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A Semantics for Unaccusatives and its Syntactic Consequences

1. Introduction

Since its original formulation, due in its current form to Perlmutter (1978), the unaccusative hypothesis has played a major role in linguistic theory, as it raises fundamental questions on the nature of grammatical relations and on the syntax-semantics map. The central idea at the basis of the unaccusative hypothesis is that the surface subject of a class of intransitives really is, at some level an object. In what follows, I will outline an explicit (truth-conditional) semantics for unaccusatives and explore its consequences for syntax. I will try to show that the semantics represented below takes us some steps forward in our understanding of unaccusativity.

My inquiry will be limited largely to Italian and the question of whether what I propose extends to other languages will have to be left for further research. At the same time, the advantage of focusing on Italian is that such a language offers an extremely rich and well charted territory for the study of unaccusativity, as attested by the extensive and insightful work of Rosen (1981), Burzio (1986) and others.

The present work is organized as follows. I will take the moves from Burzio's proposal concerning the syntactic structures associated with unaccusatives and try to provide a semantics for such structures. I will argue that this semantics sheds light on phenomena previously unaccounted for (pertaining to the interaction of unaccusatives and reflexives and to aspectual properties of unaccusatives) and leads, furthermore, to a new formulation of the aux-selection process in Italian superior to the options currently available.

2. Background

2.1. Syntactic preliminaries

Within the Principles and Parameters framework, the unaccusative hypothesis is implemented roughly as follows. A verb comes with a list of θ -roles (its arguments), one of which is generally realized outside of the maximal projection of the verb (cf. Williams 1983). So, for example, in (1) you see a sketch of the type of information that a verb entry will contain.

- (1) a. piangere: θ_1 (agent) 'cry'
b. distruggere: θ_1 , θ_2 (agent, theme) 'destroy'
c. dare: θ_1 , θ_2 , θ_3 (agent, theme, goal) 'give'

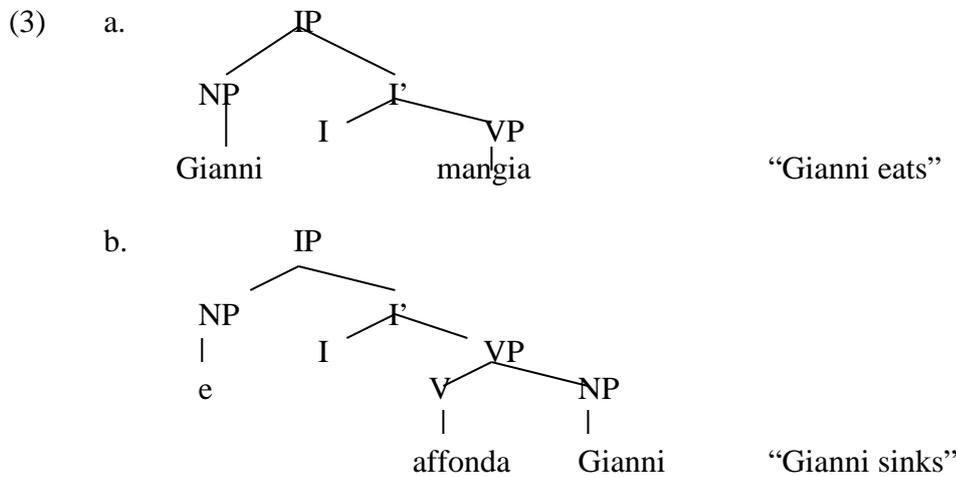
In (1) for each verb it is indicated how many theta-roles it assigns and what their (rough) semantic content is. The external argument is underlined. Some verbs, like *seem*, lack an external argument. This feature is generally associated by principles of grammar with the possibility for such verbs to have expletive subjects and to undergo raising. Unaccusatives are taken to have an argument structure like the one of *seem*, in that they lack an external argument. This is exemplified in (2).

- (2) a. venire: θ_1 (theme) 'come'
b. affondare: (θ_1), θ_2 (agent, theme) 'sink'
c. mangiare: θ_1 , (θ_2) (agent, theme) 'eat'

Venire in (2a) takes its only argument internally in contrast with the unergative *piangere* in (1a). In (2b,c), where parentheses indicate "optional" arguments,¹ one can see two widespread types of

¹ Note the scare quotes. The notion of "optionality" relevant here will be discussed shortly.

transitive/intransitive alternants. In *affondare*, the external θ -role is “optional”, thus the intransitive member of the pair will be unaccusative. In *mangiare*, the internal θ -role is optional, thus the intransitive member of the pair will be unergative. From these assumptions, it follows that the underlying structure associated with these verbs will be as shown in (3).



The NP *Gianni* occupies the canonical subject position in (3a) and the object position in (3b). Structures such as (3b), just like raising structures, are associated with either the occurrence of a phonologically null expletive in subject position or with movement into such position of the postverbal NP. This is basically the line taken in Burzio’s work.

One question that immediately arises in this connection concerns the nature of the alternations in (2b,c). The notion of “optional argument” is at present poorly understood. More specifically, the projection principle requires that the θ -structure of a predicate be projected at every level of representation. If we were to allow “optional arguments” freely the predictive power of the principle would be seriously undermined. It follows, then, that if we want the projection principle to have bite, it is preferable to assume that the members of each pair in the alternations in (2b,c) are related to one another by means of some operation on θ -roles. Either one derives the transitive member of the pair from the intransitive one by an operation that adds a role or one derives the intransitive from the transitive by an operation that removes a θ -role. The question becomes what the exact nature of these operations is. Various hypotheses on the syntactic side of this questions have been formulated (see, e.g., Burzio (1986, ch. 1) or Fagan (1988)) but the issue of their truth-conditional import has never been explicitly addressed as far as I know. The latter issue is, however, central for any attempt to gain proper understanding of the semantics of the structures in question.

In order to address such issue (and more generally, the issue of the semantics of unaccusatives), we will have to make some general assumptions concerning how truth conditions are associated with syntactic structures. The assumptions we will make are quite minimal, perhaps simplistic. But they will do for our present purposes.

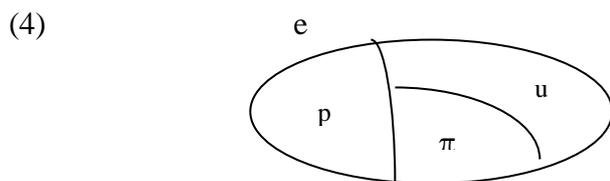
I will adopt the customary view that L(ogical) F(orm) is the level of syntax that feeds into truth conditional interpretation. Let us assume, for explicitness, that truth conditional interpretation takes the form of a map from LF into l(gical) f(orm): a logic for which truth and entailment are known quantities. The map from LF into lf is, as far as possible, compositional: one derives the meaning of a complex structure by assigning first a meaning (= lf) to its constituents. These meanings are then composed using an extremely restricted range of semantic operations, like function application, abstraction, function composition, and perhaps some type shifting principles.

The next issue, then, is: which logic is going to be best suited for this task? Clearly, the choices one makes in this connection will channel truth conditions in certain ways rather than others, and will have, thus, far reaching empirical consequences, just like the choice of primitives in

syntax does. So the scope of this question exceeds by far what we can address here. But we must at least consider those aspects of the question that are going to be of direct relevance to our goal. To this task the following section is devoted.

2.2. Semantic preliminaries: Property Theory

I am going to suggest that we adopt an intensional logic where properties and propositions are taken as primitives. The logic in question is going to be a simple first order language in which individual variables and constants are of three sorts or types: the type of basic entities, the type of properties and the type of propositions. This means that the domain in terms of which our logic is interpreted is divided into at least three subdomains: a domain of basic entities (like people, chairs, etc.) a domain of properties (like, running, loving Mary, etc.) and a domain of propositions (like *John run*, *John love Mary*, etc.). Properties and propositions are regarded just as a special sort of individuals. The logical behavior of properties and propositions is spelled out in terms of a set of axioms, whose formulation need not concern us here.² If you like, you can think of properties as actual regularities occurring in the world. For example, running is what is common to every situation where running goes on. Similarly, you can think of propositions as types of eventualities. For example, *John run* is what is common to all the situations where John runs. (I suggest this not because is of much importance here, but simply because attaching some intuitive content to these notions might help in grasping how the system works). What I just said is summarized in the diagram in (4). I use e (entities) for the type of individuals, p for the type of propositions, π for the type of properties and u (urelements) for the type of ordinary individuals.



The main characteristics of properties is that they can be predicated of other entities. In order to do so, given that properties are individuals, we need a relation of some kind to connect them to their arguments. Such relation will be a predication relation. The result of predicating a property of an individual via the predication relation is a proposition. Let us exemplify.

- (5) If r is a property and u an individual (of any sort) and \cup is the predication relation $\cup r(u)$ is the proposition that u has property r .³

Now, what we just did can be seen in a slightly different perspective. Let $\langle a,b \rangle$ be the type of functions from a 's into b 's. Thus, in particular, if e is the type of individuals and p the type of propositions, $\langle e,p \rangle$ would be the type of functions from entities into propositions (propositional functions). We can view predication, i.e. ' \cup ' ("up") as mapping properties (entities of type π) into

² See, e.g. Chierchia and Turner (1988)

³ The rationale behind the notation is the following. Predication is a special relation analogous to set membership. In a pure relational notation, where all relations are prefixed, we might write:

(a) $\cup(\text{run}, j)$ 'running and John stand in the *instantiate* relation' or 'John instantiates running'

Now, if relations are thought of as function valued function (a la Schoenfeld-Montague-Curry), then ' \cup ' becomes a function from properties into a function from individuals into a proposition (of type $\langle \pi, \langle e,p \rangle \rangle$):

(b) $\cup(\text{run}) (j)$

By omitting the first set of parenthesis and writing ' $\cup\text{run}$ ' for ' $\cup(\text{run})$ ' we obtain what we have in the text. This notation is meant to underscore the analogy between predication and verb inflection (that typically attaches to the verb stem)

propositional functions. I.e. we can say that if r is a property, $\cup r$ is a propositional function, which means that $\cup r$ applied to an individual yields a proposition. (all this is schematized in (6).

- (6)
- a. $\langle a, b \rangle =$ the type of functions from a 's into b 's
 - b. $\langle e, p \rangle =$ function from entities into propositions (propositional functions)
 - c. \cup ("up"): $\pi \rightarrow \langle e, p \rangle$; $\cup r$ is of type $\langle e, p \rangle$
 - d. Example: $\cup \text{run}(j) =$ John runs

So, for example, we can express the fact that an individual say John, has a certain property, say running, as in (6d).

To summarize, predication can be viewed as creating (for each property) a map from individuals into propositions. That is, we can regard it as associating with each property a propositional function as indicated in (6).

The predication map will have an inverse, i.e. a function that turns propositional functions (back) into properties. This map can be viewed as a way of "nominalizing" propositional functions. I use for it the symbol in (7a) and assume that nominalization will satisfy the condition in (7b).

- (7)
- a. \cap ("down"): $\langle e, p \rangle \rightarrow \pi$
 - b. $\cap \cup r = r$

Accordingly, the diagram in (4) can be completed as shown in (8).

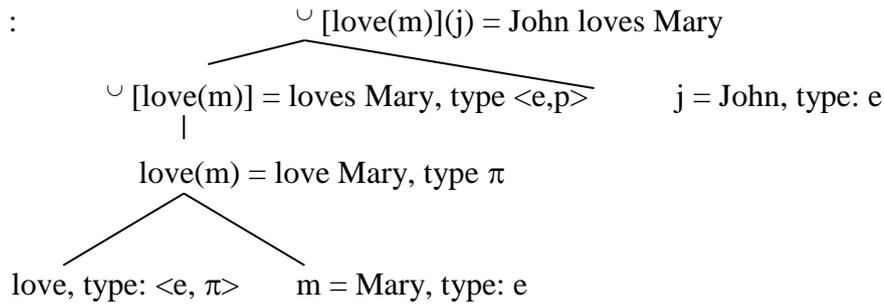


The diagram in (8) illustrates the way in which the semantic domains we are going to need to interpret English are classified. In Chierchia(1985) and Chierchia and Turner (1988), I've tried to show that a system of this sort plays an important role in characterizing the notion of "finite clause". I will argue in this paper that it also can play a key role in characterizing the semantics of unaccusatives.

