Føllesdal and Quine's Slingshot

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ABSTRACT

The *slingshot* is a family of arguments to the effect that the semantic contributions of statements are limited to their truth-values. If we accept the conclusion, and wish to maintain the intelligibility of non-truth functional, statement-embedding contexts like 'makes' and 'necessarily', we must suppose that the ingredient structure of the complex statements they yield to be illusory. Gödel (1972) was puzzled by the argument. Church (1956) used it to confirm Frege's (1892) decision, that the 'Bedeutung' or 'denotation' of a sentence is its truth-value. Davidson (1967a) used it to argue against positing facts or states of affairs in semantics, as Reichenbach (1947) had done. It was this last use that mainly interested Jon Barwise and I, in our paper ''Semantic Innocence and Uncompromising Situations" (1981), in which we named the argument ''The Slingshot." However, years before Davidson deployed the slingshot, Quine (1953a) had employed the argument in formulating his objections to modal logic. And years before Barwise and I criticized the slingshot, Føllesdal (1961, 1966, 2004) had shown how to evade Quine's argument. It is this episode I wish to explore, in order to understand Quine's use of the argument, to better understand what is wrong with it, and to give overdue recognition to Føllesdal 's accomplishment.

INTRODUCTION

An expression is an *ingredient* in larger expression in which it is embedded, if its syntactic and semantic structure remains intact within the larger, embedding, expression; basically,

if it is used, not merely mentioned. By the *semantic contribution* of a statement (closed sentence) I mean those factors that can affect the truth-values of larger statements of which it is an ingredient. One such factor is clearly the truth-value of the statement itself. '~(Obama is a Democrat)' is false, because 'Obama is a Democrat' is true. Any context, that embeds statements to form new ones, where the truth-values of the new statements are sensitive only to the truth-values of the embedded ones, is *truth-functional*.

Many linguistic contexts that embed statements are not truth-functional. For example, 'Necessarily, Obama is a Democrat' is false, although 'Necessarily, Obama is a human' is true; 'necessarily' appears to be sensitive not only to the truth-values of the embedded statements, which are the same, but also to the modality of the connection between their subjects and predicates, which differs. Moreover, it appears that the embedded statements are syntactically and semantically ingredients of the containing statements; the words are used, not mentioned.

Consider another example, in which the apparent contribution of the embedded statement is not modality. Assume 'Mary weeps' and 'Elwood grins' are both true. Nevertheless, 'Harry makes Mary weep' might be true, and 'Harry makes Elwood grin' false. 'Makes' is sensitive not only to the truth-value of the statements it embeds, but also to their *subject matter*, whom and what they are about.

It is plausible, then, that statements semantically contribute more than truth-values to larger statements of which they are ingredients, and some linguistic contexts are sensitive to these other factors.

The *slingshot* is an argument, or a family of arguments, to the effect that, contrary to what just seemed plausible, the semantic contributions of statements are limited to their truth-values. Thus, if we wish to maintain the intelligibility of non-truth functional contexts like 'makes' and 'necessarily', we have to suppose that the ingredient structure they appear to have is illusory.

The slingshot can be thought of as an argument that the following three principles are jointly inconsistent, and, since (A) and (B) are undeniable, (C) must be abandoned.

(A) (Redistribution) Statements *S* and *S'* make the same semantic contribution, if logic alone can show that they share truth-values.

(B) (Substitution) Statements φ(a) and ψ(b) make the same semantic contribution, if a = b, and φ and ψ predicate the same conditions.

(C) (Diversity) Statements *S* and *S'* may make different semantic contributions, although they have the same truth-value.

The slingshot proceeds by providing a sequence of statements, each member of which makes the same semantic contribution as its successor, according to (A) or (B). The first and last members of the sequence share truth-values, but differ in some other factor one might think formed a part of their semantic contribution. The sequence purports to show that this factor is cannot a part of a statement's semantic contribution after all.

For example, consider:

(D) Obama is human.

(E) [The object *x* such that Obama is human & *x* = Obama] = Obama (by (A)).

(F) [The object *x* such that Obama is a Democrat & *x* = Obama] = Obama (by (B))

(G) Obama is a Democrat (by (A)).

