THEODORE J. EVERETT

ANALYTICITY WITHOUT SYNONYMY IN SIMPLE COMPARATIVE LOGIC

ABSTRACT. In this paper I provide some formal schemas for the analysis of vague predicates in terms of a set of semantic relations other than classical synonymy, including weak synonymy (as between "large" and "huge"), antonymy (as between "large" and "small"), relativity (as between "large" and "large for a dog"), and a kind of supervenience (as between "large" and "wide" or "long"). All of these relations are representable in the simple comparative logic CL, in accordance with the basic formula: the more something is F, the more (or less) it is G. I use Carnapian meaning postulates to define these relations as constraints on interpretations of the formal language of CL.

In a recent article[1] I gave an intuitive account of a new, simple logic of comparisons, CL. In this paper I provide some formal schemas for the analysis of vague predicates in terms of a set of semantic relations other than classical synonymy, all of which are best represented in CL. These relations include weak synonymy (as between "large" and "huge"), antonymy (as between "large" and "small"), relativity (as between "large" and "large for a dog"), and a kind of supervenience (as between "large" and "wide" or "long"). I use Carnapian meaning postulates to define these relations as constraints on interpretations of the formal language of CL, in accordance with the general formula: "the more something is F, the more (or less) it is G".

1. THE COMPARATIVE LOGIC CL

Consider the following valid inference:

> Frank is taller than Larry.
> Larry is tall.
> Therefore, Frank is tall.

I have argued that a correct interpretation of such inferences requires that we assign not just a traditional truth value, but also a "how much" value

Synthese **130:** 303–315, 2002.

for each object with respect to each (unary) predicate, plus a separate "cut-off" value attached to the predicate itself. So, in the above example, if the cut-off for tallness is set at six feet (or any particular height), and Larry is tall (i.e., taller than six feet), and Frank is taller than Larry, then it follows arithmetically that Frank is also taller than six feet, hence that Frank is tall.

CL is a minimal comparative logic based on these ideas, and different from standard treatments of vagueness such as fuzzy logic, supervaluation theory, or Cresswell's "semantics of degree". It has the same syntax as a classical logical language L, except that the symbol $>$ ("more than") serves as a two-place logical connective for atomic sentences (the other comparisons: $<$, $\leq$, $\geq$, and =, are defined in the obvious way). In the semantics of CL, the interval from 0 to 1 is used, not as an infinite set of truth values as in fuzzy logic, but as an artificial scale of sub-values or *extensions* for atomic sentences. Every interpreted predicate letter in the language of CL is also assigned a minimum *standard* in the same range (both extensions and standards can be represented explicitly in CL using *metric constants*). The truth-value of each atomic sentence is then determined by whether its extension is at least as great as the standard for its predicate. The truth values of comparisons depend only on the sameness or difference of the extensions of their component sentences.[2] Everything else is computed classically, on the basis of ordinary truth values alone. CL is thus much more conservative than Casari's (1987) smallest system ("restricted" comparative logic), which allows comparisons to be formed between non-quantified molecular statements as well as atomics.[3]

The above inference might now be translated into CL as follows:

$$Ta$$
$$Tb > Ta$$
$$\therefore Tb$$

If the standard function for some interpretation assigned the value 0.60 to T, and the extension function assigned the values 0.65 and 0.69 to the pairs $\langle T, a\rangle$ and $\langle T, b\rangle$, respectively, then all three sentences would be satisfied by that interpretation. It should be clear that there are no allowable interpretations in which the premises would be true and the conclusion false.

Here is a list of the rules of CL:

I. Syntax

A. Vocabulary

1. A denumerable set of variables $\{x, y, z, x_1, \ldots\}$.

2. A denumerable set of constants $\{a, b, c, a_1, \ldots\}$.
3. A denumerable set of metric constants $\{i, j, k, i_1, \ldots\}$.
4. For each $n \geq 1$, a denumerable set of n-place predicates $\{F, G, H, F_1, \ldots\}$.
5. Logical symbols $\{\neg, \&, \forall, >\}$.
6. Parentheses $\{(,)\}$.

B. Formation rules

1. If ϕ is an n-place predicate and $t_1, \ldots t_n$ are terms (variables or constants), $\phi t_1 \ldots t_n$ is an atomic formula.
2. If ϕ and ψ are atomic formulas or metric constants, $(\phi > \psi)$ is a formula.
3. If ϕ is a formula, $\neg\phi$ is a formula.
4. If ϕ and ψ are formulas, $(\phi \,\&\, \psi)$ is a formula.
5. If ϕ is a formula and α is a variable, $\forall\alpha\phi$ is a formula.
6. If ϕ is a formula in which no variable occurs free, ϕ is a sentence.