We have discussed so far properties and propositions. What about relations? Well, a simple (though not the only) way of representing them in the present system is as indicated in (9). We can represent a 2-place relation as a function from entities into properties. Something like *John loves Mary* will, thus, be derived as shown in (9a). Similarly for 3-place relations.

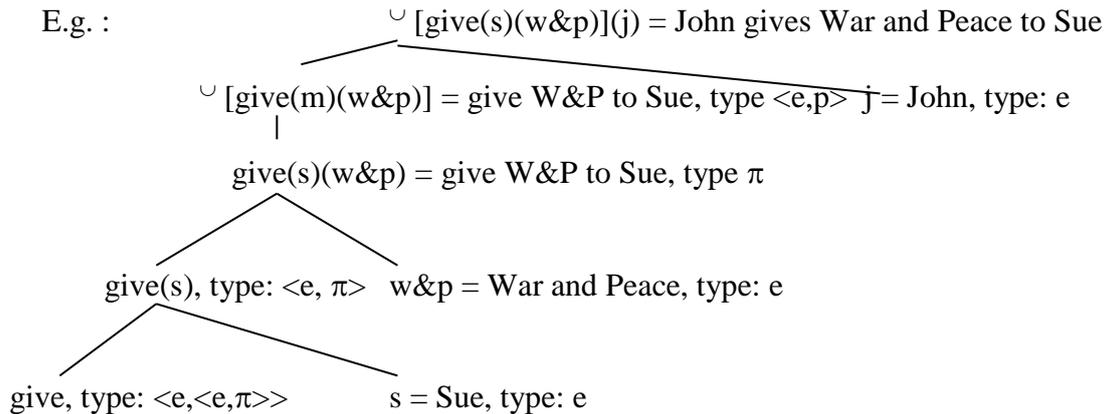
(9) a. 2-place relations: $\langle e, \pi \rangle$

E.g. :



b. 3-place relations: $\langle e, \langle e, \pi \rangle \rangle$

E.g. :



Looking, for example, at (9b), if one feeds an argument, say *Sue*, into *give*, one obtains *give Sue*, a function from entities into properties (i.e. a 2-place relation). If one further feeds into that another argument, say *War and Peace*, one obtains a property, the property of giving War and Peace to Sue. Predication then can apply to this turning it into a propositional function, which then applies to John, yielding *John gives War and Peace to Sue*. This illustrates how an n-place relation can be represented as a (curried) n-1 property-valued function. I will still refer to property-valued functions as “n-place relations”, as it is less cumbersome and mnemonically more useful. By the same token, given a relation like *love* in (9a) or *give* in (9b), I will refer to the argument that is fed last (*j* in (9a-b)) as the last argument of the relation, to the one fed in immediately before it, as the second to the last (*m* in (9a), *w&p* in (9b)), and so on.

The system that I have just sketched has, I believe, several advantages over more standard systems, such as Montague’s. For one thing, it embodies a more intensional view of properties and propositions. By treating them as basic, we can leave open their identity conditions. Which means that two logically equivalent propositions will not necessarily be identical. In Montague’s system, where propositions are identified with sets of worlds, logically equivalent propositions turn out to be the same object, which leads to well-known problems in connection with propositional attitudes. But quite independently of this feature, the following aspect of the system just sketched is going to play a crucial role for our purposes. Predicates play a double role. On the one hand, they are just individuals, perhaps aspects of the world (entities of type π). On the other hand, predication turns them into unsaturated, argument taking functions (of type $\langle e, p \rangle$). This double role will enable us to give semantic content to the notions of internal vs. external predication, which seems to be at the heart of unaccusativity. We are now in condition to see how a Property Theory of the type just sketched can be used in interpreting LF in general, and unaccusative structures in particular.

3. Interpreting LF

3.1. Relation changing operations

Let us address now the question of the semantics of operations on θ -roles. As pointed out above, in the Principles and Parameters framework, relation changing processes involve operations on θ -roles. For example, detransitivization, i.e. the alternation in (2c) above, can be cast as an operation that lexically saturates the object θ -role (see, e.g., Rizzi (1989)). Passive is generally taken to involve an operation that saturates or absorbs the subject θ -role. And so on. What one would like to determine is which operations on meanings such operations on θ -roles are associated with. This question has been studied fairly extensively in the semantic literature (cf., for example, Dowty (1982) or Keenan and Faltz (1985)). The basic approach emerging from this line of research is that there are a limited number of ways in which the logical structure of a relation or property can be modified. So operations on θ -roles can be taken to correspond to algebraic operations on relations.

It is perhaps appropriate in this connection to present here some of the standard operations discussed in the literature, adapting them to the present semantic system. In each instance, I consider only the simplest possible case. Generalizing them to more complex cases presents no problem, in so far as I can see.

Let us begin with passive. One can interpret passive as a map from relations into properties, which fills in the slot that corresponds to the subject (i.e. the last slot) with a variable and closes it off existentially. Such an operation is spelled out in (10). The logical type of the operation is given in (10i), its truth conditional import in (10ii)

- (10) Passive (P)
- i. Logical type of P: $\langle e, \pi \rangle \rightarrow \pi$
 - ii. Content: $\cup [P(\text{see})](x) \leftrightarrow \exists y \cup [\text{see}(x)](y)$
 - iii. Closest Montague-style equivalent: $\lambda x \exists y [\text{see}(x)(y)]$
 - iv.

In (10iii), I provide for comparison the closest Montague-style version of passivization. An operation of this sort appears to provide a simple way of giving truth conditional content to the claim that passive morphology absorbs or saturates the subject θ -role. Notice, in particular, that the suppressed argument is still semantically there, which makes it possible for it to manifest itself in certain cases. For example, as often noted, such an argument can control infinitival adjuncts, as in (11):

- (11) The boat was sunk [PRO to collect insurance]

The implicit agent appears to be the understood controller of the infinitival clause in (11). This is possible because the agent, even if not syntactically projected, is present in semantic structure (in the form of an existentially quantified variable) and thus accessible for this kind of control (but not, say, for controlling reflexives).

A structurally similar operation is the one arguably involved in what used to be called “indefinite object deletion”, i.e. alternations of the kind given in (2c). This is illustrated in what follows.

- (12) Detransitivization (D)
- i. Logical type of D: $\langle e, \pi \rangle \rightarrow \pi$
 - ii. Content. $\cup [D(\text{eat})](x) \leftrightarrow \exists y \cup [\text{eat}(y)](x)$
 - iii. Closest Montague-style equivalent: $\lambda x \exists y [\text{see}(y)(x)]$

The operation D in (12) corresponds to an operation which saturates the object θ -role. Note that the only difference between (12) and (10) is the slot where the existentially quantified variable is inserted. In (11) it is the last slot (the one corresponding to the subject), in (12) it is the second to the last (the one corresponding to the object). So (12) is an object-affecting operation, while (11) is a subject-affecting one.

A further important operation is reflexivization:

- (13) Reflexivization (R)
- i. Logical type of R: $\langle e, \pi \rangle \rightarrow \pi$
 - ii. Content: $\cup [R(\text{wash})](x) \leftrightarrow \cup [\text{wash}(x)](x)$
 - iii. Closest Montague-style equivalent: $\lambda x [\text{wash}(x)(x)]$

This operation identifies the two arguments of a relation, thereby reducing it to a property. In this sense, it is both a subject- and an object-affecting operation. In the lexicon this operation is presumably involved in the interpretation of forms of reflexivization like self-prefixing in English, or the alternation between transitive and intransitive *shave*. In the syntax, reflexive clitics are obvious candidates for applications of such an operation. There are many aspects of the behavior of reflexive clitics that mesh well with the idea that they are semantically associated with R. For example, reflexive clitics do not display NP behavior; e.g., they are unable to conjoin with other NPs, which makes sense in view of the fact that R is not of the same type as NPs. Furthermore, non arguments (e.g. VP-adjuncts) are typically unable to cliticize. This follows on the present view from the fact that adjuncts are *property*-modifiers (in our framework, functions of type $\langle \pi, \pi \rangle$) while reflexive clitics need *relations* to operate on. Thus the hypothesis that reflexive clitics are semantically associated with the relation reducer R seems well motivated.

By the same token, R by itself cannot be what is involved in the interpretation of non clitic reflexives, like English *himself* or Italian *sé stesso*. Non clitic reflexives are full fledged NPs. For example, they can be conjoined with other NPs as in

- (14) John likes only himself and Bill

It is pretty clear that one cannot interpret (14) by means of an argument reducing operation such as the one in (13). What has been proposed in this connection is that non clitic reflexives like *himself* are associated with two things: an ordinary pronoun meaning and an operator that encodes an instruction to bind the pronoun meaning to a suitable antecedent (subject to a domain condition, like principle A of the Binding Theory). An explicit proposal along these lines can be found, e.g., in Bach and Partee (1980) (cf. (56) below for an illustration). As non clitic reflexives are associated with an ordinary pronoun meaning, nothing will prevent them from conjoining with other NPs. Nor will they be prevented from occurring in adjunct position, to the extent that they can find a local antecedent in the relevant domain.

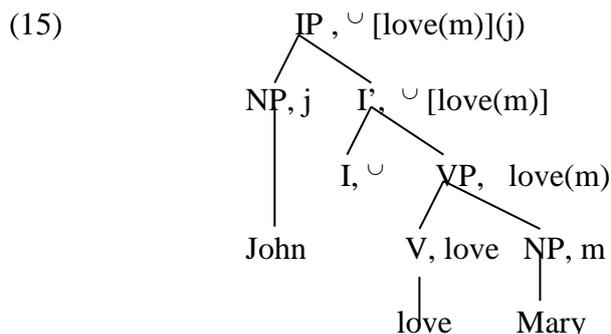
To summarize, we have discussed a number of semantic operations on relations, that can be viewed as the semantic counterparts of operations on θ -roles. The central question that now arises is which of these operations, if any, is involved in unaccusative alternations such as the one between transitive and intransitive *sink*. Before we can address this question, however, we need to be more explicit on how these operations are used in interpreting LF.

3.2. The map from LF into If

The only substantive assumption that I will be making on the LF-If map is the following. Just like clauses arise by syntactically predicating a VP of a subject, the semantic value of clauses, namely propositions, arise by semantically predicating a property of an individual. I will execute this by

assuming that the predicator (\cup) is associated with the inflectional head I^0 . In other words, \cup is what I^0 “means”. I will call this the predication principle. This principle is very much in the same spirit as the projection principle: it requires that the map from syntax into meaning is, in some sense, transparent. Perhaps, the predication principle could subsume the extended projection principle, along lines similar to those explored in Rothstein (1983). The predication relation takes two arguments: an individual and a property. If argument structure must be syntactically projected and if predication is realized as I^0 , it follows that [NP, IP] must be syntactically projected.

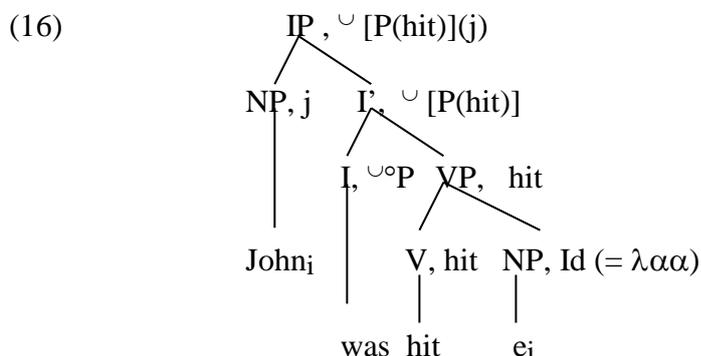
Be that as it may, let me exemplify how one might envisage, on the basis just sketched, the LF-If map. Consider a simple structure such as the one in (15):



In (15), I indicate next to each node its If-representation. As pointed out above, I assume that in general the LF-If map is compositional, i.e. it proceeds bottom up and the translation of the mother is determined by the translation of its daughters and a restricted number of semantic operations (like function application or composition).⁴ In (15) we use function application all the way through.