(D) and (G) agree in truth-value, but not in modality. But their semantic contribution is the same, given principles (A) and (B). Hence modality is not, as we might have thought, part of a statement's semantic contribution.

Gödel (1972) was puzzled by the argument. Church (1956) used it to confirm Frege's (1892) decision, that the 'Bedeutung' or 'denotation' of a sentence is its truth-

value. Davidson (1967a) used it to argue against positing facts or states of affairs in semantics, as Reichenbach (1947) had done. It was this last use that mainly interested Jon Barwise and I, in our paper ''Semantic Innocence and Uncompromising Situations" (1981), in which we named the argument ''The Slingshot," for we wanted to follow Reichenbach in this regard.[1] However, years before Davidson deployed the slingshot, Quine (1953a) had used principles like (A) and (B) to argue against (C), in the context of his objections to modal logic. And years before Barwise and I criticized the slingshot, Føllesdal (1961, 1966, 2004) had shown how to evade his argument. It is this episode I wish to explore, by way of an overdue appreciation of Føllesdal 's accomplishment.

QUINE AND THE ARISTOTELIAN ESSENTIALIST LOGICIAN

I'll focus on Quine's essay, ''Three Grades of Modal Involvement." The slingshot comes up in his critique of a character I will call the 'Aristotelian Essentialist Logician', or 'AEL'. The AEL holds four theses.

First, the AEL believes that there is a distinction between statements that are necessarily true and those that are only contingently true, e.g.

(1) Obama is human

(2) Obama is a Democrat

where (1) is necessary, and (2) merely contingent.

Second, the AEL thinks this difference is not a matter of connection of meaning between the singular term used to identify the subject and the predicate; necessity is not analyticity. It is rather a relation between the subject itself, and the predicate. Obama himself is necessarily human, but only contingently a Democrat. The fact that 'The leader of the Democratic party is a Democrat' is, arguably, analytic, does not show that Obama, who is the leader, is necessarily a Democrat. The fact that 'The object behind the podium is human' is synthetic, does not show that Obama, who is the object behind the podium, is only contingently human.

[1] See also Perry,1996.

Third, the AEL thinks there is no reason why operators such as '□' and '◇' should not be sensitive to this factor of modality; that is, why modality should not be part of the semantic contribution of statements like (1) and (2).

The AEL realizes and accepts that such operators will be 'extensionally opaque' in Quine's terminology; that is, substitution of co-extensional predicates in the embedded statement, may affect the truth-value of the whole statement. To adapt Russell's (1903, §125) classic example, consider:

(3) □ (Obama is a featherless biped)

(4) □ (Obama is a human)

Even if being a featherless biped is coextensive with being human, as Russell invited us to suppose, (3) may be false even though (4) is true, on the assumption that it is possible for Obama to grow feathers. The operators are sensitive to the connection between Obama and the predicates, so the difference in predicates is relevant, even if their extensions are the same.

Fourth, the AEL thinks that because modality is a relation between individuals and predicates, rather than singular terms and predicates, it will make sense to quantify across '□' and '◇' as in the existential generalization of (4):

(5) ∃x □ (x is human)

This makes sense, because it makes sense for a the open sentence '□(x is human)' to be satisfied by an individual. Obama, for example, satisfies it, because he is necessarily human.

A philosopher, whose modal tendencies lead him no further than using language like,

(6) 'Obama is human' is analytic

can remain at what Quine calls the 'first level of modal involvement'. It's further than Quine is comfortable with, because of his reservations about analyticity, but it's no *more* unintelligible than analyticity. If the philosopher's modal tendencies lead him to express (6) with a sentence like (4), he will have sunk to the second level of modal involvement.

Quine sees it as inherently confusing and most likely motivated by confusion, for one is embedding a sentence in (4) that is more properly mentioned as in (6); the embedded sentence appears to be an ingredient, but really isn't.

The AEL does not see necessity as analyticity, does not think (4) is confusing or confused, and aspires to sink to the third level of modal involvement, where quantifiers reach across □ or ◇ to bind variables, as with (5). The AEL thinks necessity is a matter of individuals having properties, and hence satisfying predicates and open sentences in a certain way. He thus sees nothing unintelligible about (5).

