Maria Cristina Amoretti
Nicla Vassallo (Eds.)

Knowledge, Language, and Interpretation

On the Philosophy of Donald Davidson

ontos
verlag
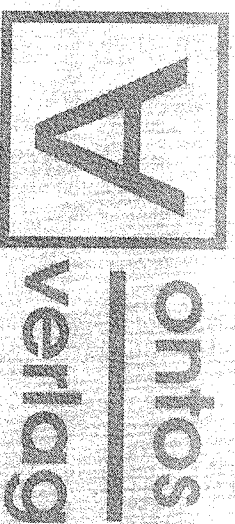
EVENTS AND CONSERVATIVITY:
CLUES TOWARDS LANGUAGE EVOLUTION[*]

Massimo PIATTELLI PALMARINI (University of Arizona, USA)

1. Introduction: The relevant (for us) components of the neo-Davidsonian program

Davidson taught us that words have basic "application" conditions—e.g., the French word *'neige'* applies to snow; this allows the Tarskian project to be extended to phrasal constituents, a most welcome outcome. These application conditions determine, in accordance with a formal, Tarskian, procedure, the *"correctness"* conditions of sentences—e.g., the sentence *'La neige est blanche'* is correct in French iff snow is white; this applies across languages and a speaker understands a language, in the sense of being able to discern all the semantic properties of expressions in the language, if the speaker knows the basic application conditions for the relevant words and knows how to determine the correctness conditions of sentences in the language (compositionality). To this we, of course, add Davidson's momentous introduction of a predicate-place for events (originally (Davidson 1967)), i.e. his classical data and arguments to the effect that words and expressions of natural languages typically refer to, and quantify over, events.

His most famous example is:

(1) John buttered the toast slowly, deliberately, in the bathroom, with a knife, at midnight.

There is no elegant way, by means of the classical, pre-Davidsonian, logical apparatus, to see the truth conditions and all the implications of (1) come out right. If one is limited to quantifying over objects only, and does not want to change the adicity of predicates for each new predicate that is introduced, then five pieces of toast easily pop up, contrary to our

---

straightforward understanding of (1). Bringing them back to one piece only, as we should, introduces inelegant objectual identifications.

The Davidsonian apparatus, on the contrary, straightens things out very nicely. Introducing a predicate place for events, and making, thus, the transitive predicate *butter* a di-transitive, the Logical Form (hereinafter LF) of this sentence (omitting some inessential details), is:

(1a) $\exists$e: Butter (John, toast, e) $\wedge$ [Agent (John, e) $\wedge$ Theme (toast, e)] $\wedge$ in the kitchen(e) $\wedge$ slowly(e) $\wedge$ deliberately(e) $\wedge$ with a knife(e) $\wedge$ at midnight(e)

There is an event, it is an event of buttering, John is the agent, and the toast is the theme, and that event took place in the kitchen[1], and it took place slowly, and so on. The adicity of *butter* is fixed once and for all, and now all the obvious inferences come out right (as being obvious) by conjunction-reduction. This is exactly what one wants to see happening. Such elegant Davidsonian strategy has changed for good the way of doing the semantics of natural language.

We owe it to James Higginbotham (Higginbotham 1985) to have crucially enriched this picture by pointing out that it is the syntactic operator Tense (T) that binds Davidsonian events.

Interestingly, there are hard cases, when the introduction of the argument-place for events makes the derivation of the LF particularly elegant, straightforward and perspicuous. These cases have been tackled successfully by Barry Schein (Schein 1986, 1993) and Paul Pietroski (Pietroski, 2003) (2005 and in print), among others.

These are paradigmatic examples of the Schein-Pietroski sentences (I omit some details for the sake of brevity):

(2) Five professors wrote six papers in March (quickly, under pressure, and inelegantly).

---

[1] In the contemporary semantics of natural language, it's useful to write something like *in*(m,e), *at*(n, e), and so on. I will gloss over these details.

LF: $\exists$e $\exists$X $\exists$Y [five professors(X) $\wedge$ six papers(Y) $\wedge$ writing(X,Y,e)] $\wedge$ quickly (e) $\wedge$ under pressure (e) $\wedge$ inelegantly(e).

In Pietroski's more detailed analysis, we have:

Five professors wrote six papers in March (quickly, under pressure, and inelegantly)

$\exists$X$\exists$Y$\exists$e{Agent(e, X) & |X| = 5 & $\forall$x:x$\in$X[Professor(x)] & PastWriting(e)   *one big*
          Theme(e, Y) & |Y| = 6 & $\forall$y:y$\in$Y[Paper(y)] & In(e, March) & ... }   *event?*

$\exists$X$\exists$Y$\exists$E{Agent(E, X) & ... & $\forall$e:e$\in$E[PastWriting(e)] & Theme(E, Y) & ... }

each-of-X   each-of-E   each-of-E   each-of-Y
was-an-Agent-of   was-done-by   was-a-production-of was-a-Theme-of
some-of-E   some-of-X   some-of-Y   some-of-E

My own favourite example is:

(3) The buildings are darker and darker as you drive North

Obviously, no individual building becomes darker, and our driving North is not the cause of the buildings becoming darker. What (3) says is that the distinct events of buildings being darker than other buildings, and of buildings being positioned further North of other buildings, and of one's driving to the North are strictly related.

