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Non-verbal Thematic Proto-Roles

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Let us suppose that thematic roles, or something very much like them, are needed to describe lexical and semantic patterns in the behavior of verbal predicates. But what about nouns? Is there evidence independent of verbal constructions motivating a system of nominal thematic relations? Beginning with the analysis of relational nouns in Barker (1991), we go on to suggest that the general problem of argument selection does in fact motivate a set of quintessentially nominal thematic proto-roles which we call Proto-Part and Proto-Whole. These nominal proto-roles are parallel to but distinct from the verbal proto-roles of Proto-Agent and Proto-Patient proposed by Dowty (1991) to account for argument selection in verbal predicates. The resulting theory of nominal argument selection is properly semantic, that is, it distinguishes between argument positions purely on the basis of the semantic entailments of the predicates involved. Furthermore, it is non-dynamic, that is, it describes static patterns of lexicalization without hypothesizing any productive grammatical process that maps semantic arguments to syntactic arguments during the derivation of a sentence.

1. ULTRA-NOMINAL NOUNS

If there are nominal thematic proto-roles distinct in some important way from verbal ones, how could their existence have remained obscure for so long? Only a

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relatively small portion of the vast literature on thematic relations considers the status of thematic relations specifically with respect to nominal predicates. Chomsky (1970), Rappaport (1983), Dowty (1989), Grimshaw (1990), and Hoeksema (1992) are a few notable examples. However, these works generally take for granted that whatever thematic properties a noun might have are derived from those of some verbal counterpart. For instance, the standard assumption would be that any thematic roles involved in a nominal such as *the destruction of the city by the Romans* are simply a subset of the thematic roles belonging to the verb *destroy*. This assumption reflects the fact that most of these authors concentrate primarily on nouns derived from verbs.¹

If we hope to discover nominal thematic roles, then, we should concentrate (at least at first) on nouns which are as non-verbal as possible. At the very least, this means those nouns which are least plausibly derived from verbs, and those which denote objects rather than events. Some nouns that we consider to be relatively non-verbal appear as the heads of the noun phrases in (1).

- | | | | |
|-----|-------------------------|---------------------------|------------------------|
| (1) | an uncle of John | a chapter of that book | the heart of Texas |
| | the wife of the mayor | the foreleg of that horse | an edge of the table |
| | a guest of the state | the coastline of Panama | the point of my story |
| | the king of the country | the friend of a painter | a birthday of Mary |
| | an enemy of peace | the captain of the ship | the tip of the iceberg |

At the end of the paper we will return briefly to nouns which are not so ultra-nominal, that is, to deverbal nouns and nouns which denote events.

2. ARGUMENT SELECTION

There are many syntactic and semantic phenomena which are supposed to involve thematic relations. The phenomenon that we will be investigating here is the problem of argument selection. In the verbal domain, theories of argument selection attempt to explain which of several arguments of a verbal predicate will be expressed as the subject, versus which will be expressed as the direct object, or as some other grammatical relation. In particular, we will adopt and extend the approach to argument selection proposed in Dowty (1991), in which the argument selection properties of a verb are predicted by examining the semantic entailments of the relation denoted by that verb.

Of course, argument selection is only an issue for predicates which have more than one argument. This means that in addition to concentrating primarily on ultra-nominal nouns, we will further restrict our attention to those nouns which have more than one argument, that is, to RELATIONAL NOUNS. For instance, we

¹ Although philosophers and logicians seem to have always been aware that some non-derived nouns must be treated as semantically relational (see, e.g., the discussion of *stranger* in Thomason 1970:164), it has only been quite recently that natural language semanticists have begun to seriously consider how to treat relational nouns in a compositional semantics. Some of the more detailed proposals include de Bruin and Scha (1988), Dekker (1990), and Barker (1991), though also see Partee (1982, 1984, 1989) and the discussion in Loebner (1985).

will assume that although the noun *person* simply denotes a set of entities, the noun *friend* is relational: it denotes the set of pairs (x, y) such that x is the friend of y .