Someone might sink to the third level by a different route. One might, for example, stick to the interpretation of necessity as analyticity, but reinterpret quantification substitutionally in order to make sense of (5). But the AEL does not wish to reinterpret quantification. He thinks (5) makes sense, because of his ''Aristotlelian Essentialism," which, at this point in the career of the term, meant only recognizing different ways, or modes, in which individuals may come to satisfy open sentences.

Quine disapproves of even this modest metaphysics. But the argument Quine makes isn't straightforwardly against the metaphysics of the AEL. It is against the aspiration to implement this conception of modality by extending predicate logic, creating the illusion that the well-understood apparatus of identity, variables, quantifiers, names and other singular terms can be supplemented with modal operators with no loss of intelligibility. Quine argues to the contrary. The AEL will either have to give up the orthodox interpretation of identity, variables and quantifiers, or do without singular terms other than variables, or see modal distinctions, the whole point of the exercise, collapse. It is in making this argument that Quine uses the slingshot.

SOME TERMINOLOGY

Before we consider Quine's slingshot and Føllesdal's response, let's fix some terminology; my use differs slightly from theirs. I use 'designate' as the all-purpose term for the relation of singular terms to the objects they pick out, rather than 'refers'. Later I

will use 'refers' with a more specific meaning that is in line with distinctions that Føllesdal makes, and associates with the phrase 'genuine singular term'.

I'll say that predicates, general terms, open sentences, and closed sentences (statements) have *extensions*; the extension of a predicate or general term is the set of objects that fall under it, of an open sentence, the set of objects of which it is true, and of a statement, its truth-value.

Names, variables, descriptions, and class-abstracts are *singular terms*, and *designate* objects. Variables are *assigned* to objects, and free variables designate the objects they are assigned to. The designations and extensions of expressions containing variables will thus also be relative to a variable assignment, and the terms 'extension' and 'designation' will be used with the understanding that this is so.

An expression α is an *extensional* ingredient in a larger expression β, if all that α provides to determining the designation or extension of β is its extension; in this case, substitution of another co-extensional expression for α will not change the designation or extension of β. Truth-functionality is a species of extensionality.

An operator O is *extensionally transparent*, or *e-transparent*, if it does not affect the extensionality of the ingredients of expressions to which it is appended; that is, if α is extensional in β, it remains extensional in O(β). Otherwise, it is *e-opaque*.

Anticipating Føllesdal, we do not assume that having a designation must be a species of having an extension, as was assumed by Frege (1892) (taking his *Bedeutungen* to correspond to extensions), Carnap (1942), Quine (1959), and many others. So we need parallel definitions for designation.

A singular term α is a *designational* ingredient in β, if all that α contributes to determining the extension or designation of β is its designation.

An operator O is *designationally transparent* or *d-transparent* if it does not affect whether the ingredients of expressions to which it is appended are designational;

that is, if if α is designational in β, it remains designational in $O(\beta)$. Otherwise, it is *d-opaque*.[2]

The AEL wants his modal operators to be e-opaque; otherwise, Obama could not be necessarily human, without being necessarily a featherless biped. If modal operators were e-transparent, the modalities would ''collapse".

But for sentences like (5) to make orthodox sense, the variable *x* must remain designational. (5) should be true if for some variable assignment to *x*, (7) is true.

(7) $\Box$(x is human)

And that should should just depend on the object assigned to the variable, and whether that object is a human contingently or necessarily.

This combination of e-opacity and d-transparency can be sustained, Quine thinks, so long as the AEL limits himself to variables as the only expressions in the system that have designation; that is, eschews names, descriptions and abstracts. But within such a limited system the AEL could not provide an account of why one might suppose

$\Box$(Barack Obama is male)

is true, while

$\Box$(The President is male)

is false.

But, Quine argues, if the AEL adds singular terms to his system, and understands them in the orthodox way the project is doomed, for *the combination of e-opacity and d-transparency cannot be sustained*. At any rate, if not impossible, it is ''... less easy than one at first supposes," for

[2] An operator might be e-transparent or d-transparent with respect certain ingredients in the expressions it embeds, while being e-opaque or d-opaque with respect to others. This complication isn't directly relevant to the issues I am discussing, so I will ignore it.