A full analysis would require a better characterization of plurals, as we will see below. It's evident, we think, that the LF of these kinds of sentences *could* not be derived without events. Events are not just a "luxury", an elegant formal device, but a sine qua non.

In this general Davidsonian frame, we wish now to proceed to the crucial puzzle of the conservativity of natural language determiners (quantifiers being a special, particularly interesting, sub-case).

2. The puzzle of conservativity

2.1. Brief history

The relevant literature is rich and has a long and distinguished pedigree. Ever since the medieval times William of Sherwood and others noted the equivalence of *All men are mortal* to *All men are mortal men* (see (Higginbotham 1993) (for a simple general introduction, see (Larson 1995) and (Larson and Segal 1995)).

Higginbotham and May noticed this universal constraint on determiners in 1978, calling it "intersectivity."[2] About the same time Barwise and Cooper called it "conservativity", and published it in *Linguistics and Philosophy* (Barwise and Cooper 1981). Dag Westerstahl improved on things, with a general theorem, in the *Handbook of Philosophical Logic*, in 1989 (Westerstahl 1989). Higginbotham wrote up, independently, a version stressing the role of not only conservativity but a more powerful property in giving characterizations of truth, in "Grammatical Form and Logical Form", where it appeared as an appendix (Higginbotham 1993). In 1986, an influential paper by Keenan and Stavi (Keenan and Stavi 1986) had enlarged the horizon to all determiners in a great variety of languages (very likely, as far as we can tell today, all natural languages).

Further fine interweaving with syntactic theory (in a Minimalist Framework) was proposed by Norbert Hornstein and Juan Uriagereka (see their contribution in (Epstein and Hornstein 1999)).

As we will see at the end of this paper, Elena Herburger importantly showed how the apparently deviant case of "only" is, after all, not deviant. Some of the evolutionary consequences of conservativity have been sketched already by Juan Uriagereka and myself in 2005 (Piattelli-Palmarini and Uriagereka 2005).

So much for a brief history of the subject, now to the facts.

---

[2] The paper was later published in volume 1, number 1, of *The Linguistic Review* (Higginbotham and May 1981).

2.2. The facts

The arguments of natural language determiners have to be *ordered*. Determiners relate sets in a specified order.

> All Tuscans are Italians (TRUE) ≠ All Italians are Tuscans (FALSE)
> All (Tusc, Ital) ≠ All (Ital, Tusc)

Determiners are two-place predicates, in an interesting parallelism with transitive verbs, as shown by Richard Larson (Larson and Segal 1995, Larson 2005 and in print) (for a recent overview, see (Larson 2004), for a nuanced discussion, see (Ludlow 1995)).

One place is the "restriction" (*Tuscans*) (syntactically, the internal argument). The other is the "scope" (*Italians*) (syntactically, the external argument).

Conservativity is a formal property of relations among sets. A two-place relation R is said to be conservative iff

$$R\,(A,B) \Leftrightarrow R\,(A,\,A\cap B)$$

If R is true of the sets A and B (in this order), then it is also true of the sets A and the intersection of A and B (again in this order).

Some, but not all, relations between functions (from individuals to truth values) are conservative. Therefore, it is very interesting that all natural language determiners are conservative. As William of Sherwood had noted, *All Tuscans are Italians = All Tuscans are Tuscan Italians.*

2.3. Consequences

It is not a truth of reason that it be so, nor is this universal property of languages something one has any hope of explaining by means of general properties of efficiency of communication, memory optimization or any other generic (let's insist, generic) property of the human mind. Pace the standard (alleged) evolutionary reconstructions of the origins of language by the neo-Darwinians, something else is needed to account for the

conservativity of determiners. This is the central consideration of the present paper.

It is important also to stress an obvious fact: Children the world over do *not* "learn" that the determiners of their native language are conservative. No one has to "teach" them such basic fact, nor do adults even realize that this property is inherent in their language. Speakers tacitly know this as they know many other subtle properties of syntax, and the interface between syntax and semantics. To put it very bluntly and somewhat inaccurately: the conservativity of determiners is innate. In a more guarded characterization, we will say that the syntax and the semantics of natural language determiners is un-learned, because it's part of the speaker's tacit knowledge of language.

3. Simple examples

3.1. Standard conservative determiners

They are best presented, we think, by means of an obvious semantic equivalence:

(4) All children love ice cream **iff** All children are ice-cream-lovers that are children.

(5) Most Basques are Spaniards **iff** Most Basques are Basque Spaniards.

(6) Most engineering buildings were designed by Frank Gehry **iff** Most engineering buildings are Frank-Gehry-designed engineering buildings.

In Barwise and Cooper's terminology (loc. cit.), determiners "live on" their internal arguments. *All* "lives on "children", *most* "lives on" "Basques", and so on.

3.2. Impossible non-conservative Dets[3]

What would a non-conservative determiner look like? It takes some effort of imagination to invent examples, but here we go:

"The" versus impossible *gre

As every native speaker of English well knows (or even a non-native one, like myself), the sentence *The bottle fell* is true iff

(7) a bottle, and there was only one, is a bottle that fell = The bottle is the bottle that fell.