- (2) a. $[[person]] = \{x | x \text{ is a person}\}$
 b. $[[friend]] = \{(x, y) | x \text{ is the friend of } y\}$

In general, a relational noun is one such that an entity qualifies for membership in the extension of the noun only by virtue of there being a specific second entity which stands in a particular relation to the first, and where that relation is determined solely by the noun's lexical meaning.

It is important to keep in mind that our criterion for the relational status of a noun is purely semantic. Fortunately, however, almost exactly this semantically-defined class of nouns can be picked out by a simple syntactically-based test: if the noun in question can take a so-called genitive *of*-phrase, and if the *of*-phrase can also be paraphrased by a prenominal possessive, then we can generally assume that noun has an appropriate relational sense. For instance, note that the most natural reading of *John's friend* has essentially the same descriptive content as *the friend of John*.²

We require the possessive paraphrase test as well as the acceptability of a post-nominal genitive *of* phrase in order to help distinguish the true genitive *of* construction from some of the many other uses of postnominal *of* in English which do not express the relational lexical meaning of the noun they modify. A few examples of these other types of *of* modifiers appear in (3).

- (3) a. Constitution: the ring of gold (\neq the gold's ring)
 b. Group membership: the bunch of grapes
 c. Natural measure: the herd of cattle
 d. Partitive: two of the men
 e. Affiliation: Mr. Jones of Suffolk County
 f. Temporal predication: the message of yesterday

For instance, note that *the ring of gold* cannot be paraphrased as *the gold's ring*. This shows that *ring* does not denote a relation between a ring entity and the quantity of matter which makes it up. We do not mean to suggest that there is no semantically important relation holding of the ring and the gold it is made of, only that this relation is not an intrinsic part of the lexical meaning of the noun *ring*.³

² Note that it is crucially important here when considering expressions involving genitive *of*-phrases to avoid headless possessives such as *the friend of John's*, since this construction has quite a different distribution than the genitive-*of* followed by a non-possessive NP. For instance, even though *a stick of Mary's* is acceptable on an ownership reading, it is the unacceptability of **a stick of Mary* which is relevant for arguing that *stick* is not a relational noun.

³ Although group nouns such as *bunch*, *committee*, and so on are not relational in sense required here (witness the non-equivalence of *the committee of the men* and *?the men's committee*), there certainly are properly relational nouns which entail that the argument of the preposition *of* refer to a group entity, as in *the members of the committee = the committee's members*. See Barker (1992) for a detailed proposal on which the relation that holds between a group noun and the sum of its members is not a lexical relation.

Note that the nouns in (1), in addition to being ultra-nominal, are all relational nouns whose second argument can be expressed by the appropriate sort of postnominal *of* phrase (as illustrated), and which also have the appropriate sort of prenominal possessive paraphrase. In other words, our operational syntactic tests support our claim that the nouns in (1) are examples of nouns which are indeed relational according to our semantic criterion.

To make the problem of argument selection more concrete, consider the two-place relation defined in (4).

$$(4) \quad R_1 = \{\langle x, y \rangle | y \text{ is the offspring of } x\}$$

There are at least two possible nouns expressing a relation which is equivalent to R_1 , which we can call N_1 and N_2 .

- (5) a. $[[an N_1 \text{ of } John]] = \text{an } x \text{ such that John is the offspring of } x$
 b. $[[an N_2 \text{ of } John]] = \text{an } x \text{ such that } x \text{ is the offspring of John}$

As it happens, in English there are two nouns whose core meanings express something very close to N_1 and N_2 , namely, *parent* and *child*.