> Extensionality does not merely recommend itself on the score of simplicity and convenience; it rests on somewhat more compelling grounds, as the following argument will reveal. (Quine, 1953a: 163)

The ''following argument" is Quine's slingshot.

QUINE'S SLINGSHOT

Quine gives us, in effect, an all-purpose slingshot.[3] Pick any two statements, *p* and *q,* that share a truth-value, but differ in any other factor that one might suppose formed a part of a statement's semantic contribution. Then consider:

(H) *p*

(I) $\{x|x = Ø \ \& \ p\} = \{Ø\}$

(J) $\{x|x = Ø \ \& \ q\} = \{Ø\}$

(K) *q*

According to principle (A), (H) and (I) make the same semantic contribution, as do (J) and (K). According to principle (B), keeping in mind that *p* and *q* have the same truth-value, (I) and (J) make the same semantic contribution. Thus (H) and (K) make the same semantic contribution. So the factors that differ, in virtue of the differences between 'is human' and 'is a Democrat', cannot be part of the semantic contribution.

Now our AEL holds that '□(Obama is human)' is true, while '□(Obama is a Democrat)' is false. The predicate 'is human' applies to Obama necessarily, while 'is a Democrat' does not. The difference in predicates means a difference in modality, even though the truth-value stays the same. How can the AEL evade the slingshot?

Consider

(L) Obama is human

(M) $\{x|x = Ø \ \&$ Obama is human$\} = \{Ø\}$

Once we absorb what (M) means, it seems that (L) and (M) do have the same modal status. Since Obama is necessarily human (L) is necessary. Now the only way that the set

[3] By using class abstraction and the empty set, Quine achieves a certain elegance. But use of set theory is not an essential ingredient of the slingshot; see (D) -- (G).

{x|x = Ø & Obama is human} could fail to be {Ø}, is for Obama to fail to be human. So if Obama can't fail to be human, the identity asserted by (M) cannot fail to be true, and (M), like (L) is necessary. Similarly,

(N) {x|x = Ø & Obama is a Democrat} = {Ø}

(O) Obama is a Democrat

are both contingent. Since it is contingent that Obama is a Democrat, it is contingent that the identity asserted by (N) holds. Thus there is no reason for the AEL, at least so long as modality is the issue, to deny (A).

The problem is with principle (B), which tells us that (M) and (N) make the same semantic contribution. This the AEL must deny, since he considers (M) necessary and (N) contingent.

As we saw, the AEL gladly gives up extensionality. But principle (B) does not depend on extensionality. It depends rather on substitutivity, the substitutivity of '{x|x = Ø & Obama is human}' for '{x|x = Ø & Obama is a Democrat}', given that they both designate the set with the empty set as its only member.

FØLLESDAL 'S DIAGNOSIS

Prior to criticizing it, Føllesdal defends Quine's argument in two ways. First, he claims the conclusion of Quine's argument follows from its premises. If we accept Quine's premises, we cannot have a modal logic that is rich enough to formulate sentences like (5), includes singular terms such as names, descriptions and set abstracts, and adheres to an orthodox interpretation of quantification, variables, and identity. Second, he claims that the existence of the then existing systems of quantified modal logic did not refute Quine's argument, because they either adopted an unorthodox treatment of quantification and variables, or an unorthodox treatment of identity, or did not incorporate singular terms, or incorporated them but treated them in an unorthodox way.

But Føllesdal nevertheless does undermine the slingshot, and Quine's argument against the AEL, because he finds an assumption of Quine's that is not

required by orthodoxy, and provides a principled reason for rejecting it. According to Føllesdal, Quine in effect assumes that an aspect of the (then) *standard* philosophical conception of how singular terms worked was required for an *orthodox* interpretation of logic.