Therefore, we have this mandatory equivalence:

The bottle fell = The bottle is a bottle that fell.

Now, let's introduce a strange determiner, marked with an asterisk, because no natural language could harbour it: *gre

Let's introduce it by means of semantic equivalence, get an intuition of its (impossible) meaning, then treat it as one treats ordinary determiners and see where this leads us:

(8a) *Gre bottle fell

(imagine it being) TRUE iff

(8b) A bottle is the only thing that fell

Therefore:

(8c) *Gre bottle is a bottle that fell (should be = to) A bottle is the only **bottle** that fell.

---

[3] Adapted and simplified from Paul Pietroski's lectures and from examples used by Andrew Nevins (Harvard, Department of Linguistics) in his lectures.

But let's consider the following, quite trivial, state of affairs:

bottle-1	bottle-2	cup-1
FELL	DID NOT FALL	FELL

It's perfectly obvious that such state of affairs makes (8c) true, but (8b) false. We are, thus, verifying that *gre is not conservative.

<u>Another impossible determiner</u> (Nevins's shrewd invention): *galoochy

Let's define it via the following equivalence:

(9) *Galoochy engineering buildings were designed by Frank Gehry **iff** Galoochy Frank Gehry-designed buildings were engineering buildings.

Notice that, unlike a real determiner (unlike, say, *most*) it is <u>not</u> the case that the following equivalence holds:

(9a) Galoochy engineering buildings were designed by Frank Gehry **iff** Galoochy engineering buildings were Frank-Gehry-designed engineering buildings.

If it were so, then *galoochy* (no asterisk now, please notice) would be a possible natural language determiner. It just sounds strange for an English determiner, but its syntax and semantics would be OK. On the contrary, our infamous *galoochy* (with an asterisk) is another non-conservative (and therefore impossible) determiner.

These two examples may suffice to bring home, rather intuitively, we hope, the data on conservativity we care for. No speaker uses such determiners, no child could learn their meaning upon simple exposure to typical sentences that contain them.[4]

---

[4] We are presently planning real experiments to show that it is so.

4. The underlying syntax

Higginbotham has stressed that nodes in syntactic trees are the quintessential meaning-assigners. A node in a syntactic tree is what it is because of the structure of the tree and its position in it. The internal argument of a determiner (similarly, the internal argument of a transitive verb, as Larson has perspicuously shown) corresponds to a precise node and to a precise sub-tree configuration. The external argument corresponds to a different, but equally precise, node-in-the-tree configuration. Lexical meanings and the configuration of the nodes that dominate them together explain compositionality.
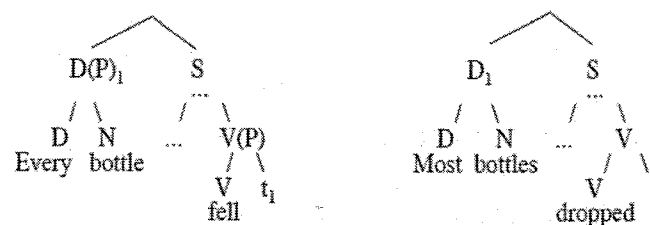
The Davidsonian event position of the thematic grid of the verb is discharged at the point where VP meets Inflection (TP). The following schematic representations (due to Paul Pietroski) can give an idea of what is involved:
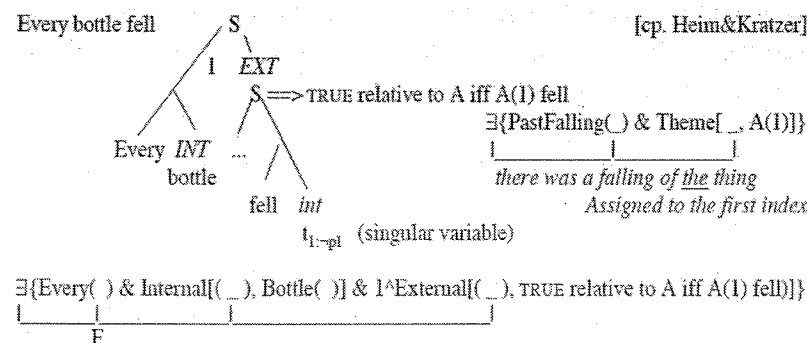
We have a process known in syntax as "raising". Intuitively, something in the sentence must receive a syntactic (and therefore also semantic) value, and this value-assignment can only be done by something else in the structure, something that is "above" it hierarchically. Raising is what accomplishes this mandatory valuation. Lexical requirements that, for syntactic reasons, cannot be satisfied locally, must be satisfied by means of raising. Arguments for events raise to receive their value from the verb inflection, more specifically from the syntactic operator Tense (present, past-tense, future etc.). The functional constituent TP (Tense Phrase) is what is needed to satisfy the lexical requirement.

There is, however, a further refinement, one introduced by the late George Boolos and adopted and enriched by Paul Pietroski. We will see it quite succinctly.

5. Plurals (not sets) (Boolos, 1984, 1998a, 1998b)

The typical Boolos sentence is:

(10) The rocks rained down on the mountain huts.

