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PROPERTIES, PROPOSITIONS AND OTHER ABSTRACT OBJECTS

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To ask of a Realist how we get in touch with his abstract ideas may seem impertinent. When Descartes postulates or argues for pure mental contemplation as our means of knowing the essence of wax, or Frege makes out that 'apprehension' is what connects us with timeless Thoughts (which are expressly distinguished from Ideas, which must have bearers), surely such honored thinkers cannot have stumbled over so elementary a practical question as to how their views link up with our everyday, or even trained and professional experience?

So it is no wonder that modern day Realists, like Jon Barwise, John Perry, John Etchemendy, Bernard Linsky and Edward Zalta can still construct their semantics of properties, propositions and other abstract objects, without feeling the force of any epistemological imperative. Why, in all Zalta's work, for instance, has he not addressed the obvious question which Chris Swoyer asked (Swoyer 1993, p248), about how human practice comes into the picture?

> ...actual natural languages are grounded in human activities and conventions, and the difficulties in gaining epistemic access to abstract objects make it hard to see how we could ever forge a link between our language and them.

From within Linsky and Zalta's Object Theory they see themselves as properly pursuing other questions, and so they see no reason to be deflected from these other aims. Their postulated abstract objects seem to be necessary for the foundations of science, however unscientific and non-experiential is our access to them. Somewhat likewise with Barwise and Perry and Etchemendy. To think, in their case, that there are certain abstract objects, namely properties and propositions, and that these are related to other objects, situations, is appealing, expressly because it produces an objectival picture, independent of human attitudes. Maybe it would be claimed that abstract objects, of the kinds in question, are used to classify human behaviour and practise, even though they are distinct from them. But it is *words* which are used for classification purposes: classifying things as winks, meltings and wavings, for instance, requires no objects other than paradigm physical ones with the characters in question, and words, to mark similarities and differences between those paradigms and other objects. The fact that historical and anthropological considerations are central in the actual application of linguistic predicates, so that their content relates to the often haphazard nature of human practices of identification and categorization, would not seem relevant, however, from within the realist theories, since those are taken to be about *the extra-human world*. As a result, although the Wittgensteinian, Conceptualist point about the nature of language is in fact final against such theories, their upholders will still be initially blind to any argument from that direction. Even to raise such issues might seem to be beside the point. Nevertheless they are to the point, because, as I shall show in this paper, it is undoubtedly our human behaviour, with respect to ordinary physical objects, which is being misconstrued and misperceived in terms of the theoretical structures above.

A key item which helps demonstrate this with respect to *objects* is David Hilbert's epsilon calculus. A further key item which helps demonstrate it is Arthur Prior's operator calculus, which formulates properties and propositions in terms of the human activities of describing and stating. The semantics of the former is given in Leisenring 1969, and Routley 1977; a fuller discussion of the latter is to be found in Hugly and Sayward 1996; see also Slater 1994(a). Both of these items, it will be noted, are *logics*. To attack a Realist theory so that its defenders themselves realize their error we must approach the matter abstractly. Rather than talking directly about human practices, we must tackle Realists first on their own, Rationalist ground, and show them, even, that their *logic* is not the best. Their misconstruals are based on *illogical* thinking, as we shall see.

I

This I shall do first in Barwise's case. Indeed there is, I believe, a logical error, which needs immediate correction, at the base of Barwise's situational ideas. But on the way to that particular mistake it will be useful to look first, more broadly at Barwise's theory of scenes and situations, since that would seem to be a tangle overall, as well as in some of its details. These details we shall look at later, for Barwise (Barwise 1989, Ch 1), sets up his theory of scenes in order to show that it alone solves four puzzles. But one of these puzzles, in fact, he does not try to solve, while the other three 'solutions', as we shall see, all contain unsound arguments —sometimes even admitted to be so— starting with one point whose validity, as above, is particularly questionable.

But Barwise, in general, is trying to get away from the traditional account of propositional attitudes, which would represent, say '*A* sees that *x* is melting' as '*aS'Mx*', where '*Mx*' is the proposition towards which the seeing attitude *S'* is taken. Instead, Barwise focuses on naked infinitive constructions like '*A* sees *x* melt' and represents them in the manner '*aSs*', where '*s*' is a scene or situation, which has parts: the thing *x* and the property of melting. '*S*' is then direct 'seeing', as of objects, not the indirect 'seeing that', which is of facts. Now the sentence which describes *x* melting has comparable parts, namely '*x*' and '*M*', and so Barwise is taking such a linguistic expression to picture the correlative fact by projecting its sentence parts onto a pair of objects with parallel features. The meaning of '*Mx*' then is taken to be this structured situation; hence the term 'Situation Semantics'. We shall look at one major error in this view of meaning later, in connection with the theory of propositions which Barwise developed with Etchemendy, in their attempt to solve The Liar. But there is another error here, of similar proportions, closer to the heart of Barwise's theory of situations. It is to do with Barwise's Realism with regard to properties.

There are quite general reasons why properties are not objects, reasons, for instance, which induce most logicians to take a non-objectival view of second order and higher order quantification (Prior 1971, p35, Bostock 1974, Ch 3.) For, as Frege knew, '...melts' is incomplete, and so does not refer, it merely describes, i.e. classifies. But there are more specific motives behind Barwise's Realism regarding properties. For Barwise bases his ideas about perception on Dretske's distinction between 'non-epistemic' and 'epistemic' seeing (Dretske 1969). And it would have avoided some confusion, first of all, if both writers had followed Ryle's more natural language, and used 'watch' or 'look at' in place of 'see', for the possibly-unsuccessful 'trying' activity (Ryle 1973, 211). If Whitehead watched Russell wink then he did not necessarily see Russell wink (or Russell winking, or that Russell winked, I shall make no distinction). So watching and other cognate activities are what these writers are talking about, as 'non-epistemic seeing', which will enable us to see what that really is.