Now, there are several ways in which this interpretive procedure is simplistic. For one thing, it might be the case that the interpretive procedure has to access information contained at other levels (like D-structure or S-structure). Moreover, it has been argued (e.g. Higginbotham (1985), Parsons (1988)) that verbs have an extra “Davidsonian” argument slot for events. These are issues I am ignoring here only for simplicity. The crucial factor, from the present perspective, is the predication principle, i.e. the claim that a proposition comes about only by using the predication relation to connect a property (i.e. an entity of a certain sort) with an argument, no matter how this is executed.

With these provisos in mind, let us move on to consider how passive works.



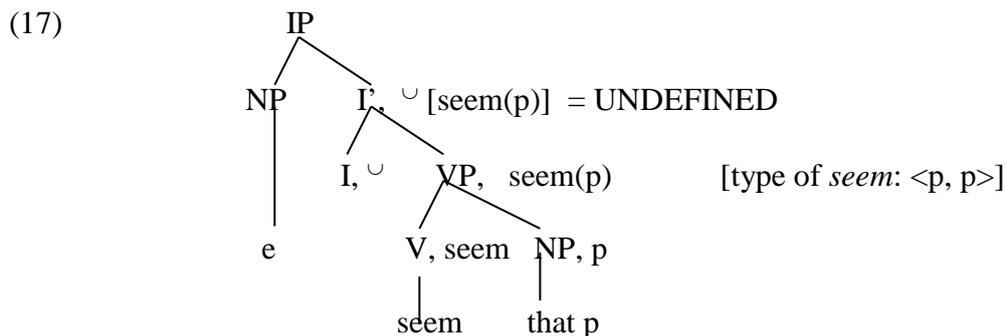
In (16) passive morphology is interpreted as the composition $\cup^{\circ}P$ ($= \lambda R \cup [P(R)]$) of the predication operation \cup with the passivization operation P ; syntactically passive morphology saturates the subject θ -role (cf., e.g., Baker 1988); its semantic counterpart P closes off existentially the argument slot corresponding to such role. NP traces (unlike A' -bound ones) are taken to be

⁴ We follow on this score the Montagovian tradition.

semantically inert, and interpreted as the identity map. So the meaning of the VP is obtained by applying the identity map associated with the trace to the semantic value of the V. This has the effect that the meaning of the V is passed up. Then P and predication apply to it and the result applies, in turn, to the subject. Again, I am leaving out, here, many details that though important for other purposes are irrelevant to the task at hand.

3.3. Expletives and predication

An interesting problem for the predication principle arise in connection with verbs like *seem*. There are expressions that are syntactically VPs and yet semantically they are clearly propositions, like *seems that John was here*. The problem is illustrated in (17):



The issue here is that *seem* appears to be taking a proposition as its (only) argument. I.e., *seem* is of type $\langle p, p \rangle$ and takes its propositional argument internally to its maximal projection. Once the propositional argument of *seem* is provided, we get a proposition. And propositions are the wrong sort of objects to be predicated of anything: they are complete structures. Thus the predication operator is undefined for them.

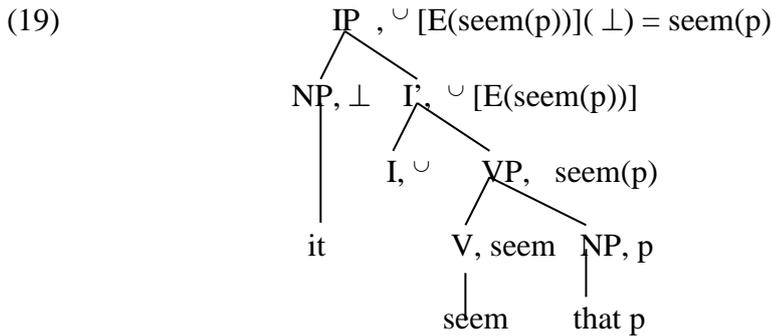
What ways out do we have? A priori, two sorts of routes are open to us: either we give up the idea that clausal structures universally involve predication in the semantic sense (i.e. we give up the predication principle). Or, if the predication principle is right, we must somehow turn *seems that p* into a property, i.e. something that can take an argument. Let us pursue this strategy, to see what it involves. Imagine defining a function of the following sort:

(18) Expletivization (E)

i. Logical type of E: $\langle p, \pi \rangle$

ii. Semantic content: $\cup[E(seem(p))](x) = \begin{cases} seem(p), & \text{if } x = \perp \\ UNDEFINED, & \text{if } x \neq \perp. \end{cases}$

Here is the idea. Expletivization applies to a proposition and turns it into a property. $E(seem(p))$ is a property that predicated of an arbitrarily chosen funny object (which I notate as ' \perp ') yields the proposition *seem(p)*. If $E(seem(p))$ is predicated of anything else but the funny object, the result is undefined. The idea is not new. It is just a variant of a standard Montaguesque strategy for dealing with expletives. Notice, incidentally, that E, as defined, is a subject-affecting operation: it adds a sort of truth conditionally inert subject to a proposition (i.e. a 0-place relation). In this sense, it falls together with passive and reflexivization, which also are subject-affecting. By means of E, we can rescue the structure in (17) as follows:



E is to be thought of as a type shifting operation that is called upon when simple function application won't work (as is generally the case for type shifting).⁵ In structures like (19) at the VP level we are stuck with an object that predication cannot apply to. Hence we resort to expletivization that turns $seem(p)$ into a property. This property can only apply to an argument that does not affect truth conditions (namely, an expletive).

This amounts to pushing the Predication Principle as far as possible. If such principle is right, then positing something like expletivization is the only way to cope with the existence of verbs like $seem$. If we don't want to resort to expletivization, we will have to resort to a different interpretive procedure for "normal" cases (such as (15)-(16) above) vs. cases like $seem$. As I do not find this particularly desirable, I will stick to the Predication Principle.

There is a further role that expletivization might play. We have assumed that passive absorbs the θ -role of the subject (i.e., it existentially quantifies over the subject slot) and externalizes the argument corresponding to the object. Imagine, now, an operation that, instead, simply saturates with an existential quantifier the subject slot, *without* externalizing anything. Such an operation would have a semantics of the following kind:

(20) I-Passive

- i. Logical type of P_I : $\langle e, \pi \rangle \rightarrow \langle e, p \rangle$
- ii. Semantic content: $P_I(\text{help})(x) = \exists y \cup [\text{help}(x)](y)$ (i.e. 'x is helped')
- iii.

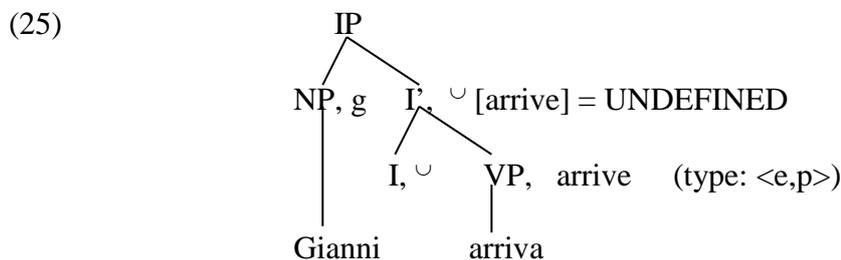
Truth-conditionally, P and P_I are just alike. The only difference between them is one of logical type: P yields properties as output, P_I yields propositional functions. Since does not call for externalization of an internal argument, nothing prevents generalizing it to intransitives. I.e., one can assume that e in (20i) is optional. In the case of intransitives, P_I would work as follows:

- (21) a. $P_I(\text{dance}) = \exists y \cup [\text{dance}](y)$ (i.e. 'it is danced')
- b. Generalized type of P_I : $\langle (e,) \pi \rangle \rightarrow \langle (e,) p \rangle$

In plain words, P_I is impersonal passive, an operation that, unlike regular passive, fails to externalize the internal argument, if there is one. But this means, that whenever we have an impersonal passive, we will wind up with something propositional at the VP level, much like in the case of $seem$. This will force us to resort to expletivization, which will create the external expletive argument that predication needs. In (22) I illustrate the whole process with a German example.

⁵ Cf. Partee and Rooth (1983) for a general discussion of type shifting principles. My use of E follows closely the spirit of their proposal.

Unaccusatives differ from unergatives just like propositional functions differ from properties. It then follows from the Predication Principle that unaccusatives are prevented from taking their argument externally. If we try to generate a structure like (25), in which the argument of *arrivare* is directly generated externally, the derivation won't go through:



When we try to apply predication to *arrivare* we get something ill formed, for ‘∪’ is only defined for properties. And this structure cannot be rescued by any of the known strategies. This forces *arrivare* to take its argument internally, which in turn forces one to resort to expletivization to avoid getting stuck with a proposition at the wrong level.

Let me try to summarize so far. I have sketched a way to interpret syntactic structures of the kind familiar from work in the Principles and Parameters framework using a property theory that crucially distinguishes properties from propositional functions and that views predication as a map from the former into the latter. The central aspect of the syntax-semantics map I have proposed is that a clause relates a predicate to a subject via a predication relation not only in the syntax but also in the semantics (the Predication Principle). This entails that VPs must be associated with the kind of things that can be predicated, namely properties. But it doesn't exclude that certain verbs might be associated with propositional functions. Given, however, the Predication Principle, these verbs turn out to be, in a sense, “defective”. They are predicted to have the following features: their arguments must be fed in internally and they will have an expletive subject (via expletivization).

So why are there verbs like *seem*? Why are there unaccusatives? Or, equivalently, why verbs may lack an external argument, while, at the same time, the subject position must be always projected? It seems to me that our theory of properties and its encoding in syntactic structure (i.e. the Predication Principle) offers the beginning of an answer to these questions. On the proposed approach, predicates exist in two related forms: as properties and as propositional functions, with predication relating the two. This leads one to expect verbs to be associated with properties (and, in the case of transitives, with property valued functions). But to rule out verbs directly associated with propositional functions we would have to pass a law. Such verbs must have unaccusative characteristics. These assumptions (if one buys property theory) are rather minimal. This makes me hope that extensions and refinements of the LF-If map will leave them unaffected.

There are a good deal of questions that the above considerations leave unsolved and that must be answered for the present line of inquiry to be viable. For example, we still have to say something on the nature of unaccusative transitive/intransitive alternations. Furthermore, in unaccusative structures, the internal argument can be externalized via NP-movement. How are the resulting structures to be interpreted?. I believe that the answer to these two questions is, perhaps surprisingly, related. To this issue the following section is devoted.

4. Unaccusatives as reflexives

4.1. On the nature of unaccusative alternations

As pointed out above, it is typical of unaccusatives to enter alternations such as the one that follows:

- (26) a. Gianni ha affondato la barca ‘Gianni sank the boat’
b. La barca è affondata ‘the boat sank’

The question that arises here is how the transitive and intransitive members of the pair in (26) are related to one another. The projection principle requires that members of transitive/intransitive pairs of this sort be related by some admissible operation on θ -roles. If, however, we start by taking the intransitive member of the pair as basic and derive the other via, say, causativization it would still remain to be explained why the argument of intransitive *affondare* should be an internal one. On the other hand, if we take the transitive member of the pair as basic, we might have a better chance at explaining why the argument left behind is internal. Imagine, for instance, that intransitive *affondare* is derived via an operation like passive from the transitive one. We have seen that passive has the option of leaving an internal argument behind (cf. (20)). If this independently available option is selected, the unaccusative behavior of the intransitive member of the pair in (26) would follow. While a story along these lines might be on the right track, there are various considerations that militate against something like passive as the right choice for unaccusatives. The main empirical reason, as far as I know, lies in well known contrasts like the one in (27):

- (27) a. The boat was sunk [PRO to collect insurance]
b. * The boat sank [PRO to collect insurance]

If unaccusatives involved the same operation as passivization, the contrast in (27) would remain a mystery. We would be left without a clue as to why the implicit argument of passives is capable of controlling the adjunct clause in (27a) but not in (27b).