(10) cannot be true of any rock in particular, because no single rock can "rain down". But it is not true, either, of any set or collection of rocks, because no set or collection of rocks as such can "rain down". Natural language predicates such as *"rain down"* are not satisfied by one thing, nor by any one set or collection of things. *Rain down* can only be true of some succession of falls by rocks, one after the other, not of a set of rocks all falling together as a set, or collection.

Boolos suggested an alternative construal of second-order quantification: *distinctively plural quantification* over xs, such that x "is one of" the Xs (not that x∈X). Some things$_x$ are such that each thing$_x$ is one of them$_X$ iff it$_x$ is not an element of itself$_x$.

In essence Boolos's proposal is that we should invoke distinctively plural quantification over singular entities, not singular quantification over distinctively plural entities. In his own words, distinctively plural quantifiers are so characterized:

[N]either the use of plurals nor the employment of second-order logic commits us to the existence of extra items beyond those to which we already committed [...] We need not construe second-order quantifiers as ranging over anything other than the objects over which our first-order quantifiers range [...] a second-order quantifier needn't be taken to be a kind of first-order quantifier in disguise, having items of a special kind, collections, in its range. It is not as though there were two sorts of things in the world, individuals and collections of them, which our first- and second-order variables, respectively, denote. There are, rather, two (at least) different ways of referring to the same things, among which there may well be many, many collections (Boolos 1998: 72).

Taking the syntax seriously is not optional, we have to do it. And, once we allow that a variable can have MANY values relative to a SINGLE assignment it's not at all extravagant that PLURAL variables are variables of this sort, and that plural variables can be arguments of PLURAL PREDICATES like *'rained down'*. And it's not at all extravagant that quantification is deeply related to plurality. So we can at least ask if determiners are plural predicates that combine with expressions that can have many values relative to a single assignment of values to variables. And it turns out that this is perfectly coherent: the values of determiners are <individual, truth value> pairs, just as suggested by the syntax. Determiners are satisfied plurally by such things; the internal (nominal) argument of a determiner imposes a condition on the relevant individuals; the external (sentential) argument of a determiner imposes a condition on the relevant truth values. The remaining task is just to devise a formal way of spelling out this extension of Tarski, via Boolos, to the structures generated if quantifiers raise.

We can now return to our determiners and to their conservativity.

6. Determiners and their arguments

6.1. Arguments and their values

As we have seen, a determiner takes as its external argument a *sentential* one (*are Spaniards, like ice-cream, etc.*), whose value is TRUE or FALSE relative to any assignment of values to variables. Proper assignments to these values, then, make the whole expression TRUE or FALSE. But *all, every, most* etc. indicate relations between *sets*. How can this be? (without cheating). How do sentential arguments and sets, and plurals, jibe well with one another? Pietroski's reasoning goes a bit like this:

It's perfectly canonical that determiners map pairs of predicates to sentences, and that determiners are thus of the type <pred, <pred, sentence>>. But that can't be the final word, even setting aside the need to explain conservativity.

Given raising, the external argument of a determiner sure looks like a sentence with a variable in it. And while a relative clause also looks like a sentence with a variable in it, a relative clause *cannot* be the external argument of a determiner. This becomes especially evident when you don't pronounce the relativizer, as in *'Every man I met'*. In fact, *'Every man (who) I met'* fails to have a reading on which the sentence is true iff every man is such that I met him.

If, once again, we take the syntax seriously, and say that the external argument of *'every'* in *'I met every man'* really is a sentence with a variable (an open-sentence), then determiners are of the type <pred, <open-sentence, sentence>>. Initially, this does look extravagant, since the value of an open-sentence is still a truth value (relative to an assignment of a value to the variable), just as the value of *'he'* is still an individual (relative to an assignment of a value to a variable). But it's not extravagant, after all. Expressions don't change their semantic type just because a constituent name or indexical gets replaced with a variable. Which is why the standard view is so odd in this respect: *'I saw you'* and *'I saw him'* are said to be of type <t>, but *'I saw TRACE'*[5] ends up getting treated as of type <e, t>

---

[5] TRACE is, in Generative Grammar, a standard unpronounced linguistics element. What is "left behind" after something has been moved to its proper place in the

(predicate). This is inconsistent, unless you say (with Heim and Kratzer 1998) that the external argument of a determiner is really like a relative clause with a covert relativizer. Under this treatment, the suggestion is coherent, but very implausible empirically, since (as just noted) relative clauses cannot be external arguments of determiners.

In Pietroski's terms, a sentence with one variable is in may ways like the corresponding predicate of type <x,t>. A determiner like, say, *every* raises to a position in which its (lexical) requirements are met. How do we express a function of type <x,t>?

Pietroski's proposal is that determiners are predicates of FregePairs. FregePairs are ordered pairs of the form <v,x>, where v is a truth-value (TRUE or FALSE) and x is the internal or the external argument, i.e. one of the things over which (singular or plural) variables range. In other words, if the open sentence <[fell $t_{1:\text{not-pl}}$]>$_S$ appears as the external argument of an indexed determiner, then relative to any Assignment A, some FregePairs (the Fs) are semantic values of that external argument iff for each$_f$ of them$_F$: its$_f$ External Participant is TRUE iff the open sentence is TRUE relative to the (minimal) variant of A that assigns its$_f$ Internal Participant to the indexed variable.[6]

This may well be, admittedly, a bit too technical for the present readers. In a nutshell: Quantification over value-entity pairs via argument positions (internal/external) takes the syntactic parallel between determiners and verbs (à la Larson), and the syntax-semantics of plurals (à la Boolos), very seriously (as we think one should).