- (6) a. $N_1 = \text{parent: } [[a \text{ parent of } John]] = (5a)$
 b. $N_2 = \text{child: } [[a \text{ child of } John]] = (5b)$

Thus we can say that the denotations of *parent* and *child* are inverses of each other, as notated in (7).

$$(7) \quad \begin{aligned} [[parent]] &= \{\langle x, y \rangle | R_1(x, y)\} \\ [[child]] &= \{\langle x, y \rangle | R_1(y, x)\} \end{aligned}$$

However, not all relations are equally likely to have lexicalized inverses. Consider a second relation as defined in (8).

$$(8) \quad R_2 = \{\langle x, y \rangle | y \text{ is a region of } x \text{ such that no other region of } x \text{ is above } y\}$$

The noun *top* expresses (roughly) one permutation of the relation R_2 , but there is no relational noun which expresses the exact inverse.

- (9) a. $[[top]] = \{\langle x, y \rangle | R_2(x, y)\}$
 b. $?? = \{\langle x, y \rangle | R_2(y, x)\}$

Thus although we have expressions like *the top of the table*, there is no corresponding inverse like *the ?? of the top* which, for any given salient top, would pick out the object which that top is a part of. This is despite the fact that this would be a sensible thing to want to say, as shown by the perfectly good relative clause paraphrase *the object which the top is a part of*.⁴

The general problem of argument selection, then, is the problem of explaining systematic gaps in the lexical distribution of logically possible argument permutations. Put another way, is it purely accidental that *parent* has a lexicalized inverse (namely, *child*) but *top* does not? And for those nouns whose denotations

⁴ Note also that *the possessor of the top* is marginally acceptable as a description of an object which has a top that is salient for some reason. However, *possessor* is hardly a good candidate for a noun denoting a relation which is the exact inverse of the relation denoted by *top*, since entities possess many things besides their tops.

fail to have lexicalized inverses (such as *top*), can we predict reliably whether the arguments will be lexicalized in one configuration instead of the other?

3. VERBAL THEMATIC PROTO-ROLES: PROTO-AGENT & PROTO-PATIENT

Since the explanation we have in mind for nominal argument selection closely resembles the analysis given in Dowty (1991) for verbal argument selection, it will be helpful to sketch Dowty's proposal here. Dowty's theory depends on comparing argument positions according to how many Proto-Agent or Proto-Patient properties the verb entails for each argument, where the main Proto-Agent and Proto-Patient properties given by Dowty (1991: 572) appear in (10) and (11).

- (10) Proto-Agent entailments:
- a. volitional involvement in the event (or state)
 - b. sentience and/or perception
 - c. causing an event or change of state in another participant
 - d. movement (relative to the position of another participant)
- (11) Proto-Patient entailments:
- a. undergoes change of state
 - b. incremental theme
 - c. causally affected by another participant
 - d. stationary relative to movement of another participant

These criteria predict verbal argument selection as specified in (12).

- (12) Verbal Argument Selection Principle (Dowty (1991: 576)):

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.

To see how this principle works, consider the two-place relation given in (13).

- (13) $R_3 = \{(x, y) | x \text{ closes } x\text{'s mouth forcefully upon some proper part of } y\}$

Clearly, the x argument is entailed to satisfy more Proto-Agent properties than the y argument. For instance, only the x argument is necessarily entailed to cause an event or to bring about a change of state in the other argument. Therefore Dowty correctly predicts that the x argument can be lexicalized as the subject, and the y argument can be lexicalized as the direct object, as in (14a).

- (14) a. Mary bit John.
b. John ?? Mary. (cf. John was bitten by Mary)

Dowty also correctly predicts that there is no basic lexical verb which means the exact inverse of *bite*, although the non-lexicalized relation can be paraphrased by a passive.

Now consider the two-place relation described in (15).

- (15) $R_4 = \{\langle x, y \rangle \mid x \text{ is aware of properties of } y \text{ which make } x \text{ happy}\}$

In this case, the two arguments satisfy an equal number of Proto-Agentive as well as Proto-Patient entailments. Therefore the verbal argument selection principle is consistent with the existence of verbs which express either permutation of the relation.

- (16) a. The story pleases Mary.
b. Mary likes the story.

And in fact, as (16) shows, there are two basic lexical verbs, each expressing a different permutation of the relation, since (16a) entails (16b), and vice versa.