For the more natural language not only allows us to keep to the old adage 'seeing is believing', much more importantly it enables us to remember the true relation between the two varieties of observation. In Tractarian terms 'Whitehead watched Russell wink' relates Whitehead (physically) to a certain state of affairs (event, situation), whereas 'Whitehead saw that Russell winked' relates Whitehead (mentally) to a proposition to the effect that the previous state of affairs exists (event occurs, situation is actual) (Tractatus §§ 4.1, 4.5). The event here is a collection of objects, principally Russell's eyes at time *t* and Russell's eyes at time *t*+1, which have a certain property; they have this property of winking if they are sufficiently akin to certain paradigm cases which define that concept; and Whitehead watching the winking is his being in a position to see that this event occurs, i.e. being so situated that he could make a judgement about the required resemblance without further investigation. Dretske (Dretske 1969, 33-4) spends a good deal of time trying to describe what situation an observer must be in if he is just looking at ('non-epistemically seeing') a man waving to his wife. Clearly, for instance, the observer cannot be just in a position to see the man, for the waving might then be out of his view. But the description of the position he has to be in is only too obvious when we discriminate the task and achievement verbs: the watching observer must simply be in a position to see *(sic)* (that) the man (is) waving to his wife. 'Non-epistemic seeing', in other words, arises when the agent is merely in the right circumstances to 'see epistemically'. Being in such a position means having all the relevant empirical objects before one, so that all that remains is to make the classifying judgement on the case, by making comparisons between it and paradigms of the appropriate kind. As a result

A watched *x* melt

could be written

$a \Diamond S'Mx$,

where the modality relates to the agent's being in a position to see the appropriate fact. But that means that watching is not formulable in terms of seeing objects, as the Situation Semantics tradition has presumed, but in propositional attitude terms using that modality. Seeing isn't just knowing, it's occurrently knowing via a certain sense —which requires being in a certain physical location. But a location is just a place amongst other objects, *not* objects and their properties, even though we can specify it with reference to what properties those objects may be seen to possess.

A good deal follows from this, but my current purpose is merely to relate it to the proposed Realism of properties, like melting. For what centrally follows is that there are no further realities —properties— to observe through our senses in addition to plain objects. Realism, with respect to properties at least, is untrue. An event is just a set of objects, which may be classified in a certain *way*, and watching an event is just attending to such objects without necessarily making that judgement. In addition to observing objects we certainly classify objects, but before that there is no world-given classification, there is just us being in a position to make such judgements. Invariably, in other words, classification is *something we do*, and different classification schemes are possible as the variety of creatures, and cultures show. The mind-dependent, propositional attitude locution 'sees that' is the basic element in terms of which all others may be defined, in this area.

II

In connection with seeing objects, however, one must remember first of all what Barwise's form '*aSs*' might lead one to forget, that seeing a man, for instance, does not have the form '*aSx*', since '*x*' in that must be replaced by a referring phrase, not a common noun. '*A* sees *that man*', for instance, is

$aS\varepsilon xMx$ (= $(\exists F)aS'F\varepsilon xMx$),

but '*A* sees a man' is

$(\exists x)(Mx.aSx)$,

while '*A* sees there is a man' is

$aS'(\exists x)Mx$.

And that is not the only fine detail one must attend to, to get out of Barwise's way of thinking. For, as before, there are three specific puzzles he sets up to defend his theory of situations, and his reasoning is unsound in all cases, but on account of points sometimes as small as this last. The first of Barwise's 'puzzles' is entirely of his own making, and brings up the basic and repeated plain error spoken of before. He says (Barwise 1989, p18):

> Imagine a room full of children, with both Russell and Dora seeing all the children. Russell instructs each boy to touch a girl, and indeed, Russell sees each boy touch a girl. Russell doesn't see any girl get touched by more than one boy. From these facts we (and Russell, if he is perceptually aware) can conclude that there are at least as many girls as boys, since what Russell sees provides us with a one-to-one function from the boys onto a subset of the girls.
> Now this is really odd, because Dora sees everything Russell sees but, from her vantage point, sees more. Namely, she sees that some girls are being touched by several boys, boys using both hands to touch girls. She sees more, but from this report of what she sees we are not able to conclude as much as we could from the report of what Russell saw. Namely, we cannot conclude from the report of what she saw that there are at least as many girls as boys. What is going on here, and what does it tell us about the semantics of perception?

It tells us nothing, since that is not how perception works. What Barwise says Dora sees, and can infer is largely correct, but he puts Russell in a 'situation' entirely of his own making. Later Barwise even reiterates his point about Russell, saying the following is a valid inference (Barwise 1989, 29):

(41) Russell saw each boy touch (at least) one girl.
(42) Russell didn't see any girl get touched by more than one boy.
so
(43) There are at least as many girls as boys.

But this inference is, as stated, invalid, since from the fact that Russell didn't see something it does not follow that it isn't so, and that is what is required to get the stated conclusion. Even if we take the 'seeing' 'non-epistemically' we get the same result, since if Russell didn't even watch then anything could have happened. If (42) were the significantly different
(42') Every girl was seen by Russell not to have been touched by more than one boy,
then the inference would be valid. But then there would be a conflict with what Dora saw, namely that some girls were being touched by several boys. For Dora to have 'seen more' she must see what Russell does not see, not see something he (contradictorily) sees is not the case.

It is because certain thinkers are of an extensionalist bent, I think, that they come to view the inference as valid. Thus I have had the following argument put to me, which follows Barwise himself (Barwise 1989, 30):

> There is no mistake. The argument is valid whatever might have happened that Russell did not see. Let 'S' be a binary relation defined as follows: Sxy iff x was seen by Russell to touch y. Let 'B' and 'G' be one place predicates meaning 'is boy' and 'is a girl', respectively. Then the premises can be formalized as follows:
>
> $$(x)(Bx \supset (\exists y)(Gy.Sxy))$$
> $$(y)(x)(z)((Gy.Bx.Bz.Sxy.Szy) \supset x = z).$$
>
> If you try to construct a model satisfying these two predicates in which there are more boys than girls, you will find you cannot do it. So the argument is valid.

Again, another argument I have heard went like this:

> If you try to construct a detailed counterexample to the inference, you will see plainly that one is not possible. For instance, suppose there are two boys, *b1* and *b2*, and one girl, *g*. Suppose also that, in fact, *b1* and *b2* both touched *g*. Finally, suppose that Russell saw *b1* touch *g*, and

saw *b2* touch *g*. In that case (41) will be true, and (43) will be false. But alas, (42) is also false, for Russell did see *g* get touched by *b1* and by *b2*. Hence the counterexample fails. If we try to repair the counterexample by saying that Russell saw *b1* touch *g* but did not see *b2* touch *g* —which is maybe what might be thought to make the inference invalid— then, although (42) is true, (41) is then false and the counterexample fails again.