In the light of what we saw a moment ago, the advantage of this is to unify the semantics of syntactic raising across the board. Most importantly, this is done under a constraint of strict minimality and strict locality. For reasons of space, I will not pursue this further here (see recent work by Paul Pietroski, Norbert Hornstein and Juan Uriagereka).

---

sentence. A simple example would be *Which book did you read?* The proper analysis of this sentence, making TRACE explicit, is *Which book did you read* TRACE. In fact, *"book"* is pronounced after *"which"*, but it is obviously understood as the object of *"read"*. Its semantic value is assigned "elsewhere" than the place of pronunciation.

[6] The "big" F and the "small" f indices denote "big" and "small" events respectively. This has to do with singulars and plurals in the framework to which I have alluded above.

We dare insist on the fact that the constraints of strict locality and strict compositionality are absolutely central to the mental machinery that carries out linguistic derivations and interpretations, but they are not part of the generic machinery of perception, thought, memory, or action. We are dealing here with another significant instance of the specificity of the language faculty, of what traditionally is labelled as the autonomy of syntax.

We can make the parallelism between verbs and determiners even more explicit:

The (syntactically) familiar Theta-roles in verbs are: An internal argument (the theme) and an external argument (the agent). For Determiners we have an internal argument (the restrictor, a Noun) and the external argument (the scope, or the predicational s). This parallel leads us to an immediate and interesting connection:

6.2. The UTAH hypothesis

Mark Baker proposed several years ago (Baker 1997) a very interesting general hypothesis called UTAH (where UTAH stands for Uniformity of Theta Assignment Hypothesis). What it states is that, in every language, the same syntactic configurations always assign the same Theta-roles (thematic roles). The internal argument is the theme (in particular for canonical transitive verbs, the "object"), while the external argument is the "agent" (syntactically, the subject). This is something that every speaker tacitly knows and something that no child ever has to "learn". Rather, the innate availability of such principle is what allows children to acquire the local lexicon and fix the local syntactic parameters.[7] The crucial fact is that (invented) verbs that would violate UTAH would be un-learnable by the

---

[7] For recent neat evidence of the crucial role that syntactic clues and the UTAH principle play in the case of the child's acquisition of the meaning of verbs like "believe" "think" and "know" (when there is absolutely nothing one can "show" perceptually to the child), see (Papafragou, Cassidy and Gleitman 2007) and (Gleitman, Cassidy, Nappa, Papafragou and Trueswell 2005)

child. What they would mean if they *could* exist is easy to state by means of circumlocutions, but no single verb-meaning can be like that.

A simple example:

(11) My sister *ploves me her children
*$plove$(x,y,e) = an event of y causing x to love y

This sentence, therefore, if such verb could exist in real languages, would mean that my sister's children are such that they cause themselves to love me. The thematic roles and the syntactic nodes would be switched, but that is impossible. No child could learn such verbs.[8] The thematic hierarchy cannot be reversed.

What UTAH adds to this is that the syntax and the semantics map to one another uniformly for all verbs in a language. Across languages, this uniformity always holds, though, at least in principle, the mapping could go the other way, but still uniformly. In (11) the syntax of English tells us that *my sister* is the subject (the external argument, the agent), that *me* is the benefactive and *her children* the theme. But the invented semantics of *plove goes the other way. No uniformity in such case.

In the same fashion, we have reasons to think that, for exactly the same kind of reason, no child could learn a non-conservative determiner. The imaginary cases presented earlier consist precisely in the swapping of the internal and the external arguments. This is why those determiners are "impossible".

It repays, we think, to insist that this is in no way a limitation of "thought". The child can easily succeed in performing mental tasks that are orders of magnitude more complex than these. Nothing here is "generically" hard. It's *syntactically* and semantically impossible, but the corresponding "thoughts", when expressed via circumlocutions, are perfectly banal. Let's see another example, also due to Paul Pietroski.

---

[8] Try to compute the truth conditions for sentences like the following:
*No parent *bloves the other parent their children without it being manifest.*
*John and Mary *blove themselves only some of each other's children.*
It takes paper and pencil to do this, unlike ordinary sentences containing ordinary verbs.

6.3. Equinumerosity

Equinumerosity is a familiar concept. "As many as", "no more and no less than", "exactly as many as", and similar expressions convey equinumerosity in ordinary language, without any problem. But let's consider the impossible determiner *equi*

(12) *Equi bottles fell TRUE iff the bottles samenumber the fallen

If *equi* were conservative, then

(12a) Equi bottles fell TRUE iff Equi bottles are bottles that fell TRUE iff the bottles samenumber the **bottles** that fell

(12b) *Equi bottles fell TRUE iff the bottles samenumber the fallen

This determiner is impossible because it switches the internal and the external arguments. The star of *equi* is well deserved, because this imaginary determiner "lives on" the scope (the fallen objects) and not on the restrictor (bottles).