Note that it is a feature of Dowty's (1991) theory, and also of the theory advanced here, that if an argument selection principle fails to predict asymmetric lexicalization of a particular relation, then nothing prevents multiple lexicalizations which differ with respect to argument selection, as for *like* and *please*, or see the discussion of *buy* versus *sell* in Dowty (1991). However, nothing requires that there be multiple lexicalizations either, and we should naturally expect to find accidental gaps; see especially the discussion of kinship terms in (20) below.

This view of roles suggests there may not be a need for 'argument structure' as a distinct level of linguistic representation from d-structure (or other syntactic structure) or for 'linking rules' to connect one to the other, as these exist in the currently more common views of Grimshaw (1990) and other works cited there. For if semantic arguments of verbs do not fall into disjoint categories like traditional Agent, Theme, Goal, etc. but are fine-grained to an indefinitely specific degree, and if the distribution of a verb's semantic arguments among its subcategorized NPs is really only partially predictable on such semantic grounds at all (i.e. is to an extent idiosyncratic to the individual verb), then the most a priori straightforward theoretical architecture is one in which the association of semantic arguments with syntactic ones is trivial and a separate argument structure level is not invoked: semantic arguments can just as well be indexed solely by the grammatical role the verb's lexical entry associates with them, not in terms of Agent, Goal, etc. Generalizations of linking or argument selection principles can be simply static partial generalizations in the lexicon about meaning and subcategorized NPs; this is the view assumed by Dowty (1991) and the view we will also assume in our account of nominal roles below. To be sure, the proto-role hypothesis is not really incompatible with the more complex view of argument structure; it only suggests it may need more motivation and/or rethinking.

4. NOMINAL THEMATIC PROTO-ROLES: PROTO-PART & PROTO-WHOLE

Can the theory of verbal argument selection just sketched (or rather, as presented in much more detail in Dowty 1991) make appropriate predictions for nominal predicates without further modification? Consider the relation denoted by the noun *top* again as specified in (8). Neither participant in this relation is any more Proto-Agentive or more Proto-patient-like than the other. Therefore the verbal argument selection principle does not apply, and we would predict that it is purely accidental that *top* has no lexicalized inverse. This prediction is not so troubling when considered in isolation; but inspection of the examples in (1) will show that by and large,

the verbal proto-role criteria simply don't apply to ultra-nominals. This would naturally lead us to look for inverses for at least some of them. However, we will see shortly that there are broad classes of nouns, one of which includes *top*, which systematically lack lexicalized inverses. In other words, we claim that verbal principles of argument selection are not adequate for describing argument selection in nouns.

In order to explain the systematic patterns in nominal lexicalization, we propose that there is indeed a set of proto-roles which are relevant for predicting nominal argument selection, but they are separate and distinct from the verbal proto-roles. What could such roles be like? Note that if *y* is the top of *x*, then it is necessarily true that *x* contains *y* as a proper part. We suggest, therefore, that the complementary notions of Part and Whole could serve as nuclei for semantic proto-categories that may govern nominal argument selection. We offer one specific set of argument properties for characterizing these proto-roles in (17) and (18).⁵

- (17) Proto-Part entailments:
- a. located at or defines a boundary of the other relatum
 - b. is a property of the other relatum
- (18) Proto-Whole entailments:
- a. entirely contains the other relatum as a proper part
 - b. is a concrete entity

Our nominal argument selection principle will be very much like the verbal one after making certain changes, as spelled out in (19). First, however, we must introduce a bit of terminology concerning nominal argument positions. By assumption, a relational noun has two semantic argument positions. We have seen that one of these arguments can typically be expressed syntactically as the object of the preposition *of*, as in the noun phrase *the table* in *the top of the table* or as a prenominal possessor, as in *the table's top*. But there is no commonly accepted way of talking about the other argument, the argument corresponding to the entity described by the noun phrase as a whole. We will (somewhat arbitrarily) call this argument the HEAD ARGUMENT, since it is syntactically inseparable from the head noun of the noun phrase.