The assumption is one we mentioned above, that having a designation is a species of having an extension, or, as Quine puts it in *Methods of Logic*, ''the primacy of predicates" (1959: 218). Frege had much earlier combined designations of singular terms, the extensions of predicates, and the truth-values of sentences under one general heading, 'Bedeutungen' (1892). This unifying idea was carried over by later writers, in the concept of extension. It might seem like a bit of harmless theoretical streamlining. But Føllesdal showed that it was more substantive.

Statements, descriptions, and other complex singular terms are built out of predicates, and their designata vary with the extensions of the predicates in them. So the idea that their designations are basically also extensions is very natural. But variables and names are not built out of predicates, and so cannot vary with the extensions contained in them. So to treat their designations as extensions is a further step, and a substantial one.

If designation is a species of extension, then d-transparency must reduce to e-transparency. Then the step that is at the heart of Quine's challenge to the AEL is irresistible: the AEL cannot reject e-transparency and retain d-transparency. The first thing Føllesdal does in his dissertation is to point out that there is however a principled reason for distinguishing and d-transparency from e-transparency. He shows that there is a good argument to the effect that an operator cannot be both d-transparent and e-opaque. The reason is that operators do not embed variables and singular terms directly, but only as they occur as ingredients in embedded general terms and

sentences.[4] Føllesdal shows that if the operator is d-opaque, then an expression that directly or indirectly embeds it will be e-opaque.

But an analogous argument will *not* show that an operator cannot be both d-transparent and e-opaque, because operators can embed sentences and general terms which are not themselves ingredients in singular terms. So there is at least the possibility of operators that are, as the AEL needs them to be, d-transparent but e-opaque.

Føllesdal then goes on to dilineate the elements essential to an orthodox interpretation of singular terms, to which the AEL must adhere. Orthdoxy requires that quantifiers and variables be treated as they are in the predicate calculus. And it requires that the identity of objects that are the values of variables be ordinary objects; the object that serves at the witness to

$\Diamond$(x is married & x is president)

should be an ordinary object, like Obama, the same sort of object that can witness the truth of

x is married & x is president

and not some sort of special ‘‘intensional" object, or an object that can ‘‘split" when we consider alternative possibilities.

But, according to Føllesdal, the treatment of designation as a species of extension is not essential to meeting these criteria.

Føllesdal does not claim that the reduction of designation to extension is inappropriate for complex terms like descriptions and class abstracts, but only that it is inappropriate for what he calls ‘genuine singular terms'. Singular terms whose semantics works like general terms, such as class abstracts and definite descriptions, are non-genuine. If proper names are hidden definite descriptions, they too are non-genuine.

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[4] Føllesdal does not claim that this is necessarily so, but only that there seem to be no exceptions to it in the constructions the AEL wishes to model.

The key property of genuine singular terms is that they stick with their designata. Føllesdal explains the difference by considering the different behavior of genuine singular terms and non-genuine singular terms as we consider different possible worlds. 'The President of the United States' designates Obama in the actual world (at the time I write), but it would have designated McCain, had the 2008 election turned out differently. So it is not a genuine singular term. A genuine singular term for Obama would designate Obama no matter what possible world we consider. Genuine singular terms thus have the property Kripke was to call 'rigidly designating' (1972).

I think it is important to keep in mind, however, that the crucial thing is that the designation of a genuine singular term *persists* as the term is embedded in larger expressions that include operators like '□' and '◇'. It behaves just as a variable does, once the assignment is fixed. Thus the distinction does not depend on using possible worlds in one's analysis of necessity and possibility.

The terminology I prefer reserves 'referring' for genuine singular terms and 'denotes' for singular terms with an extension-based semantics, including descriptions and class abstracts. On this picture, designation comes in two forms, referring and denoting. This is why I have deviated from the Føllesdal /Quine use of 'refers'.

Føllesdal points out in his preface to the reprint of his dissertation that his work did not fully anticipate modern referentialism. He did not claim that ordinary proper names are genuine proper names, as Kripke (1972) and Donnellan (1970) were, in effect, to do, but left this question open. Nor did he provide something like a causal theory of reference, as Geach (1969), Donnellan, and Kripke were to do. A causal theory provides an account of how genuine singular terms can have the designations they do, which serves as an alternative to the picture that they work like general terms.