The first thinker above, along with Barwise, does not realize that 'sees' is *intensional.* If we write '*SrTxy*', instead, for 'Russell sees *x* touch *y*' then the two premises are

$$Sr(x)(Bx \supset (\exists y)(Gy.Txy)),$$

and

$$\neg Sr(\exists x)(\exists y)(\exists z)(Bx.By.Gz.Txz.Tyz.x \neq y),$$

or

$$(x)(Bx \supset Sr(\exists y)(Gy.Txy)),$$

and

$$(y)(Gy \supset \neg Sr(\exists x)(\exists z)(Bx.Bz.x \neq z.Txy.Tzy)).$$

A countermodel, in either case, is then provided by any situation of the following kind, in which there are more boys than girls:

(a) All the boys touch the same girl.
(b) Russell sees each of the boys touch *a* girl.

but

(c) Russell does not see it is always the same girl.

Likewise the second thinker limits Russell to seeing *b1* and *b2* touch *g*, i.e. touch an identified object, and so ignores the possibility of seeing *b1* and *b2* each merely touch *a* girl, otherwise unidentified.

It is surprising that Barwise has overlooked this rather obvious point about intensional constructions. Evidently, from the fact that someone does not see something it does not follow that it is not so —as is now also the case with just this puzzle.

The second of Barwise's 'puzzles' is also not a puzzle, but now because it is easily solved along traditional lines, and so without the introduction of 'scenes'. Barwise argues against the Naive Realist's logic of perception by pointing out that while it can handle (Barwise 1989, 21)

(27) Austin saw a man born in Jerusalem,

it has difficulty with

(28) Austin saw a man shaved at Oxford,

and so

(29) Austin saw a man born in Jerusalem get shaved in Oxford.

The Naive Realist believes that only referential phrases denote realities, so Barwise argues:

> Sentence (27) might be symbolized by the naive realist as
>
> $(\exists x)(aSx.Bx)$
>
> if we interpret a as Austin and Bx as the property of being born in Jerusalem. However, the naive realist logician simply cannot express (28) or (29). The point is made more clearly with a similar example, say
>
> (30) Whitehead saw Russell wink.
>
> The closest the naive-realist logician can come to expressing this would be, say,
>
> (31) $wSr.Tr$
>
> where Tx is interpreted as x having the property of winking. However (31) is really a formal expression of (32):
>
> (32) Whitehead saw Russell, and Russell winked (at the same time).

But this is irrelevant, since it is not just the Naive Realist which Barwise needs to argue against, to motivate his introduction of scenes. The operator approach has no difficulty here, as we shall now see, through attending to scope distinctions. In natural language, differences in scope, in such a case as above, are commonly marked in a way that Barwise does not indicate: by means of commas, to show when a subsidiary clause is restrictive (as in (28)), or non-restrictive (as in (27)). Without a comma, as it stands, (27) could be read just as (28); but Barwise is obviously intending differently, in which case a comma could helpfully be inserted before 'born'. Then (28) is easily captured in a propositional attitude locution

$aS'(\exists x)(Mx.Hxo)$,

where aS'p says that a sees that p, and Hxo is the property of getting shaved in Oxford. And (27) gets expressed by means of

$(\exists x)(Bx.aS'Mx)$,

or even

$(\exists x)(Bx.Mx.(\exists F)aS'Fx)$.

On the other hand,

Austin watched a man get shaved at Oxford,

has the form

$a \Diamond S'(\exists x)(Mx.Hxo)$,

where the modality is the one described before.
Now Barwise says of his solution (Barwise 1989, 28):

> If Austin saw [watched] a man from Jerusalem get shaved, what did he see [watch]? He saw [watched] a certain scene, *s*, one part of which consisted of a man, say *b*, and the property of being shaved. The man, *b*, also had the property of having been born in Jerusalem, but that property was not part of what Austin saw [watched], so it was not part of the scene.

Hence his rendition of (29), with commas before and after 'born in Jerusalem', is somewhat similar to the traditional one
(29) $(\exists x)(Bx.a[\Diamond]S'(Mx.Hxo))$,
except that Barwise takes the objects watched to *include* a property rather than just possess one. So it is centrally his theory of 'situations' which is at fault, as was shown before. Certainly the full theory of his 'situations' Barwise has not settled (though see Zalta 1993). For elsewhere (Barwise 1989, Ch 11), Barwise lists as many as nineteen basic 'branch points' still left open in Situation Theory, including decisions needed over such fundamental questions as to whether there are non-actual situations (a very important matter), and whether every part of a situation is a situation. But the above quotation already brings up the central point which needs to be made against him: that properties are not objects. Barwise thinks of properties as objects, and so does not doubt that situations may have them as parts. This is fundamentally because he does not see the link between situations and judgements symbolized in the above modalized expressions, i.e. that classifying is *something we do*.
The third puzzle which Barwise formulates to support his theory of scenes is one which has figured elsewhere in the Situation Semantics re-

search program. For Barwise and Perry (Barwise and Perry 1983) also defend the introduction of Situation Semantics, by arguing, largely on the basis of this puzzle, against possible-world analyses of propositional attitude constructions. Specifically, Barwise and Perry (Barwise and Perry 1983, 181) argue against Stalnaker's theory of propositional attitudes by relying on the validity of

(1) If a sees $\Phi(t_1)$ and $t_1 = t_2$ then a sees $\Phi(t_2)$,

and the validity of

(2) If a sees $(\Phi \vee \Psi)$ then a sees Φ or a sees Ψ.

By this means they show the invalidity of

(3) If a sees Φ, and Ψ is logically equivalent to Φ, a sees Ψ.

Barwise admits, however, that some logicians may be more inclined to give up (2) than (3), and, indeed, there is a simple argument, which has been mentioned even by Barwise and Perry, elsewhere, which shows it is indeed not (3), but (2) above which is incorrect.