Of course, such thoughts about such states of affairs are perfectly *thinkable*, in the abstract, but not a possible (a natural, learnable, cognitively manageable) determiner of a natural language. The reason is syntactico-semantic, not generically psychological. In a nutshell (contrary to the good determiners we saw above) in *equi* the external argument of the DP (the fallen) *cannot* raise to Spec of TP and then become the internal argument of the DP. This would be a syntactic monstrosity, not an aberrant "thought".

It's, therefore, possible to *invent* non-conservative determiners and "think" about them as an intellectual exercise (with paper and pencil). It's also possible to find circumlocutions that express linguistically what a non-conservative quantifier *would* express, *if* it existed. But no *natural* human language has any such determiners. They would be *un-learnable by the child* and un-manageable by ordinary speakers in everyday discourse.

7. Lessons from conservativity

There is no explanation of any of this by means of standard predicate-argument relations, elementary quantification, set-theoretic relations, or some generic "laws of thought". The psychology of reasoning has nothing at all to tell us about "impossible" (non-conservative) determiners. Even less can we hope to explain this by means of facts and theories about pragmatic constraints, efficacy of communication, charitableness in translation, cultural conventions and the like. The explanation is exquisitely syntactico-semantic. It involves, as we have seen quite succinctly, deep similarities between verbs and determiners (*à la* Richard Larson), a natural generalization of Mark Baker's UTAH, the asymmetry between Det restriction and Det scope, constituency (a DP must be a constituent), and (possibly) parametric differences between languages.[9] Persuasive suggestions have been made to the effect that, in minimalist terms, it involves raising to check interpretable features and checking + deleting un-interpretable features. It also seems to involve chain-formation and re-projections (Uriagereka, in press). Always applying strict semantic compositionality.

The main lesson from conservativity is, in our opinion, that a quite central universal of language (the conservativity of determiners) has a syntactic and semantico-syntactic explanation, but no generic "functional" explanation. It is alien to standard neo-Darwinian adaptationism.[10] Of course, the linguistic computational capacities of our species must have been the result of some evolutionary story. Not, however the story that

---

[9] The U of UTAH states that the mapping of thematic roles onto syntactic configurations must be uniform, within a given language, but such mapping could in principle have quantal variation across different languages, provided that uniformity is everywhere respected within each language.

[10] Reconstructions of the evolution of language in the optic of neo-Darwinian adaptationism, based on claims that general functional and cultural factors have been crucial, are too numerous to be listed here. A short list of representative publications is (Arbib 2005) (Lieberman 2006) (Tomasello 2003) (Deacon 1997) (Jackendoff 2002). A recent gallery of anti-generativist pieces is to be found in the special issue of *The Linguistic Review*, Vol. 22 (2-3) (2007) "A review of the Role of Linguistics in Cognitive Science" (Nancy A. Ritter Ed.)

neo-Darwinians like to tell us (even well-informed neo-generativists neo-Darwinians like Steven Pinker and Ray Jackendoff)[11] (for earlier congenial data and arguments, see (Lightfoot 2000), (Uriagereka 1998, 2002; Epstein and Hornstein 1999), and (Piattelli-Palmarini and Uriagereka 2005, and in print)).

8. An interesting non-counter-example: *only*

8.1. The facts

Conservativity grants that the truth conditions for *all, most, some, many* involve a check restricted to the intersective sets. It does not require inspection of *any other set*. The whole wide world of possible truth-makers is narrowed down to the intersection, and nothing else. Maybe, that's why conservativity is cognitively so central (Higginbotham 2005).

Prima facie, *"only"* appears to be a glaring exception. To check whether

(13) Only sharks eat bluefish

is true or false, one has to look *also* at other species, over and above the sharks. In fact, this much wider inspection is not just suggested, but imposed. One counter to this counter is that *only* is *not* a determiner *strictu sensu*[12]. *"Only N"* is not a DP. At variance with other determiners and quantifiers, *only* is highly moveable. In fact, we have as almost perfect synonyms:

(14a) Children only like ice cream.

---

[11] See the recent brisk exchange on language evolution between Hauser, Chomsky and Fitch on one side, and Pinker and Jackendoff on the other (initial position paper (Hauser, Chomsky and Fitch 2002), critique (Pinker and Jackendoff 2005), reply (Fitch, Hauser and Chomsky 2005) and counter-reply (Jackendoff and Pinker, 2005)).

[12] Gennaro Chierchia (personal communication) is adamant in stressing this fact as the sole counter that is needed.

(14b) Children like only ice cream.
(14c) Children like ice cream only (and nothing else).

Try doing this with *most, every, all*, etc. and you will see that they cannot be likewise moved around.

Again *prima facie*, *"only"* looks like a non-conservative *"all"*. It seems (adopting Barwise and Cooper's terminology) to "live on" the scope, not the restrictor.

(15a) All angels have wings. = All angels are winged angels.
(15b) Only angels have wings. = All individuals that have wings are angels.

(15a) involves a standard quantification, where *all* 'lives on' the restrictor (the angels). In customary 'conservative' fashion, the quantification is *first* computed over the restriction, and *next* the scope. In contrast, to get the proper logical form of (b), it would seem that *"only"* must *first* be computed *over its scope* and *then* its restriction.

Elena Herburger (Herburger 2000), however, has insightfully noted that there is an element of focus involved. This can be made more evident by means of adjectivation. Rendering focus graphically by means of capitals, we have

(16) Only YOUNG angels have wings (old ones don't).