Whatever the case with ordinary proper names, Føllesdal saw that there is no apparent logical or philosophical reason why there could not be genuine names; that is, singular terms that, like variables, are simply directly assigned to objects, but unlike

variables have a designation that is fixed once and for all. There is no reason our AEL cannot incorporate such genuine singular terms into his system.

Let us say an operator is *referentially* transparent, or r-transparent, if it does not affect whether *genuine* singular terms are designational.

An operator may be r-transparent, without being d-transparent. In

Obama = the President

both 'Obama' and 'the President' are designational; that is, they only contribute their designation, Obama, to the determining the truth value of the statement. But in

◇ ~ (Obama = the President)

their status differs. 'Obama' is still designational (assuming it is indeed a genuine singular term), but 'the President' is not. Its semantic contribution is not just Obama, but also the property of being President. We have r-transparency, since the contribution of genuine singular terms is not affected. But we do not have d-transparency, since the contribution of the non-genuine terms is affected.

BACK TO THE SLINGSHOT

Føllesdal points out that Quine's argument assumes that the AEL's system will meet the following conditions (using my terminology).

(a) Quantification and identity are interpreted in the orthodox way;

(b) '◇' and '□' are d-transparent;

(c) Interchange of embedded sentences that are logically equivalent does not effect the truth value of modal statements;

(d) Complex singular terms for classes are allowed;

(e) Transparency entails substitutivity.

All of the conditions are made quite explicit by Quine, except the last. And, Føllesdal insists, if we give Quine these premises, we must accept his conclusion, that the modalities collapse.

Equipped with Føllesdal 's distinctions, however, the AEL need not accept the premises. Premise (b) is too strong. To exploit the apparatus of quantification and identity, the AEL need only claim that '◇' and '□' are r-transparent, so that variables and other genuine singular terms remain designational through the addition of these operators.

Premise (e) is now needs to be qualified, in recognition of the change in premise (b). R-transparency guarantees substitutivity of genuine singular terms, but not of all singular terms.

With these changes, the key step in Quine's slingshot, from

(M) $\{x \mid x = \varnothing$ & Obama is human$\} = \varnothing$

to

(N) $\{x \mid x = \varnothing$ & Obama is a Democrat$\} = \varnothing$

can be rejected. The AEL's holds that '◇' and '□' are r-transparent, by our modification of (b). And he holds that r-transparency guarantees substitutivity of genuine singular terms, by our modification of (e). But the move from (M) to (N) requires substitution of non-genuine singular terms. So the AEL need not accept that (M) and (G) have the same modal status.

Now consider principle (B),

(B) (Substitution) Statements $\varphi(a)$ and $\psi(b)$ make the same semantic contribution, if $a = b$, and φ and ψ predicate the same conditions

It must be amended to be plausible; 'a' and 'b' must be genuine singular terms. So amended, it can't support the slingshot.

REDISTRIBUTION AND SUBJECT MATTER

Føllesdal pointed out that there are many constructions for which Quine's argument threatened catastrophe:

> [Quine's argument] was independent of the modalities and applied to any attempt to single out by help of an operator a proper subclass of the true sentences...Quine's argument could be repeated for belief, causality, counterfactuals, probability, and the operators in ethics such as ''it is obligatory that", ''it is permitted that". They would all collapse. The argument was simply too disastrous to be correct 2004: x--xi.)

At the outset, I gave one non-modal example of a non-truth-functional contexts, 'makes', as in 'Harry makes Mary weep'. With this example it seems that principle (A), Redistribution, is the culprit, and not principle (B). Like 'necessarily', 'makes' distributes over conjunctions. Unlike 'necessarily', but like many other non-truth-functional contexts, 'makes' distributes over disjunctions. If Harry makes Mary weep or Elwood grin, then he either makes Mary weep or he makes Elwood grin.

Now consider this ''mini-slingshot," that does not depend on principle (B).