C. Definitions

1. $(\phi \vee \psi) =_{\mathrm{df}} \neg(\neg\phi \,\&\, \neg\psi)$
2. $(\phi \rightarrow \psi) =_{\mathrm{df}} (\neg\phi \vee \psi)$
3. $(\phi \leftrightarrow \psi) =_{\mathrm{df}} ((\phi \rightarrow \psi) \,\&\, (\psi \rightarrow \phi))$
4. $\exists\alpha\phi =_{\mathrm{df}} \neg\forall\alpha\neg\phi$
5. $(\phi < \psi) =_{\mathrm{df}} (\psi > \phi)$
6. $(\phi \geq \psi) =_{\mathrm{df}} \neg(\psi > \phi)$
7. $(\phi \leq \psi) =_{\mathrm{df}} (\psi \geq \phi)$
8. $(\phi = \psi) =_{\mathrm{df}} ((\phi \geq \psi) \,\&\, (\phi \leq \psi))$

II. Semantics

A. Interpretations

An interpretation is an ordered triple $\langle D, s^*, e^*\rangle$. D (the domain) is a non-empty set. s^* (the standard function) is a function from predicates to members of E (the interval [0, 1]). e^* (the extension function) is a function (1) from constants to members of D, (2) from n-place predicates to functions from n-tuples of members of D to members of E, (3) from metric constants to members of E.

B. Extensions

The extension rules define, for each interpreted atomic sentence or metric constant ϕ in the language, its extension $e(\phi)$ as a function of the interpretation.

1. If ϕ is a sentence of the form $\psi t_1 \ldots t_n$, $e(\phi) = e^*(\psi)(e^*(t_1), \ldots e^*(t_n))$.

2. If ϕ is a metric constant, $e(\phi) = e^*(\phi)$.

C. Valuations

The valuation rules define, for each interpreted sentence ϕ in the language, its truth-value $I(\phi)$ as a function of the interpretation.

1. If ϕ is a sentence of the form $\psi t_1 \ldots t_n$,

$$I(\phi) = \begin{cases} 1, & \text{if } e(\phi) \geq s^*(\psi) \\ 0, & \text{if } e(\phi) < s^*(\psi). \end{cases}$$

2. If ϕ is a sentence of the form $(\psi_1 > \psi_2)$,

$$I(\phi) = \begin{cases} 1, & \text{if } e(\psi_1) > e^*(\psi_2) \\ 0, & \text{if } e(\psi_1) \leq e^*(\psi_2). \end{cases}$$

3. If ϕ is a sentence of the form $\neg\psi$,

$$I(\phi) = \begin{cases} 1, & \text{if } I(\psi) = 0 \\ 0, & \text{if } I(\psi) = 1. \end{cases}$$

4. If ϕ is a sentence of the form $(\psi_1 \;\&\; \psi_2)$,

$$I(\phi) = \begin{cases} 1, & \text{if } I(\psi_1) = I(\psi_2) = 1 \\ 0, & \text{if } I(\psi_1) \text{ or } I(\psi_2) = 0. \end{cases}$$

5. If ϕ is a sentence of the form $\forall\alpha\psi$,

$$I(\phi) = \begin{cases} 1, & \text{if } I\beta/d(\psi\alpha/\beta) = 1, \text{ for all } d \in D \\ 0, & \text{if } I\beta/d(\psi\alpha/\beta) = 0, \text{ for some } d \in D, \end{cases}$$

where β is any constant.

2. STRUCTURAL DEFINITIONS OF SEMANTIC NOTIONS

As a classical logical language L is usually defined, and as I have described CL, all of the predicates in those languages are *primitive* ones, in that there are no specific constraints on their interpretations. Hence, there is nothing in L or CL that corresponds to the meaning or intention of a predicate in natural language, or to semantic relations such as synonymy among expressions, or to the (non-tautological) analyticity of a sentence. These notions are controversial, but I think that there is a reasonably neutral way of specifying what they are, and how they relate to one another, and what it would take to include them in a formal language system.

To begin with, it seems that synonymy can be loosely defined as sameness of meaning, and analyticity as truth based on meaning. The notion of meaning itself is much more difficult – there are several conceptions within the analytic tradition that do not seem to have much in common with one another. The most inclusive conception of meaning that one could produce is probably this one, that the meaning of a term in a language is specified by whatever there is in that language that constrains the use of that term. If we limit ourselves to core uses in scientific or descriptive language, it seems that the meaning of an ordinary predicate is given by whatever constrains its extension. I do not intend this minimal definition to imply that meanings are exclusively linguistic items – they might also be ideas or properties, or whatever else has been suggested in the past. But it is fair to require of anyone who claims that meanings are non-linguistic things that they admit that those things are also in an important sense linguistic. Otherwise, we would have to conclude that synonymy, for example, is not at all a linguistic relation.