The paraphrase is 16b, not 16a.

(16a) All individuals that have wings are young angels.
(16b) All individuals that are angels and have wings are young.

If the 'anti-conservative' theory of *only* were right, there would be no reason why a logical form as in (16b) should emerge. Focus has to be implicated here—the issue is how.

Summarizing drastically (see Herburger's monograph for a full treatment, (Herburger 2000)) there is a proper syntactic treatment of focus. Following this through, *"only"* can be seen as a *standard* determiner.

8.2. The syntax of focus

The key is that the restriction and scope of *"only"* are *not base-generated.* Rather, these are *acquired* in the course of the syntactic computation. Lexical information arranges itself so that, in the course of the derivation, *"only"* moves to a focus site, whose specifier hosts the displaced focal element that *"only"* "associates with" (overtly in some languages). The remainder undergoes what is technically called "remnant movement". After these syntactic processes take place, the focused material *is* the scope of *"only"* and the rest of the clause ends up joining the restriction of this element. The result is a logical form akin to (16b), where the quantifier has a standard conservative shape.

A comparison:

(17) All sharks ate fish.

Standard paraphrase:

(17a) 'all sharks are sharks that ate fish'.

If *all* were anti-conservative, (17) should be able to mean (17b).

(17b) 'all fish are fish that sharks ate'.

Patently, this is not the case. The logical form for (17), if it *could* be paraphrased as (17b), would be obtained by first assigning relevant theta-roles to *sharks* (as predators) and *fish* (as prey), then having the quantifier *all,* crucially *by itself,* raise to some scope-taking position; and finally the predicate *fish* raise to be in-construction-with the raised *all.* But this would be a syntactic monstrosity![13]

The effects of focus, and the syntax of focus are, of course, much more general.

---

[13] Let's notice, once gain, the sharp difference between a syntactic monstrosity and "unthinkable" thoughts, or hard-to-think thoughts.

Again representing graphically focus by means of capitals, let's have a look at

(18) Only WHITE sharks ate fish.
(18a) All fish eaters were white sharks.
(18b) All shark fish eaters were white (sharks).

Again, the correct paraphrase of (18) is (18b), not (18a). How do we get (18b)?

In complex syntactic ways (by raising—but **not** by itself) *only* 'associates' to focused material, which then in some very non-trivial sense becomes eliminated from what is presupposed in the sentence. So, in the end, Herburger shows that (after a complex series of LF processes) even *only* has a conservative analysis. And we have just seen what it would have meant for it not to have been that sort of quantificational element.

Conclusion: Wider implications

Let's rewrite (16)

(16) YOUNG angels have wings (old ones don't).

Herburger suggests, quite generally, and very interestingly, that the familiar Neo-Davidsonian operator introducing event quantifications in standard propositions is, contrary to customary assumptions, a *binary* existential quantifier. It involves *both* a restriction *and* a scope—not just a scope. The analysis just sketched for *only* directly extends to more general instances. Herburger's punch-line is (in our wording) that there is no such thing as a sentence without a focus. If so, every single human judgment expressed through a proposition would have to participate in the syntactic organization that conservativity presupposes: The standard quantifier (here a binary existential event quantifier) 'lives on' its restriction and obtains its scope through a 'quantifier raising' mechanism.

Our (Piattelli-Palmarini, Pietroski, Uriagereka) punch-line is, then, the following: What Herburger has added, technically, is the possibility that

restrictions too enter into 'raising' processes, in focal instances, in the same league as standard qantifier raising (QR) for scopal dependencies. Philosophically, if all propositions happen to involve the syntax of binary quantification, she has also added the need *to reckon with a quite elaborate and subtle syntax every time a judgment is made.*

This adds further evidence to all we have seen above. Language is essentially a medium for "thought", under severe and specific constraints (strict locality, strict cyclicity, strict compositionality, uniformity and inevitability of raising, conservativity of determiners). It is used also (of course) for communication, but it has *not been shaped by it!*

Here, as elsewhere in language, adaptationist neo-Darwinian "fables" (see footnote 9), based on the efficacy of communication, or cultural complexity, or motor precursors, go completely awry. The story to be told is one involving very abstract, very specialized, internally highly structured syntactico-semantic structures, and computations over them that are severely constrained by strong locality, and strong compositionality. A very different evolutionary story. Wholly mechanistic, but not adaptationist.

References

Arbib M.A. (2005), "From monkey-like action recognition to human language: An evolutionary framework for neurolinguistics", *Behavioral and Brain Sciences* 28, 105-167.

Baker M. (1997), "Thematic roles and syntactic structure", in: L. Haegeman (ed.), *Elements of Grammar*, Kluwer, Dordrecht.

Barwise J. and R. Cooper (1981), "Generalized quantifiers and natural language", *Linguistics and Philosophy* 4, 159-219.

Boolos G. (1984), "To be is to be the Value of a Variable (or the Values of some Variables)", *Journal of Philosophy* 81, 430-449, reprinted in (Boolos 1998a).

Boolos G. (1998a), *Logic, Logic, and Logic*, Harvard University Press, Cambridge, MA.