If passive doesn't work here, where else can we look? Should we make up some other way of saturating the subject θ -role of transitive *affondare*? Well, before doing that, it might not be a bad idea taking a closer look at the operations already available. The point is that, as often observed, in alternations such as those in (26), the transitive member of the pair tends to be causative. This entails that its meaning will have to be specified in terms of a cause-predicate. Let us assume, then, following, e.g., Dowty (1979) that its meaning is specified as in (28a). The relation in (28a) holds between x and y just in case some action β of y causes $\alpha(x)$ to be the case, where α is some suitable, possibly abstract, predicate (like, say, being under water). In (28a') I give for comparison the equivalent of (28a) in the standard Montagovian notation.

- (28) a. $\lambda x \wedge \lambda y \exists \beta [\text{CAUSE}(\cup \beta (y), \cup \alpha (x))]$
b. $\lambda x \lambda y \exists P [\text{CAUSE}(\wedge P(y), \wedge \alpha (x))]$

What I would like to suggest is that the meaning of unaccusative *affondare* is a reflexive form of the causative (28a) (which I will abbreviate as $C(\alpha)$). I.e. its representation is as in (29a):

- (29) a. $\text{affondare}_{IV} = R(\text{affondare}_{TV})$ (= $R(C(\alpha))$, where R is as in (13))
b. La barca è affondata ‘the boat sank’
c. $\cup [R(\text{affondare}_{TV})](\text{the boat}) = \text{a property of the boat cause the boat to sink}$

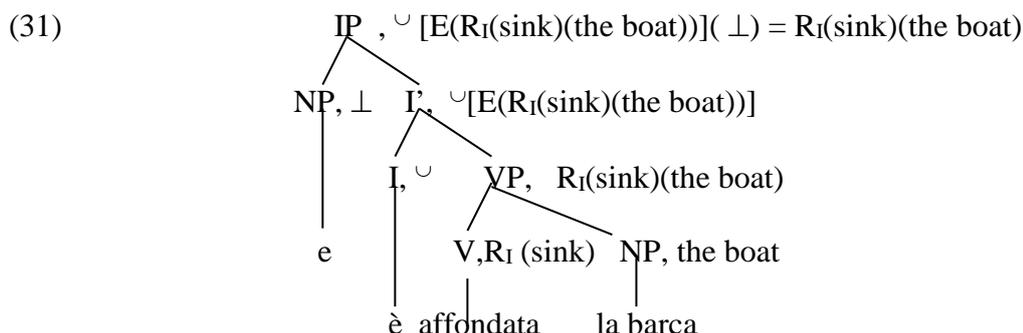
So I am essentially proposing to interpret *the boat sank* as something like *the boat sank itself*. But this is not quite right, of course. What we actually want is to interpret *the boat sank* as: some property of the boat (or some state the boat is in) causes it to go down. That is with unaccusatives the causing factor must be understood not as an action but statively. This, it seems to me, captures exactly how *the boat sank* and *the boat sank itself* differ in meaning. When we say “the boat sinks itself” we are imputing to the boat the capacity of performing an action; we are anthropomorphizing it. But for the boat to sink, it suffices that the boat has or comes to have a property that causes its sinking. The reflexive character I am attributing to unaccusatives is of a special, static nature. There are many conceivable ways of implementing this. We can define a reflexive operator that has this stativity requirement built in. Or we can assume that the cause-operator (implicitly present in the structure of *sink*) is neutral as to what type of property is involved (i.e. whether it is an action or a state). It is then the (in)animacy of the subject that triggers an implicature as to whether the causing factor involves an action or a state. I will follow the latter strategy here, as it is simpler. But very little would change if this strategy turns out to be inadequate.

Reflexivization as we have defined it above identifies subject and object and externalizes the remaining argument. Thus, we still have to explain how come the argument left behind is an internal one. The answer to this question is virtually forced upon us: the kind of reflexivization involved in deriving unaccusatives must “leave behind” an internal argument. That is to say, it must have the following characteristics:

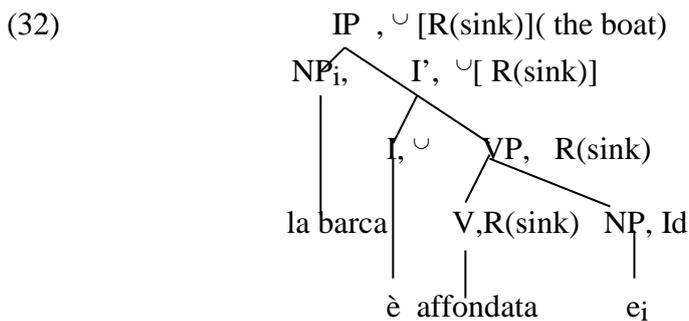
- (30) “Internal” reflexivization : R_I
- a. Logical type of R_I : $\langle e, \pi \rangle \rightarrow \langle e, p \rangle$
 - b. Content: $R_I(\text{sink})(x) = \cup[\text{sink}(x)](x)$

R_I is to R just what P_I is to P . Truth conditionally, R_I and R are exactly alike, the difference residing in the logical type of their outputs. In fact, a priori, if passive is allowed to leave internal arguments behind (i.e., in our terms, to have propositional functions as output) there should be no reason why this option should be banned to other argument manipulating operations.

The upshot of this proposal, then, is that intransitive members of an unaccusative alternation are related to their transitive counterpart via an operation of reflexivization that has the following two features: (a) the causing factor is understood statively, and (b) the reflexivization operation is an “internalizing” one. In (31), we provide a sample derivation:



As you can see, the only difference with respect to what we had previously (cf. (24) above) is that unaccusative *sink* has the structure $R_I(\text{sink})$, where *sink* is a two place causative relation. This hypothesis also provides an answer to what happens when the internal argument of unaccusative *affondare* is externalized via NP movement. In this case, we will have to assume that the externalizing operation of reflexivization R is used (as opposed to R_I). Here is an example:



In light of this, we can think of the relation between transitive vs. intransitive *sink* as follows. Intransitive *sink* is derived from the transitive one via reflexivization, with the possibility of freely choosing between R and R_I. If R_I is chosen, unaccusative *sink* will have to take its argument internally. If R is chosen, the argument of *sink* must be externalized via NP movement. Thus NP movement is interpreted very differently in unaccusative structures from the way it is interpreted in passives.

An immediate consequence of the hypothesis that unaccusatives (of this kind) are a special case of reflexives is that the contrast in (27) above, repeated here, can now be derived. Consider:

- (33) a. * La barca è affondata per [PRO far incassare l'assicurazione a Giuseppe]
 The boat sunk to make Giuseppe collect insurance
 c. Gianni è annegato per [PRO far incassare l'assicurazione a Giuseppe]
 Gianni drowned to make Giuseppe collect insurance

In (33a) the only available controller is the boat (both cause and causee, on our proposal); but the boat as such cannot collect or make anyone collect insurance, whence the deviance of (33a) (and of (27a) above). This predicts that if the subject of an unaccusative can perform the relevant action, the sentence should become grammatical. This indeed seems to be so, as (33b) shows. The structure of (33b) is identical to the one of (33a), but the subject *Gianni* in (33b) can make *Giuseppe* collect insurance and the sentence is grammatical.

The next question to ask concerns unaccusatives that lack a transitive counterpart. Does it make any sense to try to extend to them the view that unaccusatives are reflexives? And if not, how is NP movement interpreted in such cases? There are two logical possibilities here, it seems to me. One is to simply assume that unaccusatives that lack a transitive counterpart are just lexically marked as lacking an external argument (i.e., in our terms, as being of type <e,p>). For verbs like *seem*, whose internal argument is propositional, this seems very plausible. But for verbs whose internal arguments is non propositional, another option is available. One can assume that these verbs too involve reflexivization of a covert, abstract relation. In other words, unaccusatives (*seem* & Co. aside) would uniformly have the structure R(C(α)), where R is (externalizing or internalizing) reflexivization, C is a causative operator and α is a (abstract)1-place predicate. C(α) sometimes surfaces as an actual transitive verb and sometimes doesn't. Before we try to assess the merits and faults of this proposal, let me illustrate it a bit further by means of a more concrete example. Take the verb *crescere* 'grow'. In standard Italian, it is only intransitive (cf. below 34a). There is of course a two-place relation, meaning roughly "cause to become bigger", which constitutes the interpretation of the English transitive *grow*. That relation, one can assume, underlies the representation of unaccusative *crescere* in Italian.

The two hypotheses we are contrasting are the following:

Hypothesis 1: unaccusative lacking a transitive counterparts are reflexivizations of abstract causative relations (cases like *seem* aside).

Hypothesis 2: unaccusative lacking a transitive counterpart are simply listed in the lexicon as lacking an external argument.

Perhaps, Hypothesis 2 might strike one as being formally simpler. This is only apparent, however, at least within the present set of assumptions. We have given above an arguably simple account of how NP movement in unaccusatives of the *sink* type should be interpreted. Obviously, under Hypothesis 2 such an account would not extend to unaccusatives lacking a transitive counterpart, while under Hypothesis 1 it would. I.e. under Hypothesis 1, one can maintain that the If of, e.g. (34b) is as in (34c):

- (34) a. * Gianni ha cresciuto pomodori e lattuga tutta la vita
Gianni grew lattice and tomatoes all his life
b. I pomodori sono cresciuti e;
The tomatoes grew
c. $\cup[R(C(\alpha))](\text{the tomatoes})$, where R is the “externalizing” reflexivization and C(α) is whatever relation is associated with transitive *grow* in English.

The If in (34c) is the same as the one in (32). Per contra, on Hypothesis 2, one would need two different ways of interpreting NP movement in unaccusative structures: One for unaccusatives having a transitive counterpart and one for those lacking one. On the basis of this discussion, it would seem that, after all, Hypothesis 1 is preferable on grounds of formal simplicity. And it turns out to be preferable on empirical grounds as well. In the next section, I am going to consider four arguments that seem to favor it.

4.2. Empirical evidence

4.2.1. Unstable valence

As C. Rosen pointed out to me, unaccusatives tend to be unstable in their valence. They often oscillate from transitive to intransitive and viceversa, both diachronically and across dialects. For example, while in standard Italian *crescere* is intransitive (cf. (34a)), there are dialects in which transitive uses (such as (35a)) do occur.

- (35) a. I figli, Gianni li ha cresciuti bene
His sons, Gianni them (cl.) grew well
b. R(C(α))

And one finds transitive uses even of verbs like *morire* ‘die’, *ribellare* ‘uprise’, *suicidarsi* ‘commit suicide’, etc. In contrast, unergative verbs like *sudare* ‘swet’, *piangere* ‘cry’, etc. do not seem to undergo these shifts in valence.

Oscillations of this sort in unaccusatives are just what one would expect, if their representation is as in (35b). What happens to an unaccusative lacking a transitive counterpart when it is transitivized is simply that the transitive C(α) embedded in its lexical representation surfaces as an autonomous lexical entry. If, on the other hand, these unaccusatives were simply listed in the lexicon as lacking an internal argument, there would be no reason for them to undergo shifts in valence any more easily than their unergative cousins.