I do not even mean my definition to entail that meanings are *items* in any absolute sense. They might be things like spatial locations, only specifiable with relation to one another. One can describe the spatial location of some object a by saying that it is between b and c, and that of c by saying that it is to the left of d with respect to e, and so on. Similarly, one might specify the meaning of a predicate F by saying that it is synonymous with G, and that of G by saying that it bears some other semantic relation to H, and so on. This sort of procedure is likely to be circular, but not viciously so. What we say about locations is that the physical world as a whole has a certain spatiotemporal structure, and that the relativity applies only to its parts, considered as separate individuals. Similarly, we can say about meanings that a language has a certain whole semantic structure, and that the relativity of meaning applies only to its individual terms.

I do not need to claim that there is nothing to the meaning of a term beyond that term's position in an overall semantic structure. What is important is that the structural definition is weak enough to be taken safely for granted, yet still adequate to the analytic tasks at hand. As with locations, if it turns out that there is some absolute correlate to the structural position of each term, then that fact would do no damage to the structure, or to the relations within it.

A simple, very general way of imposing a semantic structure on a formal language was devised by Rudolf Carnap (1952). All one has to do is pick out a set of sentences (called "meaning postulates") of the language in question, and require that they be satisfied by all permissible interpretations. For example, if we were to represent the English predicates "bachelor", "married", and "man" in L by the predicates F, G, and H, respectively, and we wanted to represent the synonymy of "bachelor" and "unmarried man", then we could include the sentence $\forall x(Fx \leftrightarrow (Hx \ \& \ Gx))$ in a set of meaning postulates for L. That formula would be the image of the sentence "All and only bachelors are unmarried men", which is the most standard example of analyticity in English.[4]

In general, given any *structure* of a logical language (i.e., that language together with any set of meaning postulates), the meaning of each non-logical term in that structure is given implicitly by the meaning postulates that constrain its extension with respect to the extensions of the other terms.[5] A sentence is analytic in that structure if and only if it is entailed by the set of meaning postulates. A few distinct notions of synonymy arise, reflecting different identities of meaning or extension. Two expressions ϕ^n and ψ^n may be said to be *strongly* synonymous in a structure of L if and only if the sentence $\forall x_1 \ldots \forall x_n(\phi x_1 \ldots x_n \leftrightarrow \psi x_1 \ldots x_n)$ is analytic. ϕ^n and ψ^n may be said to be *partially* strongly synonymous in that structure if either $\forall x_1 \ldots \forall x_n(\phi x_1 \ldots x_n \rightarrow \psi x_1 \ldots x_n)$ or $\forall x_1 \ldots \forall x_n(\psi x_1 \ldots x_n \rightarrow \phi x_1 \ldots x_n)$ is analytic (so that the extension of one is necessarily a subset of the extension of the other). Two expressions may be said to be synonymous *in the broadest sense* in that structure just in case their interpretations are constrained in identical ways, so that each may be substituted for the other in any sentence of that structure, *salva veritate*. All primitive predicates (those not constrained by meaning postulates at all) are synonymous in this broad sense.

3. SEMANTIC RELATIONS IN L- AND CL-STRUCTURES

For a long time, analytic philosophers believed, in effect, that natural language (or its descriptive, or scientific, fragment) could be adequately modeled by some structure of L, at least in principle. One of the problems with this view stems from the fact that the only interesting semantic relations that can be expressed in a language like L are full and partial strong synonymy – one expression spelling out necessary and/or sufficient truth-conditions for another. Therefore, most philosophers who thought that natural language is fundamentally like L had to accept the consequence that predicates of natural language must be either synonymous (at least partially) with other expressions, or else completely primitive. So it was common to define the notion of analyticity, not in terms of meanings or meaning-relations in general, but directly in terms of synonymy. The most famous instance is in Quine's "Two Dogmas of Empiricism" (1951):

> The characteristic of such a statement [as "no bachelor is married"] is that it can be turned into a logical truth by putting synonyms for synonyms . . . We still lack a proper characterization of this second class of analytic statements, and therewith of analyticity generally,

inasmuch as we have had in the above description to lean on the notion of "synonymy", which is in no less need of clarification than analyticity itself (page 23).