- (19) Nominal Argument Selection Principle:

In (ultra-nominal) relational nouns, the argument for which the predicate denoted by the noun entails the greatest number of Proto-Whole

⁵ It might seem surprising that we nominate Proto-Part/Proto-Whole as the fundamental opposition upon which nominal thematic relations are built rather than more familiar nominal relations, such as ownership or possession, as in *John's pencil* or *John's dog*. But note that these possessive constructions do not necessarily express a relation which is part of the lexical meaning of the head noun. That is, an object does not need to be possessed in order to qualify as a pencil, nor is a dog obligatorily owned by someone (cf. *pet*). Therefore these nouns are not relational. This observation is in accord with the paraphrasability test introduced in section 2, since any attempt to use a postnominal genitive *of*-phrase is awkward, if not ungrammatical: *?*the pencil of John* or *?*the dog of John*. Once we eliminate cases which do not involve true relational nouns, Proto-Part/Proto-Whole emerges as dominant over possession. See Barker (1991) for further discussion of the interpretation of those prenominal possessives which do not express lexical relations.

properties will be lexicalized as the object of the preposition *of* or as the prenominal possessor; the argument having the greatest number of Proto-Part entailments will be lexicalized as the head argument.

Since the relation denoted by the noun *top* entails that one of its arguments contains the other, and also that the head argument is located at the boundary of the first, the principle in (19) correctly predicts which argument is expressed as the object of the preposition *of*, as well as the fact that the noun *top* does not have a lexicalized inverse.

Now we are ready to consider once again the pair of nouns given above which were exact inverses of one another, namely, *parent* and *child*. In this case, neither argument of the underlying relation (i.e. R_1 as specified in (4)) satisfies more of the Proto-Part or of the Proto-Whole criteria. This means that the nominal argument selection principle is consistent with the existence of a noun expressing either permutation of the predicate. And in fact, all kinship terms are predicted to at least potentially have lexicalized inverses, and many of them do have exact inverses or near inverses, as we see in (20).

- (20) Exact inverses: parent/child, grandparent/grandchild,
 ancestor/descendant, husband/wife, etc.
 Near inverses: father/daughter, aunt/nephew, etc.

Pairs which are near-inverses, such as *aunt* and *nephew*, generally fail to be exact inverses by virtue of a gender entailment which holds for one but not the other participant in the relation. That is, a woman can be the aunt of either a male or a female, but a man cannot be the aunt of anyone. As far as we know, if a nominal predicate has more specific entailments for one of its arguments, the extra entailments will always be associated with the head argument, as in *aunt* and these other kinship terms. We do not believe that this should be part of a theory of how thematic relations govern argument selection, but rather follow from more general principles of how nominals, especially those headed by relational nouns, are used in discourse to convey information. It would be rather too much of a digression from our main point to discuss this point here, however.

As far as we know, kinship nouns are the only class of ultra-nominals which have lexicalized inverses. All other (ultra-nominal) relational nouns seem to be asymmetric with respect to argument section, that is, they fail to have lexicalized inverses. And, in accord with our hypothesis, many if not all of these asymmetric nouns are also strongly asymmetric with respect to Proto-Part/Proto-Whole entailments.

- (21) Body part nouns: hand head nose heart leg
 whisker root paw feather etc.
 Other part nouns: wheel dashboard middle side top
 cap chapter trigger handle etc.
 Boundary nouns: inside outside limit surface corner
 outline profile border boundary etc.

These nouns are all correctly predicted not to have lexicalized inverses, by virtue of the fact that one argument contains the other (e.g. *heart*, as in *the heart of the region*), or that the other argument is located at or defines a boundary of the first (e.g. *surface*, as in *the surface of the pond*).

Another important class of nouns for which we predict asymmetrical lexicalizations include those relational nouns which denote abstract properties or characteristics of objects.