The quite general argument against (2), based on material Barwise and Perry themselves approvingly sketch, involves the probabilistic analysis of propositional attitude locutions (Barwise and Perry 1983, 214, see also Slater 1993). For the parallel with probability shows entirely generally why it is (2) which is at fault: clearly the probability of $\Phi \vee \Psi$ may be 1 without the probability of either Φ or Ψ being 1. And the disjunctive principle is not even true for 'non-epistemic seeing', for

If a watches $\Phi \vee \Psi$ then a watches Φ or watches Ψ

would only hold if being in a position to observe $\Phi \vee \Psi$ always put one in a position to discern Φ or discern Ψ, without further investigation.

I conclude that possible-world analyses of attitude locutions survive Barwise/Barwise and Perry's criticisms above, and I shall defend (3) further, later. In addition, if possibilities are construed Conceptualistically, there is no need for any 'possible-world' abstract objects —since they are then 'ideas' and not 'thoughts' in Frege's terminology, and so are just in their bearer's mind. But my point about properties not being objects has a larger dimension than this, for it reflects on more arguments than those for Situation Theory. If Realism with respect to properties misjudges our active participation in classifying the world, then not only are there no situations in the way Barwise and Perry want. As we shall now see, Barwise's Realism with respect to propositions is also inappropriate, and we are on our way towards the total demolition of one major train of Realist thought.

III

Thus there are clearly other areas where Barwise's reasoning is fallacious. The central flaw in Barwise and Etchemendy's discussion of the Liar (Barwise and Etchemendy 1987) concerns just the notion of proposition which they introduce as a basis for their technical analyses. For, on both their 'Russellian' and 'Austinian' models, Barwise and Etchemendy model propositions in terms of certain sets. But propositions, we can now see, are not at all like sets.

For example, atomic propositions, in the 'Russellian' manner, are supposedly of the form $<F, b>$, where b is 0 or 1 (standing for falsity and truth), and F has the form $<P, a_1,...a_n>$, with P an n-place property, and $a_1,...a_n$ objects. But while the proposition that $Pa_1..a_n$, for instance, is related to the property P and objects $a_1,...a_n$, and also truth, it is not a set-theoretic assembly of them. For a property is not a further kind of object, for one thing, merely a way of grouping them, as we saw before. But, more centrally, a proposition also is not an object, since it states something. Specifically, the current one states that a relation holds between the objects $a_1,...a_n$ *(sic)* —either that $a_1,...a_n$ collectively have the property P, or, the equivalent, that it is true that $a_1,...a_n$ collectively have this property. So the proposition, while it is connected with the set $<P, a_1,...a_n, 1>$, is not of the same order as it, since it *says something* about the set.

And not only is this account of propositions more sense, but it immediately leads, as we shall shortly see, to a solution of The Liar, which was the object of Barwise and Etchemendy's enterprise. As other commentators have pointed out, one further illogicality in these writer's discussion of this topic is that, by their own admission, no solution to the Liar is ultimately obtained, their way (Priest 1993, p67):

> For it means that there are no propositions about the global situation at all. Nor is there any proposition attributing a property to the global situation...But then what are we to make of the fact that BE [Barwise and Etchemendy] make numerous claims about the global situation? The book is replete with statements about maximal models. Thus the solution is self-refuting. Indeed BE's own description of the situation is as clean a one-line self-refutation as one can get: '...while the world is as total as one can want, we cannot, in general, make a statement about the world as a whole'.
>
> BE are aware of this further embarrassing situation...

The way that Zalta deals with paradoxes like The Liar has a similar consequence: it is self-refuting, since Zalta cannot go on to apply his theory to his own central definitions and statements. This is a particularly serious matter for Zalta, since he and Linsky want to claim (Linsky & Zalta 1995, p549) that Object Theory is 'required to make sense of any possible scientific theory'. But *some other theory* is required to make sense of Object Theory, as a result of the way Zalta deals with paradoxes like The Liar. Thus, even though 'a state of affairs... is a basic piece of information, reflecting that some objects do or don't stand in some relation' and situations are supposedly objects of a certain kind, and 'the domain of situations is partially ordered by a part-of relation (≤)' (Zalta 1993, p390), one general consequence of Zalta's theory is that relations between situations cannot be states of affairs, as this passage implies, and so cannot be expressed by means of propositions,

What gets Zalta into this tangle is his arbitrary exclusion of forms which would lead to self-reference. Thus he proves (Zalta 1993, p416):

$$\forall s(\text{Actual}(s) \leftrightarrow s \leq w_{\alpha})$$

where s is a situation, and w_{α} is the actual world. But he excludes, with an otherwise unjustified clause in his comprehension scheme (Zalta 1993, p405), the self-referential situation, which would make it factual that it itself is not actual, and so give rise to a version of The Liar. Notionally, this situation would be such that

$$s \models \neg(s \leq w_{\alpha})$$

where '$\models$' is the 'makes factual' relation. But deliberately excluded (Zalta 1993, p411) from states of affairs which might occur on the right of this relation are those given by 'encoding subformulas', i.e. formulas like 'xF'. And the part-of relation between situations is defined in terms of such formulas (Zalta 1993, p412):

$$x \leq y =_{df} \forall F(xF \rightarrow yF).$$

As a result, no situation makes factual any state of affairs (as we might call it) about any such relation between situations, let alone self-referring ones.

Now Zalta has had the foresight to patch up his system in this ad hoc way, to avoid such paradoxes as The Liar, even if that patching up does, as a result, limit the system's self-reference, in the above sense, so that it defeats its own purpose of being necessary to make sense of all scientific theories. But it has been noted that there is at least one other paradox Zalta has taken no steps to avoid (Swoyer 1993, p247), so, as it stands, his system is quite independently still inadequate.

The paradox Zalta has not avoided is akin to The Liar, but requires the contingent premise that someone only says one thing: 'Not everything I say is true'. Prior was much exercised by this puzzle (Prior 1958), but in the same year Goodstein developed a formalization of intensional constructions which resolves the issue, as well as the plain Liar, itself (Slater 1986). And Goodstein showed his system was consistent (Goodstein 1958). I will repeat the solutions to these puzzles below, but I am more concerned to emphasize here the non-realist understanding of propositions which immediately leads to these and other resolutions of paradoxes in the area.