The problem is, it turns out that there are not very many pairs of strongly synonymous expressions in ordinary language. The logical empiricists were never able to come up with satisfactory sets of linguistically based truth-conditions for most interesting terms. Some more recent writers have taken this failure to find synonyms to imply that the very notions of meaning and analyticity, and the whole enterprise of the logical analysis of language, are worthless.[6] But I claim that their arguments should be taken to apply only to L-based conceptions of these things. Classical first-order logic is inadequate, not just for the purpose of validating certain kinds of inference (as in the example above), but also for the explication of many important semantic relations among terms. In the language of CL, we can do much better than mere strong synonymy.

4. WEAK SYNONYMY

There is, for example, a kind of loose synonymy that holds between such terms as "large" and "huge", "old" and "ancient", and the like. These terms are not intersubstitutable – one can say that whatever is huge is also large, but not the other way around. Yet there is clearly a similarity of meaning between the two terms, over and above this partial strong synonymy. That relationship can be expressed in English by saying that one thing is huger (or as huge, or less huge) than another just in case the first is larger (or as large, or less large, respectively) than the second. In other words, the larger something is, the more it is huge. This form of statement: the more something is ϕ, the more it is ψ, has no formal analysis in the language of L. But it does have one in CL, to wit:

$$\forall x \forall y((\phi x > \phi y) \leftrightarrow (\psi x > \psi y)).^{7}$$

When employed as a meaning postulate in CL, such a sentence constrains the interpretation of the predicates ϕ and ψ, to the effect that the extensions of those predicates are required to rise and fall together, as it were, but it says nothing at all about their standards. And this is what we want: if someone understands the terms, he knows that if anything is large to a greater or lesser extent than something else, then it is also huge to a greater or lesser extent. But one does not know *a priori*, beyond knowing that all huge things are large, how large things have to be in order for them to be huge.

The English modifier "very" is explicable in CL, according to the following schema for meaning postulates:

$$\forall x \forall y((V\phi x \rightarrow \phi x) \& ((V\phi x > V\phi y) \leftrightarrow (\phi x > \phi y))).$$

The representative of "huge" should then be synonymous (in the broadest sense) in CL with that of "very large", since they will have the same meaning, to the extent that they are meaningful. But they will not be strongly synonymous in CL, since their meanings, as I have defined them, do not fully determine their extensions. This is intuitively right, I think, because in ordinary language we can use such terms synonymously if we want to, but nothing requires us to do so.

"Extremely" is explicable in turn, according to:

$$\forall x \forall y((E\phi x \rightarrow V\phi x) \;\&\; ((E\phi x > E\phi y) \leftrightarrow (\phi x > \phi y))).$$

At a popcorn booth, for example, we might find the terms "large", "very large", and "huge" denoting three different sizes. "Extremely large" might denote a fourth size, possibly larger than "huge", possibly smaller – it is up to the vendor. The form of definition I am suggesting does not even entail that whatever is very (or even extremely) ϕ must also be ϕ to a strictly greater extent than what is (just plain) ϕ. It is possible, consistent with the rules of the language, to assign to weak synonyms exactly the same extension. Some people do so with the expressions "bad headache", "very bad headache", and "extremely bad headache", at least when describing their own cases, without any real insincerity.

Another version of this sort of semantic relation is the antonymy that holds between such pairs as "large" and "small", "hot" and "cold", and the like. Again, this relation cannot correctly be modeled in the language of L. The closest one could get would be $\forall x(\phi x \leftrightarrow \neg\psi x)$, which says too much – if someone is not tall, that does not make him short – or $\forall x(\phi x \rightarrow \neg\psi x)$, which says only that one cannot be both tall and short, which is too little. What needs also be said is that the terms are opposites, in that the *more* something is one way, the *less* it is the other. And this can be expressed in CL, according to the formula:

$$\forall x \forall y((\phi x > \phi y) \leftrightarrow (\psi x < \psi y)).$$

Again, an instance of this formula, when employed as a meaning postulate for CL, would act to constrain the extensions of ϕ and ψ relative to each other, but not their standards.

We use the prefix "un-" (as distinct from "non-") to turn any vague predicate into its weak antonym: "happy" and "unhappy", "believable" and "unbelievable", and the like. This prefix can be defined schematically as follows:

$$\forall x \forall y((UN\phi x > UN\phi y) \leftrightarrow (\phi x < \phi y)).$$

5. RELATIVITY OR "CONTEXT-DEPENDENCE" FOR PREDICATES

A semantic operation that can readily be captured in CL is the relativization of one predicate to another – "large for a dog", "expensive for a toaster", etc. What is interesting about such expressions is that many predicates, especially the most obviously measurable-type adjectives like "tall", "hot", or "old", do not seem to have determinate classical extensions unless they are (at least implicitly, or contextually) relativized to other predicates in that way. If we say that Frank is tall, we might mean that he is a tall man, a tall center on a basketball team, or at all five-year-old child, but it does not seem that anyone or anything is (objectively speaking) tall *simpliciter*. However, such predicates do appear to make full sense all by themselves for purposes of comparison: that thing over there may or may not be a tall one (depending on what it is), but it is certainly taller than the table it is standing next to.