- (22) Characteristics: shape color speed property etc.
 De-adjectival nouns: length width redness roundness etc.

Furthermore, if we consider de-adjectival nouns as being sufficiently non-verbal to count as ultra-nominal, then they pattern with the characteristics nouns. That is, *the length of book* denotes an abstract property which (partially) characterizes the book in question in the same way as the non-adjectival noun *shape* does in, e.g. *the shape of the book*.

These broad classes of ultra-nominal relational nouns, then—namely, kinship nouns, body part nouns, other part nouns, boundary nouns, nouns denoting abstract characteristics, and de-adjectival nouns—serve to illustrate the core predictions of our hypothesis.

There are a number of important questions that we have not attempted to answer here. Note that by identifying the notion *protorole* mnemonically with PROTOTYPE in the sense of Rosch and Mervis (1975), we are implicitly claiming that the sets of entailments in (17) and (18) are not reducible to single criterial definitions. But we may nevertheless ask whether the Proto-Part/Proto-Whole opposition has a “deeper source”, in the sense of speculating about an earlier, more course-grained, stage of conceptual and linguistic development that antedates these particular entailment sets. This would parallel Dowty’s (1991) suggestion that the Proto-Agent/Proto-Patient opposition might be seen as a reflection of the more basic opposition between causes and their effects. On a somewhat related issue, why should Proto-Whole map onto the genitive argument and Proto-Part onto the head argument position rather than the other way around? Is there an explanation for this mapping in terms of typical discourse structure, in the same way that we can understand the affinity of Proto-Agents for subjects in terms of the general alignment of subject position with topic? We have constructed what we hope are plausible answers to each of these questions, but regret that we cannot fit an adequate discussion into this short paper.

5. THE DOMAIN OF NOMINAL VS. VERBAL PROTO-ROLES

We now turn to the question of argument selection in nouns which are ostensibly derived from verbs and nouns referring to events. We will consider three main hypotheses, beginning with the most obvious.

- (23) Hypothesis I: Grammatical Category is the only factor which determines which type of role is relevant: “Verbal” thematic proto-roles determine argument selection for verbs, “Nominal” thematic proto-roles determine it for nouns.

We must reject this as it stands, however, because of derived nominals referring to events. As is well-known, the grammatical marking of the syntactic arguments of such nominals is directly determined by properties of the corresponding verb. For instance, the NP corresponding to the verb’s object is typically marked by *of*, and the

NP corresponding the verb's subject is typically marked by *by* if the verb is transitive (such as *the destruction of the city by the Romans*), or by *of* if it is not (*the death of the man*), and so on. Since the argument selection of such nouns clearly depends on properties of the corresponding verb, nominal proto-roles presumably are not operative in such cases (although it is not clear that our nominal argument selection principle makes any predictions which are in direct conflict with such examples).

We are thus led to consider modifying hypothesis I as in Ia:

- (24) Hypothesis Ia. Grammatical category, including derivational morphology, determines which kind of proto-roles are relevant for argument selection: "Verbal" proto-roles are relevant for verbs and nouns derived from verbs, "Nominal" proto-roles are relevant for other nouns.

Note that this hypothesis (as well as the two other hypotheses discussed below) explicitly contemplates the possibility that argument selection in certain nouns might be governed by Proto-Agent/Proto-Patient entailments. One serious difficulty with this hypothesis is that the alignment of Proto-Agents and Proto-Patients with particular nominal arguments is by no means consistent across the full range of examples. The problem is perhaps most vivid with zero-derived deverbal nouns.

- (25) a. *John's deposit* was not received in time to cover the overdraft.
 b. *Mary's recent purchase* lay on the table.
 c. John spilled *his drink* on the rug.
- (26) a. the team's coach
 b. the ship's pilot
 c. the patient's nurse

The derived nominals in (25) refer to something that corresponds to the Proto-Patient argument of the source verb (as in "the money which John deposited"), while those in (26) correspond to Proto-Agent arguments (as in "the one who coaches the team"). Yet the meanings of all of the verbs involved here have a strong asymmetry in Proto-Agent/Proto-Patient entailments. If the nominal argument alignment were simply mapped over from the verbal source in a consistent manner, then we would expect that only one type would exist, not both.