For the point which was made before was that propositions are not any kind of object. This is a result akin to the previous conclusion about properties not being objects, and can be arrived at through a parallel study of grammar: sentences are not names, since stating something is not referring to anything (see again Prior 1971, p35). By *using* a sentence we state something, but what we state is not an object; it can only be given by again using that sentence, or another with the same meaning. If we write

$$Msp$$

for '*s* means that *p*', it is thus crucial, as in the traditional account of propositional attitudes above, that '*p*' is a sentence (used, not mentioned), not a name, whether for a 'situation', or any other kind of object. As a result '*Ms*' is an operator, and not a predicate —grammatically, operators take sentences to form other sentences, whereas predicates take names to form sentences (c.f. Koslow 1992)— and this holds for all indirect speech locutions, expressly because *indirect* speech is involved. Certainly we can then go on to construct propositional descriptions, like

$$\varepsilon pMsp,$$

i.e. 'what *s* means', and these are nominalisations, which therefore can go into subject place. But not all subjects are objects, and, in particular, such phrases do not refer to entities of any kind called 'meanings'. Moreover they no more give the meaning of the sentence than 'the direction of this road' tells one the direction of the road. It is such a form as

$$\varepsilon pMsp = q,$$

e.g.

what 'Jack is a bachelor' means is Jack is an unmarried male,

which gives the meaning —by using an appropriate sentence '*q*'.

Goodstein's solution of The Liar then starts by considering, for instance,

$$Ms(p)(Msp \supset Fp),$$

where '*F*' is again an operator on a used sentence, and Fp is equivalent to $\neg p$. Now if,

$$(p)(Msp \supset Fp),$$

then, by instantiation to this same thing, we get its reverse

$$F(p)(Msp \supset Fp),$$

which means we definitely must have that reverse

$$F(p)(Msp \supset Fp),$$

i.e.

$$(\exists p)(Msp.\neg Fp),$$

i.e.

$$(\exists p)(Msp.p).$$

But it then follows that

$$Ms(p)(Msp \supset Fp).(\exists p)(Msp.\neg Fp),$$

and so

$$(\exists q)(Msq.\neg q).$$

As a result *s* has two meanings, i.e. it is ambiguous, since we have

$$(\exists p)(Msp.p).(\exists q)(Msq.\neg q).$$

Now Prior was slow to realize the need for such ambiguity (but see Prior 1971, p106), which is why he had difficulty with the other puzzle, when only one sentence is uttered. For if '*Sip*' says that I say that *p*, then

$$Si\neg(p)(Sip \supset Tp),$$

has a similar consequence to the above. If

$$(p)(Sip \supset Tp),$$

then obviously we get its reverse,

$$(\exists q)(Siq.\neg q),$$

and so that reverse is true. But then

$$\neg(q)(Siq \supset q)$$

and so, with the original remark, we can infer that

$$(\exists p)(Sip.p)$$

is true. The puzzle over just one sentence being said is then resolved by that sentence saying two things at once, i.e. by it being a double entendre. But Prior originally must have thought that every sentence was univocal, since he interpreted such results as the above in terms of the need for at least two sentences —until Prior 1971, 106, as before. Notice that allowing ambiguity automatically brings the non-realist, human and pragmatic aspects of language into this logic, and very forcibly, since it is then, clearly, not just a sentence, but its use, on some occasion, which determines its particular meaning at that time. But already this relation with human practices was present when we related the meaning of a sentence to the bare using of it, since for a sentence to be used at all there obviously must be a user. And so the fundamental anti-realist point which also immediately emerges is that the meaning of a sentence is no more an object than the using of that sentence. Meaning one's words is indeed, in some ways, the primary human linguistic practice, since it is a locutionary act (Austin 1962, 93-5). There are no doubt many more consequences of understanding meaning this way, but its formal superiority over Zalta's approach, and also that of Barwise and Etchemendy, is surely now already clear.

IV

The next point to be made against Zalta requires a brief introduction to the epsilon calculus, so I shall first provide that. I shall also show this calculus' quite general usefulness in connection with a matter we looked at in outline before; for there is a finer point to be made with respect to Barwise's third puzzle above which only the epsilon calculus gives us access to.

Now in the epsilon calculus, a term binding operator 'ε' is introduced, generating epsilon terms like 'εxFx', and Skolem and Herbrand functions, like '$\varepsilon xGxy$'. The quantifiers may be defined by means of

$$(\exists x)Fx \equiv F\varepsilon xFx,$$
$$F\varepsilon x\neg Fx \equiv (x)Fx.$$

Amongst other things, this allows the sole axiom defining the calculus, beyond the propositional logic axioms, to be, for instance,

$$Fy \supset F\varepsilon xFx,$$

(where y is free for x in Fy). It was David Hilbert who invented the epsilon calculus, and his reading of 'εxFx' was 'the first F'. This then denotes the first F, in any context of use. More significantly it provides a complete symbol for the referential use of such descriptions as 'the F', in comparison with the incomplete iota symbol Russell introduced, to capture their attributive use.

We can see this contrast most pointedly in connection with a closer look at Barwise's third puzzle, as was mentioned before. For it will be remembered that Barwise and Perry argue against Stalnaker's theory of propositional attitudes by relying on the validity of

(1) If a sees $\Phi(t_1)$ and $t_1 = t_2$ then a sees $\Phi(t_2)$,

and the validity of

(2) If a sees $(\Phi \vee \Psi)$ then a sees Φ or a sees Ψ.

By this means they show the invalidity of

(3) If a sees Φ, and Ψ is logically equivalent to Φ, a sees Ψ.

But while Barwise admits, on his own, that some logicians may be more inclined to give up (2) than (3), in a footnote (Barwise 1989, 24) he offers a proof of the invalidity of (3) relying just on (1), which goes as follows:

> Let t_1 and t_2 be the following definite descriptions: the x such that $(F(x)\&x = m)$ and the x such that $(B(b)\&x = m)$. Since $F(m)$ and $B(b)$ are both true, t_1 and t_2 both denote Mary, so $t_1 = t_2$ is true. But $F(m)$ is logically equivalent to $t_1 = m$, $B(b)$ is logically equivalent to $t_2 = m$. Thus (we) can argue as follows. Since f saw $F(m)$ is true, so is f saw $(t_1 = m)$, by logical equivalence; hence, by (1), we have f saw $(t_2 = m)$. Another appeal to logical equivalence gives f saw $B(b)$. Q.E.D.