4.2.2. Reflexive morphology

The second argument is based on the fact that a significant class of unaccusatives is marked by reflexive morphology:

- (36) a. rompere /rompersi ‘break’
 aprire/aprirsi ‘open’
 irritare/irritarsi ‘irritate’
 etc.
- b. inginocchiarsi ‘knee’
 scontrarsi ‘collide’
 arrabbiarsi ‘get angry’
 etc.

In (36a), we see examples of transitive/intransitive alternations of the unaccusative type where the intransitive member of the pair is obligatorily marked by a reflexive morpheme (the reflexive clitic *si*). In (36c), we see examples of unaccusatives lacking a transitive counterpart, which are also obligatorily marked by a reflexive. Reflexive marking of this kind, which behaves to all effects like a regular reflexive clitic, is sometimes called “inherent” and is generally viewed as a pure marking of unaccusativity (see, e.g. Burzio (1986, ch. 3)). The question that arises in this connection is the following: why should unaccusatives be marked by reflexive morphology, as opposed to any other one? As far as I know, this question remains without an explanatory answer within current approaches.⁶ Structurally, unaccusatives are parallel to passives, not to reflexives.

The present approach clearly offers a basis to a principled account for such a phenomenon. It has been occasionally observed that unaccusatives (and/or middles) and reflexives appear to have some common semantic traits. But this semantic similarity has never been actually spelled out. The present theory provides a substantive hypothesis concerning what exactly unaccusatives have in common with reflexives and how they differ from them. Unaccusatives are viewed as reflexivizations of causative transitive forms. But they are reflexivizations of a special sort. The causing factor is not perceived as an action performed by the subject, but as a property or state of the subject. Thus, what is special about unaccusatives marked by *si* as opposed other unaccusatives is simply that the former wear their meaning on their sleeves. All unaccusatives have an implicit reflexive operator in their lf. In some cases, the reflexive operator is lexically incorporated into the meaning of the verb without any morphological reflex. In others, the reflexive operator actually shows up in its usual form: a clitic, a piece of verb morphology.

4.2.3. The distribution of *da sé* phrases.

A consequence of the view that unaccusatives are reflexives is that the subject of unaccusatives should systematically be associated not only with the semantic role associated with the object (say, theme) but also with the one associated with the subject. In *John kills himself*, *John* is both the theme and the agent of the killing. Similarly in *the boat sunk*, *the boat* is claimed to be both the theme and the cause of the sinking (not the agent, of course, since it is inanimate and hence can perform no action). In other words, the subject of unaccusatives should be associated with the entailments that characterize themes as well as with the entailments that characterize causes. If we can find grammatical constructions sensitive to these roles, we should be able to test this consequence, which, as far as I can tell, is peculiar to the present hypothesis. I think that there is indeed, in Italian, a structure sensitive to the ‘cause’ role, which enables us to test our claim. The structure in question has to do with the idiomatic anaphor *da sé*, similar to the English *by itself*, exemplified in (37).

⁶ Within relational Grammar a “retroadvancement” from 2 to 1 is postulated, which creates the same structural configuration associated with reflexives (cf. Rosen 1981, pp. 71 ff.)

- (36) Gianni mi ha picchiato da sé
Gianni hit me by himself

Da sé is a modifier, occurs in adjunct position and its antecedent must be construed as the sole cause of the event under consideration. That is what *da sé* contributes to meaning. Sentence (37) says that Gianni is the only agent of the hitting. The *da sé* anaphor appears to have the following properties. It disallows long distance antecedents (cf. (38a)) and is subject oriented (cf. (38b)).

- (38) a. * Gianni sostiene che io sia venuto da sé
Gianni claims that I came by himself
Gianni claims that my arrival was his responsibility
b. *Io ho picchiato Gianni da sé
I hit Gianni by himself

The facts in (38a) suggest that *da sé* is subject to principle A of the binding theory. This would account also for (38b), since *da sé* is an adjunct and the only C-commanding local antecedent would be the subject. The following facts further support the claim that the antecedent of *da sé* must be an agent or cause:

- (39) a. * Gianni conosce il latino da sé
Gianni knows Latin by himself
b. * Gianni ha sudato da sé
Gianni swet by himself
c. A: Tu hai fatto sudare Gianni
You made Gianni swet
B: No, ha sudato da sé

No, (he) swet by himself

Example (39a) shows that with statives *da sé* is bad, as their subject is non agentive. With verbs denoting involuntary physical functions, like *sudare* ‘swet’, *da sé* is also bad (cf. (39b)). It improves somewhat only to extent that their subjects can be understood as causing the physical change. The dialogue in (39c) provides a context in which this happens.

Given all this, we expect *da sé* to be impossible in passives, for the only possible controller (the subject) is clearly non agentive. This expectation is indeed borne out:

- (40) * La porta è stata aperta da sé
The door was opened by itself

Sentence (40) is completely ungrammatical, whether the agent is expressed or not. A similar point can be made with so called impersonal *si*:

- (41) * Questo libro si legge da sè
this book one (cl.) reads by itself

If we try to construe *si* in (41) as impersonal (as on the reading indicated by the gloss), the sentence is ungrammatical. The only reading that (41) has is the anthropomorphic one where the book reads itself; in such a case, however, *si* is being interpreted as a reflexive and the sentence is, consequently, agentive.

Consider now the case of unaccusatives. According to our theory, the subjects of unaccusatives are systematically associated with the causer role, for they are reflexivization of

causatives. Hence, we expect that they should be acceptable antecedents for *da sé* phrases. And indeed they are:

- (42) a. La porta si è aperta da sé
The door opened by itself
b. La barca è affondata da sé
The boat sunk by itself
c. * La barca è stata affondata da sé
The boat was sunk by itself

Sentences like (42b) vs. (42c) provide a nice minimal pair involving passives vs. unaccusatives. These contrasts are very sharp.

This test provides us with a way to distinguish our hypothesis from a conceivable alternative. One could argue that in unaccusatives the cause/agent role is simply absent. That is to say, one could say that in the unaccusative member of the transitive/intransitive pair the subject θ -role is just not there. A claim along these lines has been put forth in connection with English middles (cf., e.g., Keyser and Roeper 1984). This hypothesis could perhaps provide an alternative account for the control facts considered above in (27). But it would leave the behavior of *da sé* phrases in the dark. There would be no reason why the subjects of unaccusatives are legitimate antecedents of phrases requiring precisely an agent/cause role, while the subjects of passives are not. Per contra, under the present theory the distribution of *da sé* phrases falls into place.

4.2.4. The aspect of unaccusatives

The claim that unaccusatives are reflexivizations of causative structures has a further consequence concerning their aspect. Causatives involve semantically the bringing about of a certain state. There can be causative states; but if a causative is non stative, it will have to be telic (for the coming about of the relevant state provides a culmination for the event). It follows that non stative unaccusatives, cannot be activities, but have to be accomplishments or achievements. This expectation appears to be borne out, as noted by several researchers (cf. especially van Valin (1987) and Levin and Rappaport (1988)). The aspectual class of unaccusatives is telic in the overwhelming majority of cases. This can be illustrated with particular cogency by considering verbs like *run*, as the following argument, adapted from van Valin's work, shows. *Run* is generally atelic (i.e. an activity/process). In Italian *correre* 'run' has both an unergative and an unaccusative variant, as attested by the fact that it can take both *essere* (the aux selected by unaccusatives) and *avere* (the aux selected by unergatives). Yet these two variants of *run* have different aspectual properties. The canonical test to distinguish telic from atelic verbs is modification by for- and in-phrases, as illustrated in (43), taken from Dowty (1979):

- (43) a. John pushed a cart for an hour
b. ?? John drew a circle for an hour
d. ?? John pushed a cart in a minute
e. John drew a circle in a minute
f.

For-phrases are odd with telic events and fine with atelic ones. In-phrases behave the opposite way: they are odd with atelic events, fine with telic ones. Many different accounts of these facts have been pursued. One of the most complete to this date remains that of Dowty's. He provides an aspectual calculus where, essentially, telic events are analyzed in terms of a cause operator, which is then provided with an interval semantics in whose terms the distribution of various adverbials can be derived. The point of relevance to us is that unaccusatives seem to systematically pattern with telic events with respect to tests such as those in (43):

- (44) a. ?? Gianni è corso in giardino per un'ora
 Gianni aux run in the garden for an hour
 b. Gianni ha corso in giardino per un'ora
 Gianni aux run in the garden for an hour

The choice of aux in (44b) shows that we are dealing with the unaccusative variant of the verb *run*. Modification by a for-phrase is odd, which suggests that we are dealing with a telic event in this case. This contrasts with what happens, if the choice of aux disambiguates towards the unergative variant. The behavior of in-phrases reinforces this pattern.

- (45) a. Gianni è corso in giardino in un minuto
 Gianni aux run in the garden in a minute
 b. ?? Gianni ha corso in giardino in un minuto
 Gianni aux run in the garden in a minute

What is interesting is that this happens with a verb whose basic meaning does not lend itself naturally to a telic interpretation. Yet to the extent that such verb is classified as unaccusative, a telic interpretation is superimposed. That is, *correre* is interpreted as “run to point x”, which bounds the activity and gives it a culmination that makes its aspectual class shift. And this behavior appears to be completely general. The correlation between unaccusativity and telicity is highly systematic and calls for a principled account. The present line of inquiry appears to provide a basis for it. If the representation of unaccusative *correre* is of the form $R(C(\alpha))$, i.e., say, cause oneself to bring about a change in location in a certain way, then one would expect it to be classified as telic, since (non stative) causatives have a built in culmination. If unaccusatives were simply listed in the lexicon as lacking an external argument, nothing would seem to follow concerning their aspect. Their distribution across the various aspectual classes would be expected to be random, contrary to fact.

4.3. Intermediate summary

On the basis of the foregoing discussion, I conclude that the hypothesis that unaccusatives are generally reflexivizations of causatives (i.e., they have the If in (46a) below) is well supported. For proposition taking verbs like *seem* this option is not available (propositions do not undergo reflexivization). Hence such verbs have simply to be listed in the lexicon as having the type shown in (46b). Verbs of this subclass are expected not to have the properties associated with the structure in (46a). Thus, they should not undergo shifts in valence, nor should they ever be associated with reflexive morphology. Moreover, they are not expected to be telic.

- (46) a. $R(C(\alpha))$
 b. seem: <e,p>

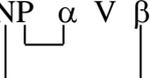
This analysis provides us with a semantics for unaccusatives which is not only truth conditionally adequate and explicit. It also accounts for transitive/intransitive alternation in a way that restores the predictive power of the projection principle and bypasses the dubious notion of optional argument. And it explains certain properties of unaccusatives previously either unnoticed (like their distribution in connection with *da sé* phrases) or unaccounted for (like the presence of reflexive morphology and their aspectual class). Further consequences concern the much discussed process of aux-selection in Italian, to which I turn next.

5. Aux selection

In Italian, the aux *essere* is selected over *avere* in the following cases:

- (47)
- a. passives
 - b. reflexive clitics
 - c. unaccusatives
 - d. impersonal *si*

The most sweeping attempt to account for this distribution within the Principles and Parameters framework is Burzio (1986). Very briefly, Burzio's account can be schematically summarized as follows:

- (48) a. NP α V β
- 

- b. *essere* is selected iff a binding* relationship obtains between the subject and a nominal contiguous to the verb.

The asterisk on the term *binding* indicates that not all types of binding will do. Binding of non clitic reflexives like *sé stesso* does not trigger *essere* selection. Burzio's approach does remarkably well in trying to reduce the seemingly unrelated contexts in (47) to a unity. Still, one cannot fail to notice that an awkward disjunction still remains. *Essere* is selected iff the subject binds the object position *or* it binds a subject clitic, where the latter side of the disjunction accommodates the aux selection properties of impersonal *si* constructions. The question one would like to ask in this connection is whether having an explicit semantics takes us any further in our understanding of what it is that makes the contexts in (47) a natural class. The following considerations suggest that this might indeed be so.