(O) Mary runs

(P) Mary runs & [Elwood grins ∨ ~ (Elwood grins)]

By principle (A), (O) and (P) make the same semantic contribution. Hence it seems that we can infer (9) from (8)

(8) Harry makes Mary weep

(9) Harry makes {Mary weep & [Elwood grin ∨ ~(Elwood grin)]}

But then, because 'Harry makes' distributes over conjunctions, we can infer

(10) Harry makes [Elwood grin ∨ ~(Elwood grin)]

and then, because it distributes over disjunctions, we get

(11) Harry makes Elwood grin, ∨ Harry makes ~(Elwood grin).

But of course, simply from the fact that Harry makes Mary weep, it does not follow that he makes Elwood do or not do anything.

Since 'possibly' does distribute over disjunction, we might expect that the mini-slingshot would pose a problem for it. But it doesn't, because for every statement *S*, we have either $\Diamond S$ or $\Diamond \sim S$. So with 'necessarily' the mini-slingshot argument doesn't get started, and with 'possibility' the final step doesn't lead to a problem.

The semantic contribution that is obscured by the move from (8) to (9) is what I call "subject matter". (8) tells us of a relation between Harry and Mary, and Harry and the issue of Mary's weeping or not; principle (A) allows us to import completely new subject matter, Elwood, and the issue of whether he grins or not.

It seems that getting rid of (B) will not solve all of the problems of intensional logic. We need also to get rid of (A). Logical equivalence does not preserve semantic contribution, because it allows us to import extraneous subject matter.

This inability to track subject matter seems to be built into the standard interpretation of the predicate calculus, in terms of total models. Every model that makes 'Mary weeps' true, will also make the conjunction 'Elwood grins & ~ (Elwood grins)' true. This feature of the predicate calculus, and the associated concept of logical equivalence, were used by Nelson Goodman (1961) to argue that we have no good concept of what a statement is *about*. Standard semantics for intensional logic, in terms of total possible worlds, which provide answers for every issue that can be framed in the base language, also loses track of subject matter. The intension of 'Mary runs' and 'Mary runs and 'Mary runs & [Elwood jumps ∨ ~(Elwood jumps)]' will be the same set of possible worlds (See Perry, 1989).

The sentence 'Mary weep' in 'Harry makes Mary weep' is an example of what is sometimes called a "naked-infinitive". The idea is that 'Mary weep' and 'Elwood grin' are sentences that lack tense; the time of the jumping and running is the same as the time of seeing. This is a plausible but not completely uncontroversial idea.

Other examples seem not to require any controversial syntactic views. For example, 'the x-ray shows that Gretchen has a broken leg' does not imply that 'the x-ray shows that Elwood has a fractured skull or the x-ray shows that Elwood doesn't have a fractured skull'.

Barwise and I (1983) tried to handle the slingshot within situation theory. By exploiting the various forms of partiality built into the theory, we denied both (A) and (B). Recognition of genuine reference is already a step in the direction of partiality, since the reference of a genuine singular term does not depend on the extensions of the predicates in the language. Still, I cannot see that recognition of genuine reference by itself can handle the problems that are due to (A). However, it is difficult to be certain, and Føllesdal 's dissertation may contain the ideas for way of blocking the redistribution step, or the ideas for explaining why doing so is not necessary.

But, for the time being, I'll take some solace in that it seems there was part of the story about the slingshot still left to tell when Barwise and I wrote our article.

REFERENCES

Barwise, Jon and John Perry, 1981. Semantic Innocence and Uncompromising Situations. *Midwest Studies in Philosophy*, Vol VI: 387--403.

Barwise, Jon and John Perry, 1983. *Situations and Attitudes*. Cambridge: MIT/Bradford.

Carnap, Rudolf, 1942. *Introduction to Semantics*. Cambridge: Harvard University Press.

Church, Alonzo, 1956. *Introduction to Mathematical Logic*. Princeton: Princeton University Press.

Care, Norman S. and Robert M. Grimm, 1969 (eds.). *Perception and Personal Identity*. Cleveland: The Press of Case Western University.

Cohen, Robert S. and Marx W. Wartofsky (eds.), 1965. *Boston Studies in the Philosophy of Science*, Volume II. New York: Humanities Press.

Clark, A., J. Ezquerro, and J. Larrazabal (eds.), 1996. *Philosophy and Cognitive Science: Categories, Consciousness, and Reasoning*. Dordrecht: Kluwer Academic Publishers.