Indeed, this proof, if it were valid, would show that f saw $F(m)$ entails f saw $B(b)$, for any F, B, m and b for which $F(m)$ and $B(b)$, given just (1) and (3).

It is clear, however, that Barwise's argument against (3), resting just on principle (1), is fallacious. For while it is certainly logically true that

$$F(m) \equiv \iota x(F(x).x = m) = m \; (\equiv (\exists x)(F(x).x = m))$$
$$B(b) \equiv \iota x(B(\mathrm{b}).x = m) = m \; (\equiv (\exists x)(B(b).x = m))$$

unfortunately for Barwise, the Russellian iota 'terms' are incomplete symbols, and so they can never correctly appear in both (1) and (3). With a primary sense reading Barwise's argument goes:

$$fS'F(m),$$

so

$$(\exists x)(F(x).x = m.fS'x = m)$$

(misapplying (3)), so

$$(\exists x)(B(b).x = m.fS'x = m)$$

(applying (1)), so

$$fS'B(b)$$

(misapplying (3)). With a secondary sense reading the argument goes:

$$fS'F(m),$$

so

$$fS'(\exists x)(F(x).x = m)$$

(applying (3)), so

$$fS'(\exists x)(B(b).x = m)$$

(misapplying (1)), so

$$fS'B(b)$$

(applying (3)).

If we use epsilon terms instead, then we have complete symbols for individuals, and these will obey (1) and (3) together. But, unfortunately for Barwise again, he now cannot have as logical equivalences

$$F(m) \equiv \varepsilon x(F(x).x = m) = m,$$
$$B(b) \equiv \varepsilon x(B(b).x = m) = m.$$

For the left hand sides of these are contingent (in general), whereas the right hand sides, if true, are necessary.

This means that there is no way that Barwise's argument quoted above, using just principle (1) against principle (3), will work. The accuracy of the epsilon calculus in providing complete symbols for individuals shows that (2) is also required, and a general argument against (2) was given before, leaving (3) intact.

V

It is some further exact points about the functioning of epsilon terms which allow us, now, to continue our criticism of Zalta. The first bears some comparison with a point made some time ago (Slater 1988, 284) against Fine, with respect to his theory of Arbitrary Objects. It also bears on another aspect of the chosen nature of properties, which is our theme. Fine (Fine 1985), considering natural deduction treatments of Fregean predicate logic, erected into a Metaphysic the theory of instantial terms which are introduced into such deductions by the rules of Existential Specification,

$(\exists x)Fx$, so Fa (where 'a' is new),

and Universal Generalisation,

Fa, so $(x)Fx$ (if 'a' is sufficiently arbitrary).

Rather than seeing terms like 'a' as mere calculating devices, which appear only in the working, and cannot be part of the premises or conclusions in proper deductions, Fine wanted them to have a substantive reference, and to a new and extraordinary breed of object. Of course they do not have such a reference, and Fine's exercise just illustrates again Wittgenstein's claim about how much of metaphysics arises through misunderstanding simple grammar.

A similar point can now be made about Zalta's notion of 'encoding relation', and indeed the comparison is even closer than it may at first seem. For while now Zalta has invented a symbolism, and invested it with a metaphysical significance which is unjustified, this again reflects on his lack of awareness of the same portion of grammar, which gave rise to Fine's scheme. For in the epsilon calculus we can transform the above two rules into the exact deductions

$(\exists x)Fx$, so $F\varepsilon xFx$,
$F\varepsilon x\neg Fx$, so $(x)Fx$,

and so we get terms which can occur in the premises and conclusions of proper deductions. But we also get terms which refer to (chosen) *paradigm objects,* and so have not just a natural reading, but also an ordinary reference.

Now understanding the functioning of epsilon terms in deductions removes the rationale for Fine's arbitrary objects, but it is, remarkably, understanding another aspect of the functioning of the same terms which removes the rationale for Zalta's encoding relation. For Zalta's abstract objects 'encode' properties, of all kinds, without necessarily exemplifying them. And likewise epsilon terms may be formed for any predicate, though it does not follow that the object denoted by the term has the associated property. But epsilon terms refer to ordinary *physical* objects while otherwise functioning appropriately. As a result, as we shall see, Ockham's Razor makes Zalta's postulated realm of abstract objects needless. For example, the round square, according to Zalta, is an abstract object which encodes both roundness, and squareness, but which need not (indeed cannot) be both round and square, and so does not exemplify both properties. But what is there *in actuality* to support anything like this theory? Well, first, descriptive terms for any combination of predicates can be formed:

'$\varepsilon x(Rx.Sx)$',

for instance. But there is no requirement that either

$R\varepsilon x(Rx.Sx)$,

or

$S\varepsilon x(Rx.Sx)$,

and so a distinction between 'encoded' and 'exemplified' properties is clearly made. Moreover, since there is no abstract object referred to by the epsilon term, the distinction is made in a way which gets us over the epistemological questions with which we began. The round square is simply like Donnellan's man with a martini, in being physically present, but also by being not properly described, with the given description. The behaviour of epsilon terms is thus a large part of the 'latent content' of the Realists' dream. There is not just the 'manifest content' of their story about objects beyond our ken, one can penetrate that story to its historical origin, and find the original referents of the individual terms, locating them merely in an obscured part of the sensible universe.

VI

We can now see how the above start makes Zalta's whole account *illogical*, in a certain, Kantian sense. For, since epsilon terms refer to ordinary objects, they thereby relate to logica utens, not some purely manufactured 'logic', which is more properly seen as just a pattern —what Wittgenstein dismissed as 'wallpaper' (Wittgenstein 1956, p11). The above point about epsilon terms, that is to say, is sufficient (like other instances of its kind below) to show the *synthetic* nature of properly *logical* truths. Logic is an instrument we operate with to reason correctly in our ordinary language, and formal calculi must match up to it if they are to assist us in such reasoning. Certainly Zalta (Zalta 1983, 1989, 1993) has created a possibly consistent 'logic' to structure a number of supposed inferential facts, but if he is wrong in the first place about those facts, or if they have a different rationale, his invention has no significant relation to *natural language*, or, therefore, to *logica utens*.