5.1. Subject-affectedness

Consider the semantic operations associated with the structures in (47) (leaving aside for the moment impersonal *si*). Passive requires P, reflexive clitic require R, unaccusatives require R and/or E. What do these operations have in common? The answer seems clear: they are all subject affecting operations. As discussed in section 3.1, the operations just mentioned affect a specific projection ("slot") of a relation, namely the one that corresponds to the subject (in our notation, the last one). P existentially quantifies over the subject slot. R identifies the subject with the object slot. E adds a truth conditionally inert subject slot. So the generalization that suggests itself is that *essere* is defined exclusively for subject affected properties, i.e. properties in the range of subject affecting operations.

Let us spell out this hypothesis a bit further. As aux's are verb modifiers, they can be viewed semantically as functions from properties into properties. The function/argument structure of, say, sentences like (49a,c) can be specified as in (49b,d) respectively.

- (49)
- a. Gianni è stato picchiato
Gianni aux-past beaten-pass 'Gianni was beaten'
 - b. \cup [essere(P(beat))](g)
 - c. Gianni ha sudato
Gianni aux-past swet
 - d. \cup [avere(swet)](g)

Since aux's are property modifiers, they can be sensitive to the semantic make up of what they modify. For example, in Spanish there are two forms of the copula, *ser* and *estar*; *ser* seems to select the class of properties that are somehow "inherent" or "essential", while *estar* selects the complement of such class. The choice of *essere* vs. *avere* in Italian is instead sensitive to a different factor: subject affectedness. More explicitly, the range of subject affecting operations will be the set: $\{ r \in \pi: \exists g[f(g) = r] \}$, where π is the set of properties, g any n-place relation and f a subject affecting operation. This set constitutes the domain of *essere*; its complement (i.e. $\pi - \{ r \in \pi: \exists g[f(g) = r] \}$), the domain of *avere*. All this can be summarized as follows:

- (50) a. *essere* is a function defined only on subject affected properties
 b. A subject affected property is a property in the range of a subject affecting operation (i.e.: $\{ r \in \pi: \exists g[f(g) = r] \}$)

If this is right, it must be the case that impersonal *si* is also semantically associated with a subject affecting operation. This hypothesis has a great deal of intuitive plausibility, for, as it has been observed several times, impersonal *si* sentences are very close in meaning to passives. And if indeed it turns out to be correct that impersonal *si* corresponds semantically to a subject affecting operation, then (50) would provide us with a maximally simple, truly non disjunctive characterization of the environments in which *essere* is selected, and thus, arguably, constitute an improvement over (48) above.

I believe that within the limits of the present work, it will be impossible to establish conclusively the thesis I have just outlined: the syntax and semantics of *si* are one of the most complex aspects of Italian grammar, and there is no way that I can do justice to it. However, I would like to offer some considerations that I think lend strong plausibility to the claim that the semantics of *si* is formally on a par with the semantics of passive.

5.2. Impersonal *si*

As noted by Cinque (1988) and others, salient features of the semantics of impersonal *si* are the following: *si* is restricted to ranging over a (plural) group of humans, and is sensitive to discourse factors, such as the generic or episodic character of the sentence, the presence of adverbs of quantification, and the like. This latter aspect of the meaning of *si* is illustrated by the following examples.

- (51) a. *Si è bevuto molto ieri sera*
 si aux-past drunk a lot last night
 People/we have drunk a lot last night
 b. $\exists x_p[\text{drink a lot}(x_p)]$
 c. *Se si invita qualcuno, lo si deve intrattenere*
 If si invites someone, him-cl si must entertain
 If one invites someone, one has to entertain him
 d. $\forall x_p \forall y[\text{invite}(x_p, y) \rightarrow \text{entertain}(x_p, y)]$
 e. *Talvolta, se si invita qualcuno, lo si deve intrattenere*
 Sometimes, if one invites someone, one has to entertain him
 f. *In Italia, si beve molto vino*
 In Italy, one drinks a lot of wine
 g. $\forall x_p [x_p \text{ in Italy} \rightarrow x_p \text{ drinks a lot of wine}]$

In (51) we have an episodic sentence and *si* is interpreted as having a quasi existential force, as indicated in (51b), where x_p is a variable ranging over groups of people.⁷ In (51c) we have a conditional, and *si* acquires a quasi universal force. These examples show, furthermore, that *si* licenses what has come to be known as donkey anaphora. In fact, as is generally the case with donkey type anaphora, the universal quantificational force in examples like (51c) is obtained as a default only when no explicit adverb of quantification is present. If such an adverb is overtly present, it typically determines the quantificational force of the indefinites within its scope. Thus, for example in (51e) *si* has again a quasi existential force under the scope of *talvolta* ‘sometimes’. I.e. for (51e) to be true it suffices to entertain some guests, not all guests. Finally, in (51f), we have a generic sentence (that can be analyzed as conditionals of a special sort -- see e.g. Krifka (1988)), and consequently *si* acquires again quasi universal force.

These facts strongly suggest that *si* should be regarded as indefinite in the sense of Discourse Representation Theory (DRT).⁸ DRT treats indefinites as variables (whose value has got to be “new” in the relevant context). Their quantificational force is then determined in systematic ways by the presence of overt or implicit unselective quantifiers. Within the present framework, a first step towards a DR-theoretic treatment of *si*, that does justice to the previous observations could be the following:

- (52) a. Logical type of *si*: $\langle \pi, p \rangle$
 b. Truth conditional content: $\text{sip}(r) = \cup r(x_p)$ [x_p a variable ranging over a group of people]
 c. Example: $\text{sip}(\text{lavora}) = \cup [\text{lavora}(x_p)]$

In (52a) the semantic operation associated with *si* (denoted as sip) is defined as a map from properties into propositions. Such a map plugs a distinguished variable (restricted to groups of humans) into the subject slot of a property. The quantificational force of this variable is then determined along the lines of Kamp’s and Heim’s theory. It is easy to see that the operation in (52) corresponds closely to passive. See in particular our definition of impersonal passive PI in (21) above. The main differences between sip and PI appear to be that sip but not PI restricts the variable introduced in the subject slot to groups of humans and that sip , but not PI, does not close existentially the variable it introduces. One cannot fail to notice in this connection that the second difference might just reflect an inadequacy of our semantics for passive as originally formulated in (10) and (21). The point is that the implicit agent argument of passives does interact with quantificational adverbs and conditionals just like other indefinites:

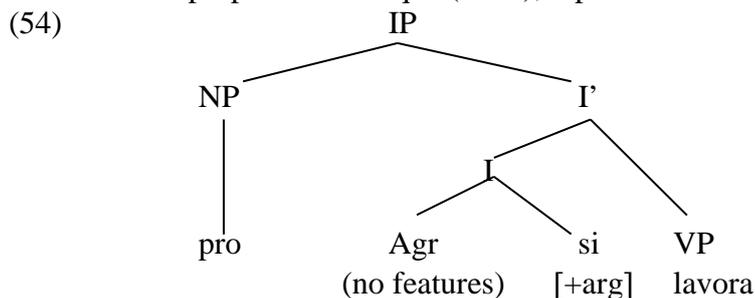
- (53) a. If this medicine is taken in the morning, it must be taken on an empty stomach
 b. $\forall x \forall y [x \text{ takes } y \text{ in the morning} \rightarrow x \text{ takes } y \text{ on an empty stomach}]$

In (53a) we see that in the antecedent of a conditional the implicit agent of a passive gets a quasi universal force, much like *si* and other indefinites. This suggests that indefinites, *si* and the implicit arguments of “agentless” passive should all be treated uniformly. If indefinites are treated as variables, then both *si* and regular passive should simply introduce a variable into subject position. This modification of our semantics, if ultimately warranted, does not affect, as far as I can tell, any of the points made here.

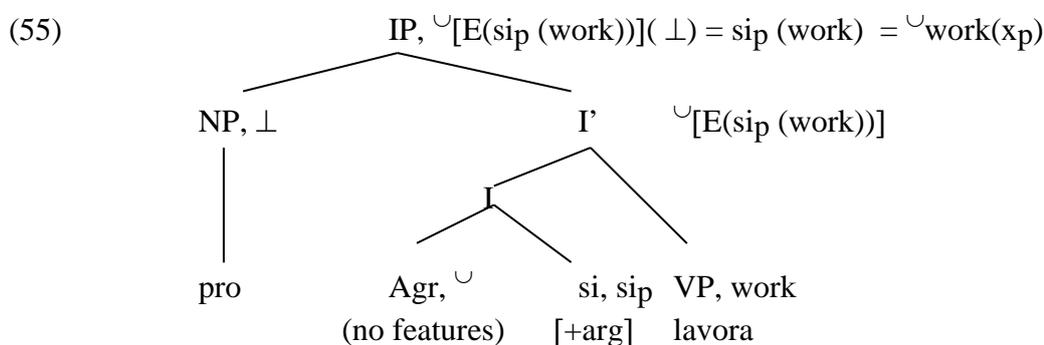
⁷ There is also an “empathy” effect with the speaker. I.e. the speaker adopts the point of view of the subject. For relevant discussion, cf. Sells (1987), Cinque (1988)

⁸ See Kamp (1981), Heim (1982). An alternative formulation of DRT that maintains the basic insight of Kamp and Heim, but treats indefinites as existentially quantified NPs (using a dynamic “logic”) can be found in Groenendijk and Stokhof (1987) and Chierchia (1988).

How does this proposed semantics mesh with syntax? Consider the LF for impersonal *si* constructions proposed in Cinque (1988), reproduced here:



Cinque, building on previous work on the topic, argues that in structures like (54), *si* is an [NP,IP] clitic that receives the subject θ -role, while the subject position is occupied by an expletive *pro*. On the basis of our semantics for *si* given in (52), the interpretation of (54) proceed as follows:



The interpretation of (54) is completely parallel to the one of impersonal passive. Let us consider it in some detail. The interpretation proceeds as usual bottom up. In Infl we have \cup and *sip*. There are two options here, depending on in what sequence these operations apply. Either we get $\cup sip(work)$ or, on the opposite order, $sip(\cup work)$. In either case, the result is ill formed, as types do not match. Hence, we must resort to type shifting. Our operator E, in particular, enables us to get the well formed $\cup[E(sip(work))]$, a property that looks for an expletive subject. And such property finds the expletive it needs in subject position. The resulting logical form reduces then to $\cup work(x_p)$, where the free variable will be quantificationally closed on the basis of the principles of DRT. So, assuming that *si* is associated semantically with *sip*, the route from structures like (54) into their lf's follows from general principles.

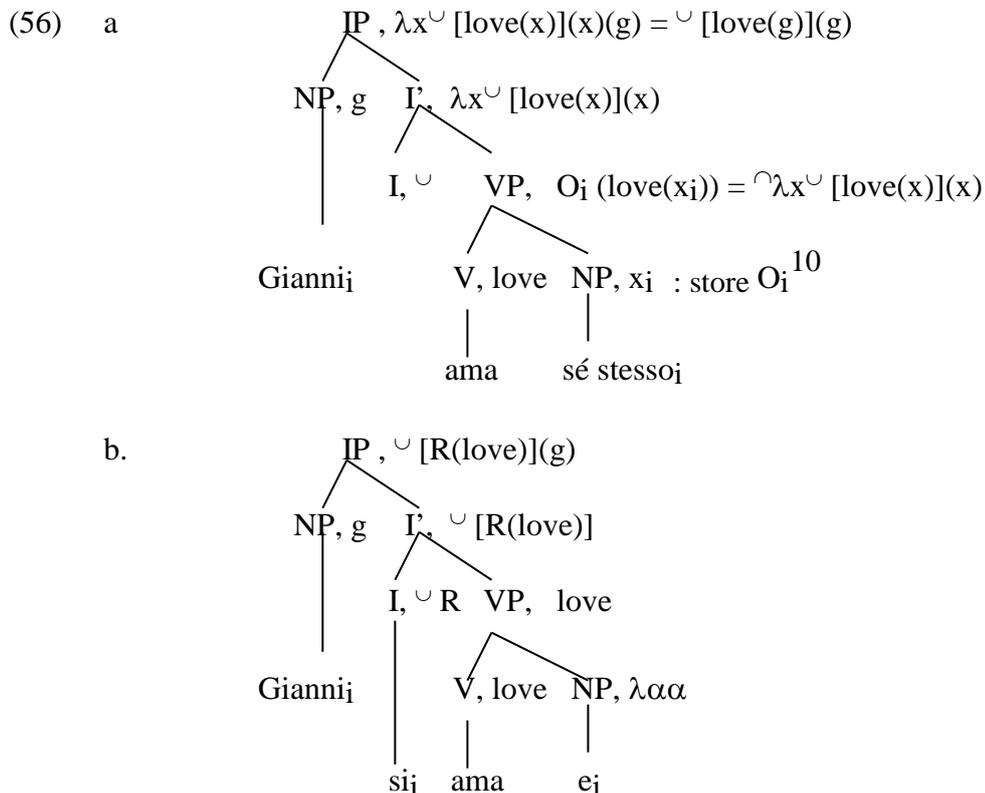
Things are of course more complicated than what I've been able to say here might lead the reader to believe.⁹ But perhaps the above considerations provide enough details to lend some preliminary support to the thesis that the interpretation of impersonal sentences in Italian must involve a passive like subject affecting operation.