Davidson, Donald. 1967. Truth and Meaning. *Synthese*, 17.

Davidson, Donald and Gilbert Harman (eds.), 1973. *Semantics of Natural Language*. Dordrecht: Reidel.

Davidson, Donald and Jaakko Hintikka (eds.), 1969. *Words and Objections*. Dordrecht: Reidel.

Donnellan, Keith, 1970. Proper Names and Identifying Descriptions. *Synthese* 21: pp. 335-358.

Føllesdal, Dagfinn, 1965. Quantification into Causal Contexts. In Cohen and Wartofsky, 1965: 263--274; reprinted in Linsky, 1971: 52--62; page references to the latter.

Føllesdal, Dagfinn, 1969. Quine and Modality. In Davidson & Hintikka, 1969: 175--85.

Føllesdal, Dagfinn, 1961, 1966, 2004. *Referential Opacity and Modal Logic*. New York: Routledge. Originally published 1961, Ph.D. thesis, Harvard University Department of Philosophy. Published (in mimeographed form), Oslo, Oslo University Press, 1966. Page references are to the edition published in New York, Routledge, in 2004, which includes additional introductory material by Føllesdal.

Frege, Gottlob, 1892. On Sense and Reference. Originally appeared in 1892 as Über Sinn und Bedeutung, *Zeitschrift für Philosophie und philosophische Kritik* L (1892). In *Translations from the Philosophical*

Writings of Gottlob Frege, ed. Max Black and Peter Geach, trans. Max Black, 2nd edition Oxford: Basil Blackwell.

Geach, Peter. 1969. The Perils of Pauline. *Review of Metaphysics* 23: pp. 287--300.

Gödel, Kurt. 1972. Russell's Mathematical Logic. In David Pears, ed., *Bertrand Russell: A Collection of Critical Essays*. Garden City, N.Y.: Anchor Books.

Goodman, Nelson. 1961. About. *Mind* 70: 1-24.

Hintikka, Jaakko, 1969a. On The Logic of Perception. First published in Care and Grimm, 1969 : 140-173. Reprinted in Hintikka, 1969: 151-183.

Hintikka, Jaakko, 1969. *Models for Modalities,* Dordrecht: Reidel.

Kripke, Saul, 1980. *Naming and Necessity*. Cambrdige, MA.: Harvard University Press. First published in Davidson and Harman, 1973: 253-355, 763-769.

Linsky, Leonard, (ed.), 1971. *Reference and Modality*. Oxford: Oxford University Press.

Perry, John, 1989. Possible Worlds and Subject Matter: Discussion of Barbara H. Partee's Possible Worlds in Model-Theoretic Semantics: A Linguistic Perspective. In S. Allen (ed.). *Possible Worlds in Humanities, Arts and Sciences: Proceedings of Nobel Symposium, August, 1986*. Berlin and New York: Walter de Gruyter. Reprinted in Perry, 2000.

Perry, John, 1996. Evading the Slingshot. In A. Clark, J. Ezquerro, and J. Larrazabal (eds.), 1996. Reprinted in Perry, 2000.

Perry, John, 2000. *The Problem of the Essential Indexical and Other Essays, Enlarged edition*. Stanford: CSLI Publications.

Quine, Willard van Orman, 1953.Three Grades of Modal Involvement. *Proceedings of the Eleventh International Congress of Philosophy*: vol. 13, pp. 65--81. Reprinted in Quine, 1976: 158-176. References are to the reprint.

Quine, Willard van Orman, 1976. *The Ways of Paradox, and other essays*. Second edition. Cambridge: Harvard University Press.

Quine, Willard van Orman, 1953. *From a Logical Point of View*. Cambridge, MA.: Harvard University Press.

Quine, Willard van Orman, 1959. *Methods of Logic*, revised edition. New York: Holt, Rinehart and Winston.

Reichenbach, Hans, 1947. *Elements of Symbolic Logic*. New York: The Free Press.

Russell, Bertrand, 1903. *The Principles of Mathematics*. Cambridge: Cambridge University Press.