Linsky and Zalta claim, as we have seen before, that Object Theory is required to make sense of any scientific theory, and we have seen that, by its own construction, Object Theory cannot account for every one, specifically it cannot comprehend itself. But we now come to a much more severe deficiency in Linsky and Zalta's claim —it is not required at all! If there is another 'explanation of the logical form of...propositional attitude reports, modal contexts, discourse about fictions, puzzles about definite descriptions' (Linsky & Zalta 1995, pp548-9), and that is *quite natural*, then there is no reason to suppose Object Theory is required. And indeed there is another such explanation.

This is very easily seen with the bulk of the Zalta's 'Twenty Five Basic Theorems in Situation and World Theory' (Zalta 1993(a)), since, taking, as has been usual, a possible world to be given by a maximally consistent sequent, and a 'situation' to be given by an arbitrary sequent, all but three (21-23, about the extraordinary 'states of affairs properties') of Zalta's theorems are immediate and obvious consequences (see Slater, forthcoming). There is also, extant, a logicist foundation for number theory which respects the non-objectival nature of higher order quantification over numbers, and so does without any of Zalta's abstract objects in that area (Bostock 1974). But what it concerns me to demonstrate right here and now is the power of the epsilon calculus to treat the issues listed above, given its preferable naturalism, on account of the point made before, that the ontology of that calculus is just the actual, physical world.

Zalta in fact builds his intensional logic around what he sees as the failure of four principles, in the intensional area: Strong Extensionality, objectival, and substitutional Existential Generalisation, and Leibniz' Law. I will discuss each of these, in what follows, by way of illustration, covering the examples Zalta gives in Zalta 1989 chapter one. Seeing why, for instance, Leibniz' Law does not break down in intensional contexts is particularly important in amplification of the points made before, about possible-world, and specifically probabilistic analyses of attitude constructions. For these analyses to be fully satisfactory there has to be transparency in attitude constructions, and the study of epsilon-terms, we shall see, enables us to realize that that is indeed so. I have published two books, and over twenty articles on these issues, to which readers are referred for further details.

Now one of the main features of natural language which the epsilon calculus codifies is the distinction between reference and attribution. Russell's Theory of Descriptions formalized an attributive account of how we speak of things, but Donnellan, it will be remembered, showed that reference is not necessarily attributive. It might be said that Donnellan gave a fuller content to Russell's notion of logically proper names, and also of names simpliciter, in Mill's sense, which makes them non-connotative (Slater 1988). Epsilon terms are such non-connotative logically proper names, and the fact that they are not necessarily attributive comes from the general possibility that, say,

$$\neg F\varepsilon xFx,$$

since this is equivalent, as before, just to

$$\neg(\exists x)Fx,$$

in the epsilon calculus.

But the facility to formalize the difference between reference and attribution helps us immediately to see exactly why, and when, certain natural language inferences are valid or invalid. Thus in Zalta's case (Zalta 1989, p5)

It is necessary that the teacher of Aristotle is a teacher,
The teacher of Aristotle is Plato, so
It is necessary that Plato is a teacher,

we now recognize two ways in which 'the teacher of Aristotle' may be intended. If it is a referential term, '$\varepsilon xTxa$', then there is no fault with the argument, since it is then

$LT\varepsilon xTxa$,
$\varepsilon xTxa = p$, so
LTp.

This is against Zalta's belief that Substitutivity, i.e. Leibniz' Law can fail in such cases. Leibniz' Law never fails, although sometimes it cannot be applied since there are no referring phrases, only predicative ones —a distinction Zalta has difficulty making because of his use of referring phrases even in connection with predicates. Thus the phrase above is a rigid designator, like the epsilon term, and not a non-rigid description, like a Russellian iota term (Slater 1992(b)). And it is because of that that Leibniz' Law can be applied. But if the phrase is taken to be attributive then there is trouble.

Certainly

$$L(\exists x)(Txa.(y)(Tya \supset y = x).(\exists y)Txy)$$

with

$$(\exists x)(Txa.(y)(Tya \supset y = x).x = p)$$

still entails

$$L(\exists y)Tpy.$$

For, if

$$b = \varepsilon x(Txa.(y)(Tya \supset y = x).(\exists y)Txy)$$
$$c = \varepsilon x(Txa.(y)(Tya \supset y = x).x = p)$$
$$d = \varepsilon x(Txa.(y)(Tya \supset y = x)),$$

then we can get, because of the uniqueness clauses, and the re-expressions for the quantifiers in epsilon terms, that $b = d$, and that $c = d = p$, and so $b = p$. But, the first premise is not then the truth presumably intended by Zalta. So perhaps he had in mind

It is necessary that any teacher of Aristotle is a teacher,

i.e.

$$L(y)(Tya \supset (\exists x)Tyx),$$

since from this and the second premise the conclusion no longer follows. But that gives a different argument from the one above.

Analysis of this case, therefore, shows there is no need for Zalta's 'logic', and indeed shows that his *reasoning,* on which this 'logic' is based, is faulty. Similar points may be made about Zalta's other case here:

Susan believes Mark Twain wrote Huckleberry Finn,
Mark Twain is Samuel Clemens,

so

Susan believes Samuel Clemens wrote Huckleberry Finn.

The substitution is invariably valid, against Zalta —and Frege (Slater 1992(a))— simply because names, which are clear referential terms, are involved. But other forms may be intended, for instance,

Mark Twain is called 'Samuel Clemens',

and while it certainly does not follow from the first premise, and this descriptive statement that

Susan believes Samuel Clemens wrote Huckleberry Finn,

or even

Susan believes someone called 'Samuel Clemens' wrote Huckleberry Finn,

still, if the descriptive statement was what was intended, it should have been made explicit, to make clear that failure of Leibniz' Law was again not involved.

Further close analysis helps us with the inference

Ralph believes that the tallest spy is a spy, so
Something is such that Ralph believes it to be a spy,

which Zalta (Zalta 1989, 5) thinks may be invalid, and so faults substitutional Existential Generalisation. But if 'the tallest spy' here is referential then the entailment holds, while if the 'the', as before, was intended to be 'any', then, while the entailment does not hold, neither is Existential Generalisation in question. Even if the phrase is supposed to be taken in the manner of Russell, then the entailment holds, although that point requires more discussion. For it might not be realized that an internal existential quantifier always implies an external one, in such contexts. Thus in Quine's original case (Quine 1971, 102), the truth is that

Ralph believes there are spies

entails

> There is something Ralph believes is a spy.