5.3. Further consequences

On the basis of our discussion, it would appear that the suggestion put forth at the beginning of section 5 is not just wishful thinking. The aux selection process in Italian appears to be amenable of

⁹ In particular, Cinque (1988) argues that there is also a non argumental *si* that occurs with a non pleonastic *pro*. I believe that the semantics sketched here is compatible also with this aspect of Cinque's proposal, but I will not pursue the issue here.

a maximally simple semantic characterization. Here I would like to point to two further interesting consequences of our formulation of aux selection as a semantic constraint on the meanings of *essere* and *avere*. In introducing our treatment of reflexivization in section 5, we pointed out that non clitic reflexives (such as English *himself* and Italian *sé stesso*) could not be assimilated to an argument reducing operation like our R. They must be associated with a binding operator that links the reflexive to its antecedent. In (56) I illustrate the differences between clitic and non clitic reflexives, using Bach and Partee (1980) approach to the latter.



Leaving irrelevant details aside, *sé stesso* in (56a) is associated with an ordinary pronoun meaning and an operator in store. This operator is then assigned scope (perhaps at V^{\max} , perhaps in infl) and links the reflexive to its antecedent (subject to principle A). I leave it open here how this storage operation is to be syntactically realized. In keeping with the tenets of Property Theory, $R(\text{love})$ and $\lambda x \cup [\text{love}(x)](x)$, the interpretations of *si ama* and *ama sé stesso*, respectively, while truth conditionally equivalent are distinct properties. And given the syntax and semantics of non clitic reflexives, there is no obvious way in which VPs containing them can be regarded as subject affected properties in our sense. The fact that they do not trigger *essere* selection is a consequence of this.

Burzio tries to account for the different behavior of clitic vs. non clitic reflexives by arguing that *essere* selection and the licensing of clitics are S-structure phenomena, while the binding theory (responsible for the distribution of non clitic reflexives) applies at LF, a controversial hypothesis. It is also significant that a similar difficulty (an unwanted binding theoretic relation accidentally meeting the description for *essere* selection) arises in an unrelated area, namely the pro-drop parameter (as Burzio himself (1986, ch. 2) points out). It is generally assumed that the pro-drop parameter has to do with the “richness” of infl or agr. A way of spelling this out (the one adopted by Burzio) is to regard agr as a pronominal element, essentially a [NP, IP] clitic. As such, it will be

¹⁰ The proposal and notation is taken from Bach and Partee (1980).

coindexed with the subject position so as to license an empty category in that position and to make the recovery of its content possible. So, the structure of a sentence like (57a) will be as in (57b).

- (57) a. Telefona
 pro phones
 b. [_{NPE_i}] agr_i telefona

But (57b) appears to be just the configuration that should trigger *essere* selection. Now, proposals as to the exact formulation of the pro-drop parameter vary a great deal. But they all share the assumption that pro-drop phenomena of the type found in Italian are based on a syntactic relation between agr and the subject position, a relation that appears to be structurally similar to the one between the subject clitic *si* and the subject position. Burzio addresses briefly this issue (1986, p. 93) and suggests that the two relations in question should be viewed as “complementary”. On the present approach, this issue doesn’t arise at all. Pro is a pronominal element and its semantics will be analogous to the one of its overt counterpart *he*. It could not be associated with an operation on relations, in the way impersonal *si* constructions can (and, if I am right, must). Accordingly, structures like (57b) are irrelevant to aux selection.

The point that emerges is that by stating *essere* selection as a condition on the domain of *essere* and *avere* (the first being a function defined for the set of subject affected properties, the second for its complement) we can derive which binding relations are going to affect such process. In particular, there is no danger that “wrong” types of binding (like binding of *sé stesso* or of pro) may get in the way.

6. Summary and (tentative) conclusions

Unaccusativity phenomena are at the center of an intricate node of issues in the grammar of Italian and in Universal Grammar. My proposal is tentative and incomplete. It remains to be seen, for example, whether my formulation of the *essere* selection rule can be maintained once causatives and “reanalysis” constructions are taken into consideration. It also remains to be seen, for example, how the present semantics interacts with the definiteness effect associated with unaccusatives (cf. Belletti 1988). And, of course, it remains to be seen how the present line does in connection with unaccusativity in other languages.

Let me try to summarize briefly what I have tried to do. I have advocated the adoption of an (independently motivated) theory of properties as the semantic algebra in terms of which truth conditions are recursively specified. The main characteristic of such a theory is that properties are taken as primitives and linked to their arguments via predication, where the latter is viewed as a map from properties into propositional functions. Thus, in a sense, predicates come in two forms: as properties and as propositional functions (with predication connecting them). I have then indicated how to use such a theory in interpreting compositionally fragments of LF, i.e. in mapping LF into lf. The main assumption here is that clausal structures come about via predication, which I have taken to be associated with infl (the predication principle). This principle, which plays a key role in our approach, is “configurational”, in the sense that it makes crucial use of syntactic configurations (much like the projection principle).

One of the consequences of the predication principle is that verbs that are associated with propositional functions must have certain characteristics: they will have to take their argument *within* the VP and will have to be associated with an expletive subject. These are central features of unaccusatives.

I have furthermore argued that unaccusatives should be regarded as a special sort of reflexivization. Such a form of reflexivization is also involved in the “externalization” of the internal argument of unaccusatives via NP movement. I have argued that this hypothesis accounts

for (a) the unstable character of their valence, (b) the association of unaccusatives with reflexive morphology, (c) the control properties of *da sé* phrases, and (d) the aspectual properties of unaccusatives. Finally, our semantics has led to a reformulation of the aux selection rule of Italian as a purely semantic domain condition on the meaning of *essere* that exploits the notion of subject affected property. Such a reformulation may pave the way to a genuinely non disjunctive account of the factors triggering *essere* selection.

While a great deal of this picture might turn out to be modified in the light of future work, one thing does seem to emerge from it. What we assume concerning the semantics (= If) of unaccusatives is bound to make a significant difference in our understanding of the phenomenon. While syntactic research has convincingly shown that a simple minded semantic account of unaccusativity will not take us far, it also seems to be the case that a purely syntactic account of the phenomenon will not take us all the way. Neither the syntax nor the semantics of unaccusativity can be reduced to an epiphenomenon of the other.

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Postscript

The main idea put forth in Chierchia (1989, this volume) is that unaccusativity is a form of reflexivization. Is such hypothesis still viable? The debate on this question remains open. In the present note I would like to add a few observations on it, most of them prompted by Reinhart (1996), which insightfully reformulates and develops such a line of investigation.

As is well known, reflexivization can be viewed as an operation that reduces the arguments of a relation by identifying them:

$$(1) \quad \text{REFL}(K) = \lambda u K(u,u) \quad ^{11}$$

Such an operation turns a relation into a property (and can of course be generalized to n-place relations, but we won't get into that here). It is useful, I think, to visualize what REFL actually does in a concrete example. Let $D = \{a, b, c, d\}$ be our domain of discourse. Assume that the extension of K (in a relevant situation) is as in (2a). Then the result of applying REFL to it will be as in (2b):

$$(2) \quad \text{a.} \quad K = \left\{ \begin{array}{l} \langle a, b \rangle \\ \langle b, c \rangle \\ \langle c, d \rangle \\ \langle a, a \rangle \\ \langle d, d \rangle \end{array} \right\}$$

b. $\text{REFL}(K) = \{a, d\}$

Under standard assumptions about relations, properties, etc. there is at most one operation like REFL. REFL is entirely defined by what it does: it applies to sets of ordered pairs and turns them into sets by selecting those individuals forming pairs constituted by identical objects. There are no two ways of doing that. (There can be, of course, two different symbols/structures associated with the same operation).¹² Chierchia (1989, this volume), but also much other work both before and after it, argues that REFL is the semantic counterpart of at least some forms of reflexive marking in the languages of the world. For example there are reasons to believe that REFL is involved in the semantics of the reflexive clitic *si* in Romance. The question is: can REFL also be the very operation that derives unaccusatives? It would be great if it were so; for it would reduce the essence of a complex phenomenon to a simple and rather well understood operation on argument structure. I believe, however, that the answer to such question has to be no. Let me motivate my skepticism.

Take your prototypical verbs that have unaccusative alternates, say *break* or *sink*. The following are clearly contradictory.

¹¹ REFL corresponds to R in Chierchia (1989, this volume)

¹² This is true also if possible worlds are added in. It is not necessarily true in a framework where properties and relations are taken as primitives (cf., e.g. the property theory of Chierchia (1989)). In such a set up, two functions, relations etc. that do the same thing can be distinct functions (as functions, relations, etc. are not identified with their set theoretic graphs).

- (3) a. John broke the door, but the door didn't break
 b. The explosion sank the boat, but the boat didn't sink

What these elementary examples show is that if K_{TR} is a two place relation (transitive) and K_{IN} is its unaccusative alternate (intransitive), anything that occupies the second slot of K_{TR} (the one corresponding to the object) has to be in the extension of K_{IN} . That is to say:

- (4) Main fact about unaccusative alternations:
 For all u, u' , if $K_{TR}(u, u')$, then $K_{IN}(u')$

But REFL does not and cannot yield that. Quite the opposite. Given what REFL means, for any K , $REFL(K)$ has to be a proper (possibly empty) *subset* of the individuals related by K , unless, of course, K is *already* a reflexive relation.¹³ A formal proof of this fact can be readily provided, but just look at (2), and you'll see immediately why. REFL merely collects in a set all the pairs of the form $\langle u, u \rangle$ in the extension of the relation; all pairs of the form $\langle u, u' \rangle$, with $u \neq u'$, are irrelevant and get lost. It follows that REFL, by itself at least, cannot be what is involved in deriving intransitive unaccusative variants from transitive forms, for it cannot meet the main factual property of unaccusative alternations (*viz.* (4)).

This much is a fact. Yet, this fact does not exclude that REFL *plus something else*, might be involved in unaccusativity. I still believe that the available evidence points strongly in that direction. What that something else might be is going to depend on the nature of the relations involved. I will now speculate on what the relevant residue might be, elaborating a bit on what I proposed in Chierchia (1989).

