience and volition matter for non-causative verbs, and, if these entailments are not present, then motion matters. Given these priorities, they argue that number of entailments is not relevant for determining subjecthood, contra the Argument Selection Principle.

⁶Dowty uses the term 'transitive' in its strict, syntactic sense to refer to a verb that takes a subject and an object (in contrast to an intransitive verb, which simply takes a subject). Most verbs that semantically select for two arguments are transitive verbs, but not all are (e.g., *look (at)*, *rely (on)*).

Moving beyond causative verbs, Dowty's entailments offer insight into why the Proto-Agent entailments bear on subject selection and the Proto-Patient entailments bear on object selection rather than vice versa. The dependence of the paired Proto-Patient entailments on the corresponding Proto-Agent entailments can be interpreted as the Proto-Agent entailments having greater semantic prominence than the Proto-Patient entailments. Assuming semantic prominence is reflected in syntactic prominence (Jackendoff 1992:22, Levin and Rappaport Hovav 2005:140–145), then the Proto-Agent entailments should bear on subject selection and the Proto-Patient entailments on object selection.

3 Impact of the Paper and Subsequent Developments

Dowty's proto-roles represent perhaps the best-known 'generalized semantic roles' (Levin and Rappaport Hovav 2005:51–53, Van Valin 1997). Such approaches to semantic roles are often prompted by a desire to overcome the challenges facing attempts to posit unified semantic determinants of subjecthood or objecthood, and reject semantic roles as defined by sets of necessary and sufficient conditions. Dowty's proto-roles, unlike other generalized semantic roles, are not reified. For instance, Role and Reference Grammar (Foley and Van Valin 1984, Van Valin and LaPolla 1997), another well-known generalized semantic role approach, reifies its Actor and Undergoer 'macroroles'; see Van Valin (1997:386–387) for discussion.

Dowty's paper continues to provide one of the most compelling and comprehensive expositions of the shortcomings of traditional semantic roles. Nevertheless, semantic roles continue to be used in certain areas, such as NLP applications (Gildea and Jurafsky 2002, Márquez et al. 2008, Palmer et al. 2005). Although semantic roles have not been completely discarded, they are now treated with more care, and many researchers have embraced Dowty's proto-roles. Dowty's work has also prompted researchers to think deeply about the semantic determinants of argument realization, including re-evaluating some commonly used determinants and recognizing the need for finer-grained determinants than traditional semantic role approaches provide.

Proto-role entailments have been integrated into various syntactic frameworks. Taking a Principles-and-Parameters perspective, Baker (1997) uses proto-role-like notions of agent, patient, and location defined over syntacticized predicate decompositions to show that a wide range of argument realization phenomena are consistent with his Uniformity of Theta Assignment Hypothesis (1988:46), but see Newmeyer (2002) for a critique. Davis and Koenig (2000:72) fine-tune the proto-role entailments and use the revised entailments in an HPSG-inspired theory of argument realization, which uses reified proto-roles. To address unaccusative mismatches, Zaenen (1993) integrates the entailments into Lexical-Functional Grammar's Lexical Mapping Theory (Bresnan and Kanerva 1989). She uses them in the assignment of the intrinsic classification features that in turn determine grammatical function assignment. Also working in LFG, Alsina (1996:38–43) adopts a reified version of proto-roles to explain morphosyntactic phenomena in Catalan and Spanish.

Proto-roles have been used in the analysis of argument realization phenomena that go beyond the English phenomena that Dowty considers. I mention some representative examples. Dowty's paper has provided a foundation for work on typological issues, with proto-role entailments invoked in the explanation of properties of case-marking systems. Particularly ambitious in scope is Grimm's (2011) study, which uses a set of privative features inspired by the Proto-Agent entailments to define a lattice. He shows that attested morphological case systems are defined over contiguous regions in the lattice, and proposes that the lattice's form constrains available case systems. Aissen (1999) uses reified proto-roles in an Optimality-Theoretic account of the constraints on crosslinguistically available person- and animacy-based case marking splits identified by Silverstein (1976). Primus (1999, 2006) proposes that number of proto-role entailments matters for case-marking and agreement patterns, such as the assignment of nominative vs. accusative or ergative vs. absolutive case to the arguments of core transitive verbs, but that the dependence relations defined between Proto-Agent and Proto-Patient entailments matter for word order.

Other work focuses on specific languages. Ackerman and Moore (2001:89–127) show how proto-role entailments can be used to understand alternate realizations of the arguments of a single verb, such as the accusative–partitive case alternations of Estonian and Finnish. Blume (1998) uses Proto-Agent entailments to capture the properties of interaction verbs, verbs that in many languages take an animate oblique second argument. García-García (2007:74, 2018:229–231) invokes Proto-Agent entailments to explain the distribution of differential object marking (Bossong 1991) with inanimate objects in Spanish. Tollan (2018:17) builds on Proto-Agent entailments to distinguish core two-argument verbs in Samoan, which take ergative subjects, from unergative verbs and two-argument 'middle' verbs, both of which take absolutive subjects. She proposes that the latter have subjects with fewer Proto-Agent entailments than the former: they always lack volitionality and effortfulness entailments. Brunetti (2009) appeals to Proto-Agent entailments to explain why the dative experiencer argument of psych-verbs is the topic in Spanish and Italian.

Another line of work explores wider implications of proto-roles, and in so doing bears on Dowty's proposal that the proto-role entailments are cognitively salient notions. Kako (2006) presents a series of experiments, some replicated by Reisinger et al. (2015), intended to verify the psychological validity of the proto-role entailments in the argument realization of transitive verbs. The experiments show that subjects across real and nonce transitive verbs have more Proto-Agent than Proto-Patient properties, while the reverse holds of objects. The broad applicability of the proto-role entailments is shown by Reisinger et al. (2015), who report on a large-scale corpus annotation of these entailments. Their work shows that such annotations provide an alternative to semantic role labelling in NLP applications. Further, an examination of the distribution of the entailments across verbs in their annotated data reveals that a small number of combinations of entailments are encountered frequently, but the vast majority occur just a few times. Reisinger et al. (2015:482–483) take this finding as evidence favoring proto-roles over traditional semantic roles. In particular, this finding provides further evidence that role fragmentation is endemic, supporting Dowty's claim (1991:553–556) that it poses an obstacle to any effort to posit a fairly small set of traditional semantic roles. However, in order to operationalize the proto-role entailments so they are accessible to non-linguists, both studies omit the incremental theme

entailment, which has figured prominently in approaches to argument realization. Finally, taking Dowty's Proto-Agent entailments as inspiration, Mayrhofer and Waldmann (2014) develop empirical criteria for agentivity in an experiment involving video scenarios of (near-)collisions between two balls (i.e. Michottean (1963) launching events).

4 Summing up

At over 50 pages, Dowty's paper 'Thematic Proto-roles and Argument Selection' is not short, but its length is matched by its many contributions, large and small. It argues for a prototype perspective on semantic roles grounded in the entailments that a verb imposes on its arguments, simultaneously rejecting discrete and categorical semantic roles. It proposes an Argument Selection Principle and its corollaries that take advantage of the cluster concept nature of proto-roles. In so doing, the paper confronts the challenge of argument selection, providing a novel solution to the continuing debate over the semantic underpinnings of subjects and objects. Simultaneously, it offers insights into prominent phenomena bearing on argument realization. The paper is so jam-packed with insights into the lexical semantics of verbs that repeated readings prove rewarding. For all these reasons, Dowty's paper will continue to be appreciated in the years to come.

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