If we want to maintain Hypothesis Ia, then, we are faced either with abandoning the theory of verbal argument selection proposed by Dowty (1991) (or any stronger theory), or we must conclude that it is not possible to predict from any general semantic principles how the arguments of a verb will map onto derived nominal arguments. A derived noun might denote a Proto-Patient-type argument as in (25) or an Proto-Agent-type argument as in (26).

The most obvious and likely explanation for this dilemma appeals to the fact that English derivational morphology—including zero-derivation—is only partially productive and highly idiosyncratic. If so, then these examples are simply the zero-derivation counterparts of the overt suffixes *-ee* and *-er*.

- (27) The city employs the architect.
- (28) a. the employee of the city
 b. the employer of the architect

In (27), the subject clearly outranks the direct object in Proto-Agent properties, in perfect agreement with the verbal argument selection principle. When we form a deverbal noun through suffixation with *-ee* as in (28a), the Proto-Agentive argument appears as the object of the *of*-phrase, and the more Proto-Patient-like argument appears as the head argument. But in (28b), when the derivational suffix is *-er*, the pattern is reversed: the Proto-Agentive argument appears as the head argument, and the more Proto-Patient-like argument appears as the object of *of*.⁶

If we assume that each derivational suffix or derivational process specifies a alignment of verbal proto-roles with nominal argument positions, then we can understand Hypothesis Ia as suggesting that the argument selection of derived nouns is predicted by verbal proto-roles in combination with the mapping relation determined by the particular derivational process involved. And if we assume that there are two abstract zero-derivation processes deriving nouns from verbs, then Proto-Agent-denoting nominals would be derived from one process, and Proto-Patient-denoting nominals from the other.

In the absence of as yet undiscovered tests which would reliably distinguish one sort of zero-derivation from the other, the net result of this line of thought suggests that the argument selection of zero-derived nouns is basically unpredictable. And in fact, many additional examples illustrating the non-productive nature of derivation from verbs to nouns and vice versa can be found in traditional exhaustive studies of English derivational morphology, e.g. Marchand (1969:376). We see no reason at this point not to accept this explanation, although there remains much interesting work in describing the regularities in the effect of various derivational processes on argument selection mapping.⁷

If derivational morphology is so irregular, are there any systematic patterns in the argument selection of deverbal nouns that need to be captured? We believe that there are, especially if we pay attention to some semantic distinctions in nouns derived from verbs. It has often been observed that many derived nominals are ambiguous between a sense denoting an event and one denoting some participant in that event, e.g. *Mary's gift* must denote an event of giving in (29a) but can denote only an object that has been given in (30a) (and similarly for (29b) versus (30b)).

- (29) a. Mary's gift of a book to John surprised him.
 b. John's creation of the artwork took a long time.

⁶ For a very different analysis of the semantics of these particular suffixes, see Keenan and Faltz (1985:223–4).

⁷ Incidentally, deverbal nominals such as *purchase* and *sale* serve as counterexamples to Dowty's (1989) conjecture that syntactic argument marking in nouns, as opposed to that in verbs, depends solely on the semantic entailments associated with the arguments. It is reasonable to suppose that the verbs *purchase* and *sell* refer to the same event type, which is to say that their entailments with respect to their thematically-corresponding arguments are the same. However, in the nominal *the purchase by John*, the *by*-phrase refers to the buyer, while in *the sale by John* it refers to the seller; this shows that grammatical marking of arguments in such nominals cannot be predicted without knowing which specific verb the nominal was derived from.

- (30) a. Mary's gift lay on the table.
 b. Mary dislikes John's latest creation.