Boolos G. (1998b), "On second order logic" (Chapter 3 of *Logic, Logic, and Logic*), in: (Boolos 1998a), 443.

Davidson D. (1967), "The logical form of action sentences", in: N. Rescher (ed.), *The Logic of Decision and Action*, Pittsburgh University Press, Pittsburgh, PA.

Deacon T.W. (1997), The Symbolic Species: The Co-evolution of Language and the Brain, W.W. Norton & Company, Inc., London.

Epstein S.D. and N. Hornstein (1999) (eds.), *Working minimalism*, MIT Press, Cambridge, Mass.

Fitch W.T., M. D. Hauser and N. Chomsky (2005), "The evolution of the language faculty: Clarifications and implications", *Cognition* 97 (2), 179-210.

Gleitman L., K. Cassidy, R. Nappa, A. Papafragou and J.C. Trueswell (2005), "Hard words", *Language Learning and Development* 1 (1), 23-64.

Hauser M.D., N. Chomsky and W.T. Fitch (2002), "The faculty of language: What it is, who has it, and how did it evolve?" *Science* 298 (22 November), 1569-1579.

Heim I. and A. Kratzer (1998), *Semantics in Generative Grammar*, Blackwell, Oxford, UK.

Herburger E. (2000), *What Counts: Focus and Quantification*, MIT Press, Cambridge, MA.

Higginbotham J. (1993), "Grammatical form and logical form", in: J. Tomberlin (ed.), *Philosophical Perspectives, vol. 7: Philosophy of Language and Logic*, Ridgeview Publishing Company, Altascadero, Cal., 173-196.

Higginbotham J. and R. May (1981), "Questions, quantifiers and crossing", *The Linguistic Review* I, 41-80.

Higginbotham J. (1985), "On semantics", *Linguistic Inquiry* 16 (4), 547-593.

Jackendoff R. (2002), *Foundations of Language: Brain, Meaning, Grammar, Evolution*, Oxford University Press, New York-Oxford, UK.

Jackendoff R and S. Pinker (2005), "The nature of the language faculty and its implications for evolution of language (Reply to Fitch, Hauser, and Chomsky)", *Cognition* 97 (2), 211-225.

Keenan E.L. and J. Stavi. (1986), "A semantic characterization of natural language determiners", *Linguistics and Philosophy* 9, 253-326.

Larson R. (1995), "Semantics", in: D.N. Osherson, L.R. Gleitman and M. Liberman (eds.), *An Invitation to Cognitive Science (2nd. ed.). Volume 1: "Language"*, Bradford Books/The MIT Press, Cambridge, Mass. 361-380.

Larson R. (2004), "The Projection of DP", Talk given at the Guest lecture series at the University of Stuttgart, January.

Larson R. and G. Segal (1995), *Knowledge of Meaning: An Introduction to Semantic Theory*, The MIT Press, Cambridge, MA.

Lieberman P. (2006), *Toward and Evolutionary Biology of Language*, Harvard University Press, Cambridge, MA.

Lightfoot D. (2000), "The spandrels of the linguistic genotype", in: C. Knight, M. Studdert-Kennedy and J.C. Hurford (eds.), *The Evolutionary Emergence of Language: Social Function and the Origins of Linguistic Form*, Cambridge University Press, Cambridge, U.K., 231-247.

Ludlow P. (1995), "The logical form of determiners", *Journal of Philosophical Logic* 24 (1), 47-69.

Marantz A. (1997), "No Escape From Syntax: Don't Try Morphological Analysis in the Privacy of Your Own Lexicon", in: A. Dimitriadis, L. Siegel, C. Surek-Clark and A. Williams (eds.), *Proceedings of the 21st Annual Penn Linguistics Colloquium*, University of Pennsylvania Working Papers in Linguistics 4.2., Philadelphia, 201-225.

Papafragou A., K. Cassidy and L. Gleitman (2007), "When we think about thinking: The acquisition of belief verbs", *Cognition* 105 (1), 125-165.

Piattelli-Palmarini M. and J. Uriagereka (2005), "The Immune Syntax: The Evolution of the Language Virus", in: L. Jenkins (ed.), *(Chapter 4 of) Variations and Universals in Biolinguistics*, Mouton-De Gruyters, Amsterdam, 341-377.

Pietroski P.M. (2003), "The character of natural language semantics", *Epistemology of Language*, Oxford University Press, Oxford, UK.

Pinker S. and R. Jackendoff (2005), "The faculty of language: what's special about it?" *Cognition* 95, 201-236.

Schein B. (1986), *Event logic and the interpretation of plurals.* Unpublished Thesis Ph.D., Massachusetts Institute of Technology, Dept. of Linguistics and Philosophy 1986.

Schein B. (1993), *Plurals and events*, MIT Press, Cambridge, MA.

Tomasello M. (2003), Constructing a Language: A Usage-Based Theory of Language Acquisition, Harvard University Press, Cambridge, MA.

Uriagereka J. (1998), Rhyme and Reason: An Introduction to Minimalist Syntax, The MIT Press, Cambridge, MA.

Uriagereka J. (2002), *Derivations*, Routledge, London U.K.

Westerstahl D. (1989), "Quantifiers in formal and natural languages", *Handbook of Philosophical Logic* 4, 1-131.