There are several ways of seeing this (see Slater 1992(b), 1994, Ch 9), but fundamentally it holds because the first belief —$(\exists x)Sx$— is verified by the first spy being found to be such, i.e. by εxSx being found to be S. So Ralph's belief is about that object (which ever it may be.)

This also shows the external quantification is objectival, not merely substitutional. Thus the two fictional cases Zalta thinks (Zalta 1989, 4) defeat objectival Existential Generalisation, namely

> Sherlock Holmes still inspires modern detectives,
> Ponce de Leon searched for the fountain of youth,

are no bother, now we recognize clearly that existence is a second order property, i.e. not a predicate of objects. What is fictional, as a result, is some description applied to some object: maybe there is no one with Sherlock Holmes' *character* (i.e. a violin playing, drug taking bachelor, living in Baker Street at a certain time), but that merely means there is no *such* person, i.e. $\neg(\exists x)Sx$, which still allows $(\exists y)(y = \varepsilon xSx)$, indeed the latter is a theorem of the epsilon calculus. Thus we can say, in the second case,

$$Sp\varepsilon xFx,$$

and so imply

$$(\exists x)Spx,$$

i.e. there was something Ponce de Leon was searching for, without implying

$$F\varepsilon xFx,$$

i.e.

$$(\exists x)Fx,$$

i.e. that there is a fountain of youth. Likewise we can say in the first case

$$(\exists x)(Dx.Isx),$$

where $s = \varepsilon x S x$, without implying s has, in fact, any of the characteristics that Conan Doyle attributed to him. The latent, material base for Conan Doyle's hero, and so who, or what his stories were actually about, is s, even if who, or what s is is quite unknown without historical research (see Slater 1987).

So there are no problems about Existential Generalisation, which leaves Zalta's difficulty with Strong Extensionality to be considered. This law is in a different class to those discussed above, but it relates to the epsilon calculus in the following way. The straight law of Extensionality requires that any two predicates with the same extension be identical. And indeed if we added to the epsilon axiom above what is sometimes called the second epsilon axiom,

$$(x)(Px \equiv Qx) \supset \varepsilon x Px = \varepsilon x Qx,$$

then we too could make no discrimination between predicates with the same extension. But it is clear that we need to make such discriminations, if only because of the following kind of case, in natural language:

> There is a red-haired man, and a male Caucasian in the room, and they are different.

This must be symbolized

$$(\exists x)(Rx.Mx).(\exists x)(Mx.Cx).\varepsilon x(Rx.Mx) \neq \varepsilon x(Mx.Cx),$$

and if the second epsilon axiom applied this would have to be false if, for instance, there were only red-haired male Caucasians in the room.

So we should not use the second epsilon axiom to formalize natural language, but instead allow some co-extensional predicates to be distinguished by means of the referents of their epsilon terms, i.e. by means of the paradigm cases around which applications of the different predicates start (Slater 1992(a)). Now Zalta is concerned with a stronger form of the extensionality principle, and therefore we must consider a stronger form of the second epsilon axiom. For Strong Extensionality requires that, at least, predicates which are *necessarily* co-extensive be identical, and Zalta wishes to question this. Specifically he wishes to affirm (Zalta 1989, 6),

> Necessarily, all and only brown and colorless dogs are barbers who shave just those who don't shave themselves,

but deny

Being a brown and colorless dog is the same thing as being a barber who shaves just those who don't shave themselves.

Now, distinguishing necessarily equivalent concepts by using epsilon terms referring to different paradigms, would require denying that the following, modalized form of the second epsilon axiom was a law:

$$L(x)(Px \equiv Qx) \supset \varepsilon xPx = \varepsilon xQx.$$

But what motive could we have for denying this? Paradigms of bachelors are ipso facto paradigms of unmarried men, and the first square which is mentioned in a certain context must be the first equal sided rectangle mentioned there. The case where the concepts are impossible needs a little more discussion, since such concepts cannot have paradigms which instantiate them. The paradigm round square, for instance, is merely what is such if anything is, in line with the predicate calculus thesis which justifies the introduction of epsilon terms:

$$(\exists x)((\exists y)Py \supset Px).$$

But what could distinguish logically vacuous concepts from other logically equivalent concepts? The meaning of 'there is a round square' has to be the same as the meaning of 'there is a colorless brown', since they are each meaningless, and so inspection of the same first object would, per impossibile, verify them.

As a result, Strong Extensionality does hold, and Zalta's 'logic' is illogical again, i.e. it does not fit with logica utens. In this connection it may be pointed out, as well, that it is largely in connection with Set Theory that the unmodalized form of the second epsilon axiom is used, but in that context it is equivalent to Strong Extensionality. So while, in Set Theory, it is well known that simple Extensionality holds, this is because Strong Extensionality also holds there. Strong Extensionality holds there because sets are objects, and any identity between objects is necessary (Hughes and Cresswell 1968, p190). More specifically, sets are defined to be identical just so long as they have the same members, i.e. given

$$(x)(x \in y \equiv x \in z)$$

then

$$y = z.$$

But then

$$L(y = z),$$

i.e.

$$L(x)(x \in y \equiv x \in z),$$

and this chain of reasoning may be reversed. Hence, in particular, when the predicates are of the form '$\in y$', the modalized second epsilon axiom is equivalent to the unmodalized one. So our point above, about simple Extensionality, does not affect Set Theory.

VII

I conclude not only that some realists are illogical, but that some central and influential realists are illogical in a way that undermines their whole Realist project. They have not thought sufficiently consistently and thoroughly about the foundations of their intellectual structures, leaving them building what are no more real than 'castles in the air'. Predicates and sentences do not denote certain objects, properties and propositions. Only referential terms denote objects, and with predicates and sentences we, instead, describe such objects, and make statements about them. Possible-world, operator analyses of attitude constructions are therefore superior, metaphysically, to situation theoretic analyses of them; and we have a straightforward escape from The Liar. In addition, the detail of how referential terms are to be understood, using epsilon terms, shows that other abstract objects are not justified, and thereby the principles of intensional logic are greatly clarified.

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