A closely related distinction to note, which is evident in these same examples, is that between a nominal that actually refers to events, like the nominals in (29), versus a nominal that refers to concrete objects but does so via indirect reference to an entailed event, like those in (30). True, an object qualifies as a gift if and only if some appropriate sort of giving event has taken place, so that a use of (30a) entails the existence of a particular event; but this entailed event is not one of the relata predicated over by the denotation of the head noun. Thus in (30a), the noun *gift* is a relation between a giver and an object, and any event entity is merely implicit.⁸

These observations lead us to hypothesis II:

- (31) Hypothesis II: The ontological types of the relata denoted by a predicate determine which kind of proto-roles are relevant for its argument selection. If one of the relata of the denotation is an event, then "Verbal" proto-roles govern its argument selection. Otherwise, "Nominal" proto-roles govern its argument-selection.

Thus for (29), where the noun denotes a true event, the verbal proto-roles are relevant; but for those nominals whose denotation merely indirectly refers to an event, as in (25), (26), and (30), only nominal proto-roles are relevant.

As it stands, a number of details must be worked out to make this hypothesis a viable candidate. For one thing, note that there are relational nouns for which both relata can or must denote events, as in (32).

- (32) a. the end (of the war)
 b. the start (of the presidential campaign)
 c. the origin (of the practice)

According to Hypothesis II, we would expect the verbal proto-role system to govern argument selection for these cases. However, our intuition is that the relationship between the end of a war and the war itself are much closer in spirit to a Proto-Part/Proto-Whole relation than an Proto-Agent/Proto-Patient relation. It may be that Hypothesis II should be modified so that verbal argument selection governs only those predicates which 'mix' levels, that is, which relate concrete entities with events. Since both relata are events in (32), nominal argument selection principles would apply. Why such an exception would exist would be rather puzzling, however.

A final hypothesis which is also capable of explaining this intuition and which we believe is worthy of further investigation is given in (33).

⁸ The same distinction can be applied to non-derived nouns. Nouns such as *edge*, *leg*, *color* etc. do not plausibly denote events, nor do they entail the existence of any specific event located in space or time. Nouns such as *victim*, *bride*, or *groom*, however, although they do not denote events directly, do entail the existence of a specific event. That is, a person is a bride only by virtue of participating in an instance of a certain type of event. Also, see the discussion of the nominals in (32), which plausibly denote events directly.

- (33) Hypothesis III: If the denotation of a relational predicate has any entailments of the Proto-Agent or Proto-Patient sets, then the verbal proto-role system governs its argument selection, and if it has any entailments of the Proto-Part or Proto-Whole set, then the nominal system is relevant.

The idea is to let each proto-role system govern any lexical item to which its criteria apply non-vacuously. This hypothesis dispenses entirely with a dependence on ontology of the relata. This hypothesis not only allows for verbal proto-roles to govern nominal argument selection, it also contemplates the possibility that nominal proto-roles might govern argument selection in some verbal predicates. In support of this hypothesis, we merely note that stative verbal predicates such as *contain*, *surround*, and *enclose* exist which entail a Proto-Part/Proto-Whole relation of a consistent orientation, and (tentatively) that we have observed no clear converse cases among stative transitive verbs.⁹

This last section has been more speculative, only a first step toward a serious investigation. It is important to note, however, that whichever of these hypotheses (or which mixture of hypotheses) ultimately turns out to be the most promising for event nouns, they are all consistent with our main result describing argument selection for ultra-nominal nouns. That is, the remaining problems of argument selection in deverbal nouns do not impinge in any way upon our main claim, which is that the traditional conception of verbal thematic roles is not adequate for describing the behavior of ultra-nominal nouns, and that we need to recognize quintessentially nominal thematic proto-roles such as Proto-Part and Proto-Whole.

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⁹ It is also conceivable that there will be predicates for which both sets of proto-roles apply non-vacuously. The verbs *enter/exit* and *swallow/emit* are interesting in this regard; however, it is not completely clear whether the event types described by these predicates can or should satisfy Proto-Part entailments or Proto-Whole entailments.

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