As Reinhart and others have underscored, all the relations of the relevant type (i.e. those that have unaccusative variants) have the following characteristic: eventualities can surface as subject arguments. Here are some standard examples:

- (5) a. The explosion sank the boat
 b. The gust of wind opened the door
 c. An earthquake moved these rocks

Cases like these have the form $K(e, x)$, where e is an eventuality and x an ordinary individual. Notice one thing. The eventuality e that surfaces as subject must clearly affect or involve the object x . The explosion must be sufficiently near the boat, the gust of wind must invest the door, etc. In θ -role talk, there must be some kind of thematic relation that links the event surfacing as subject to the object. To sharpen things out, let us couch the relevant relation, namely *sink*, in a Davidsonian format, where every verb has an implicit argument ranging over eventualities. In this format, something like *the explosion sank the boat* would have a logical form of roughly the following type:

- (6) $\exists e' \text{ sank}(e, x, e')$ [where $e = \text{the explosion}$]

¹³ The kind of reflexivity that K would have to satisfy to get the generalization in (4) via an application of REFL is the following:

$$(a) \quad \forall x[\exists yK(y, x) \rightarrow K(x, x)]$$

Relations such as *sink* *prima facie* do not satisfy this constraint. From *John sinks the boat*, it does not seem to follow that *the boat sinks itself*. (which is, in fact, a deviant sentence). I do believe that the meaning of *the boat sinks* is in some sense close to that of *the boat sinks itself*. But the problem facing any approach along these lines is of course to spell out in exactly what sense this is so.

This is to be read as follows. There is a sinking e' of the boat x brought about by the explosion e . This can be of course further analyzed by factoring out explicitly the relevant θ -roles, for example along the lines proposed in Parsons (1990). The important point is that there are *two* eventualities at play here: the one associated with the subject (the explosion) and the one brought about by it (the actual sinking). It is unconceivable that the eventuality expressed by the subject bears no significant relation to the one brought about by it. These two eventualities must share a θ -role. Let us call this “ θ -sharing”. Clearly, θ -sharing is perfectly general, and applies to every relation that takes events as arguments. Let us make this explicit:

- (7) θ -sharing
 For every eventuality e, e' and every individual x , if $K(e, x, e')$ holds, then there is a thematic relation θ such that $\theta(e, x)$.

Not much to quarrel over so far. Now a further observation. Intuitively, θ -sharing is a form of hidden reflexivization, in the sense that one individual plays a double role in two distinct events. What (7), essentially, says is that x is, say, the theme of e' and also at the same time the theme (or some other θ -role) of e . It is this form of reflexivization that I think is at the basis of unaccusative alternations. Unaccusativity brings this hidden form of reflexivization to the surface. Here is one way of making this intuition explicit. Consider any relation K that can take as subject argument an eventuality. It is straightforward to turn it into a reflexive relation K^r as follows:

- (8) a. $K^r = \lambda x \lambda y \lambda e' \exists e \exists \theta [K(e, y, e') \wedge \theta(e, x) \wedge x = y]$
 b. $\text{sink}^r = \lambda x \lambda y \lambda e' \exists e \exists \theta [\text{sink}(e, y, e') \wedge \theta(e, x) \wedge x = y]$

The operation $[]^r$ (call it “reflexive closure”) simply pulls out the argument that the subject event shares with the event being brought about. Because of θ -sharing (which is simply a factual observation) such operation is guaranteed to be well defined. Reflexive closure, in effect, puts a copy of the object argument into the first argument slot of the relation, thereby making it reflexive.

Now take a particular output of such operation, say sink^r , and suppose there is a word that lexicalizes it. What properties would this word have? How could it enter in a syntactic derivation? The most directly relevant observation in this connection is that it would not make sense to apply sink^r to two *distinct* arguments, for the result would be necessarily false (by definition of $[]^r$). The arguments of sink^r must be identical for the resulting sentence to make sense. Projecting sink^r into a usable syntactic structure must guarantee identity of arguments. The computational system, as presently conceived, gives us two and only two ways of doing so. One way is to ensure that the two arguments are syntactically identical copies of one another:

- (9) The boat sink^r the boat

When this configuration is created, i.e. when two identical copies are around (in the right configuration) one of them doesn't get to be pronounced (i.e. it is a trace). Another conceivable way to insure identity of arguments is to resort to REFL (i.e. “real” reflexivization):

- (10) The boat REFL(sink^r)

RELF gets rid of/saturates/discharges or however you want to put it the inner argument of a relation, by forcing it to be identical with the outer argument. This second strategy tantamounts to the composition of REFL with $[]^F$. If REFL is associated with a special morphology, we would expect such morphology to show up whenever this second option is selected.

These two strategies appear to be exactly the two main syntactic realizations of unaccusative verbs, both within and across languages; the first one involves movement (i.e. copying); the second reflexive morphology. Thus, the mapping from sink^F to its admissible syntactic manifestations across languages is both in some sense trivial and forced upon us by the very nature of $[]^F$, which in turn rests on θ -sharing. I find it tempting to conclude that something like $[]^F$ is indeed what is behind unaccusativity, the piece needed to integrate and understand the role that REFL seems to play in it.

One immediate consequence of this view is that verbs that cannot take eventualities as overt subjects, (for example, verbs that impose animacy requirements on their subject), obviously cannot undergo reflexive closure. Thus verbs like *notice*, *love* or psych verbs of the *fear* class will be unable to undergo reflexive closure and hence won't have unaccusative alternates. This simply follows from the fact that one cannot say things like *the explosion notices/fears Bill* and consequently θ -sharing does not apply. On the other hand, psych verbs of the *piacere* 'please' or *scare* type in principle can undergo reflexive closure, for they patently have the relevant property of allowing eventualities as subjects (cf., e.g., *the statue scared John* vs. *seeing the statue scared John*).

Does this proposal derive the main fact about unaccusative transitive intransitive alternation, namely (4)? Yes, under one assumption. The assumption one needs is the following. If an ordinary individual x sinks y , then there must be an eventuality e of which x is the agent that stands in the sink-relation to y . Let me be explicit about it:

- (11) Assumption
 $\text{sink}(x, y, e') \rightarrow \exists e [\text{Ag}(e, x) \wedge \text{sink}(e, y, e')]$

This ensures that if x sinks y , there is an eventuality that causes the sinking (typically, what x does) out of which we can extract the argument such eventuality shares with the actual sinking. For my money, assumption (11) is likely to be correct. As a concrete illustration of this idea, we might take Parsons' (1990) proposal on the semantics of *sink*, namely:

- (12) a. John sank the boat
 b. $\exists e \exists e' [\text{Ag}(e, \text{John}) \wedge \text{CAUSE}(e, e') \wedge \text{Th}(e', \text{the boat}) \wedge \text{SINK}(e')]$

(11) is a logical consequence of the semantic representation for *sink* at the basis of example (12).¹⁴ We may of course disagree on how to derive (11) (e.g. via lexical decomposition or not, via projection in the syntax of the relevant semantic heads or not, etc.). We also may disagree on how to explain the less than perfect synonymy between pairs like (13a,b):

- (13) a. John broke the window
 b. John's blow broke the window

These matters are important and substantive. But in the end, someone's breaking something does necessarily correlate with an event that brings the breaking about. And this should suffice for our

¹⁴ I am ignoring tense here. I assume, moreover that the verb *sink* is defined in the obvious way, namely:
 $\text{sink} = \lambda e \lambda y \lambda e' [\text{Th}(e', y) \wedge \text{CAUSE}(e, e') \wedge \text{SINK}(e')]$

observations about θ -sharing to apply: the causing event must share a θ -role with the event that is being caused.

I've mentioned several times that the net effect of $[]^F$ is making a relation reflexive. It might be useful to actually visualize how:

$$(14) \quad \text{a.} \quad K = \left\{ \begin{array}{l} \langle a, b, e1 \rangle \\ \langle e, b, e1 \rangle \\ \langle c, d, e2 \rangle \\ \langle e', d, e2 \rangle \\ \langle e'', f, e3 \rangle \end{array} \right\} \quad \text{b.} \quad K^F = \left\{ \begin{array}{l} \langle b, b, e1 \rangle \\ \langle d, d, e2 \rangle \\ \langle f, f, e3 \rangle \end{array} \right\}$$

Think of K as a relation where the first member of the triplet corresponds to the subject, the second to the object, and the third is the Davidsonian argument. Imagine a situation where $\{a,b,c,d,f\}$ are ordinary individuals, $\{e, e', e'', e1, e2, e3\}$ are eventualities and the extension of K is as in (14a). Thus there are three K -eventualities ($e1, e2, e3$), three eventualities that cause them (e, e', e'') and a and c are the agents of e and e' respectively, while e'' does not have an agent. Applying $[]^F$ to K in such a situation yields (14b). Essentially the subject argument is deleted and the object argument gets copied in its place. This is done by pulling out of the causing arguments (namely, e, e', e'') what it shares with the event e_n which is being caused. The operation is both easy to grasp and formally simple. (14b) shows how an unaccusative relation would actually look according to the present hypothesis. The properties of unaccusatives appear to be readily derivable if we assume that they look as in (14b). Notice, for instance, that the main fact about unaccusative alternations (viz. 4) comes out right. Notice, moreover, that the subject argument of the unaccusative relation K^F is identical to its object argument (an inherent reflexivity of sort) and that such argument is non agentive. Plus, we have already remarked on why something that looks like (14b) would have to be structurally realized either exploiting NP movement or reflexive morphology.

Summarizing, transitive relations like *sink*, *break*, etc. admit of eventualities as subject. Moreover, if ordinary individuals can be taken as subjects of such relations, then there is an eventuality of which they are agents that causes the sinking, breaking, etc (assumption (11)). In either case, we have an eventuality that brings about the sinking, breaking, etc. The causing eventuality will share an argument (typically the theme) with the event being caused (θ -sharing). It is in this form of θ -sharing that reflexivity is hidden. All we've got to do is pull out the argument that the causing eventuality shares with the eventuality that is being brought about. One way of doing so is via the operation $[]^F$ of reflexive closure. The effect of such operation is focussing on the portion of the causing event which specifically involves the object (i.e. focussing on the inner cause, to borrow Levin and Rappaport's term) and thus factoring out external causing agents. Pure REFL by itself cannot suffice to explain unaccusative alternations. It fails to derive what we called the main property of such alternation (viz. (4)). REFL plus $[]^F$ can. With minimal and straightforward assumptions on the syntax/semantics map.

To put it in slightly different words, Universal Grammar surely has a number of devices designed to alter the argument structure of relations. The suggestion I am making is that among such devices, there are two forms of reflexivization: plain vanilla REFL and reflexive closure $[]^F$ (or, if you wish, the composition of REFL with $[]^F$). The former is potentially total, in the sense that it can in principle apply to any relation. The latter is inherently partial. It can only apply to relations that allow event arguments as subjects. It exploits θ -sharing and its communicative purpose is the

elimination from the argument structure of the verb of the external cause.¹⁵ The complexity of the relevant phenomena surely requires more elaborate mapping hypotheses than those we could entertain here.¹⁶ My guess, for what it is worth, is that such necessary elaborations can/must maintain a variant of the present idea (inherent reflexivity) as their semantic core. At any rate, I keep feeling that trying to be as explicit as possible as to the semantic import of unaccusativity is a fruitful heuristic.

Further References

Parsons, T. (1990) *Events in the Semantics of English*, MIT Press

Reinhart, T. (1996) "Syntactic Effects of Lexical Operations: Reflexives and Unaccusatives", OTS Working Papers, Utrecht

¹⁵ []^I corresponds to RI in Chierchia (1989, this volume). Both novelty and continuity with regards to the general line adopted there should be fairly clear. Reflexive Closure, as developed in this postscript, is independent of property theory and of any particular hypothesis on the syntax semantics map. It also makes explicit the relation to the event based approaches that have developed since. Finally, it factors out differently pure reflexivity from what is special about unaccusatives formation.

¹⁶ One relevant area is that of Aktionsart. On this issue, I do not share Reinhart's pessimism as to its relevance to unaccusativity. Unaccusatives tend to be either telic or (more rarely) stative. Atelic verbs that display unaccusative properties are of very special sorts: inchoative like *cool* and motion verbs like *roll*. The former are iterations of (telic) achievements; the latter when in unaccusative forms tend to behave in a telic way.