These facts have a simple account in the jargon of CL. What happens is that some predicates have no *standards* associated with them on their own, but can be used with different standards when relativized to different other predicates. They can still make sense unrelativized when they occur in comparisons, just because the evaluation of a comparison depends only on the extensions of the predicates involved. CL already allows for standardless predicates, and the extra semantics are simple. The classical extension of ϕ/ψ (i.e., "ϕ for a ψ") should be a subset of the classical extension of ψ, the "how much" extension of ϕ/ψ should rise and fall with the "how much" extension of ϕ, and the standard for ϕ/ψ should be whatever it is, regardless of the standard for ϕ. These things can be accomplished by adding instances of the following schema to the class of meaning postulates for CL:

$$\forall x \forall y((\phi/\psi x \rightarrow \psi x) \,\&\, ((\phi/\psi x > \phi/\psi y) \leftrightarrow (\phi x > \phi y))).$$

The predicates ϕ and ϕ/ψ are the fundamentally just weak synonyms.

Since the standard function in an interpretation of CL is defined for predicates generally (not just for primitive predicates), the possibility of having different standards for different relativizations of one predicate to others is already taken care of.[8]

6. THE BASIC FORM OF "CLUSTER-CONCEPTS"

Another important semantic relation that can be modeled in CL, but not in L, is the one that holds between the term for a so-called cluster concept (or "family resemblance" concept) and the set of terms that name the multiple criteria over which that concept supervenes. Many difficult and interesting concepts seem to have that structure: goodness, for example, with respect to pleasantness and desirability; being a person, with respect to various controversial criteria, perhaps including consciousness or self-awareness, plus some kind of social standing; etc. All these concepts are applied to objects by way of an overall judgement based on a number of variable factors, no particular one being either necessary or sufficient.

Here is a somewhat artificial example. Consider the predicate "large", as it is applied to such things as boxes. It should be obvious that the largeness of a box has something essentially to do with its length, width, and depth. We might sometimes identify the largeness of the box with the product of those variables (i.e., its volume) – but not always. If we are trying to fit boxes into the trunk of a car, say, then the different dimensions are likely to be weighted unequally, and we might end up saying something like, "We'll have to strap the larger one onto the roof", referring to the longer, wider, shallower box with lesser volume. There are nevertheless *some* constraints on the possible orderings of boxes according to size. For one, it should be clear that if one box would fit entirely inside another, then the first cannot be larger than the second. That is, we cannot correctly say, "This box is less long, less wide, less deep, and larger than that one". At the same time, if we say that a certain box is larger than another, then we cannot sensibly deny that the first is *either* longer, wider, or deeper than the second.

Once again, there is no adequate way of representing such constraints in the language of L. The closest we could get without employing comparisons would be something like $\forall x((\phi_1 x \ \& \ldots \& \ \phi_n x) \rightarrow \psi x)$, together with $\forall x(\psi x \rightarrow (\phi_1 x \vee \cdots \vee \phi_n x))$. This would say that the factors $\phi_1 \ldots \phi_n$ are, in a yes–no way, conjunctively sufficient, and disjunctively necessary, for the applicability of the cluster term ψ.[9]

But that cannot be right. To judge that a box is large overall does not entail that one judges it long or wide or deep. If we are going by volume, for example, then we might reasonably judge a cubical box with average dimensions to be large enough to be large, without also judging that it is long enough to be long, wide enough to be wide, or deep enough to be deep. Once again, our judgements as to ψ are not made on the basis of *whether* $\phi_1 \ldots \phi_n$ obtain; they are based on *how much* each applies.

The factors are not chosen among; they are weighed. This essential feature of cluster concepts can be modeled in CL, just by using the comparative analogue to the above L-based analysis. The appropriate schemas are

$$\forall x \forall y(((\phi_1 x > \phi_1 y) \mathbin{\&} \cdots \mathbin{\&} (\phi_n x > \phi_n y)) \rightarrow (\psi x > \psi y))$$

and

$$\forall x \forall y((\psi x > \psi y) \rightarrow ((\phi_1 x > \phi_1 y) \vee \cdots \vee (\phi_n x > \phi_n y))).$$

These two formulas, taken together, entail that each ϕ_k $(1 \leq k \leq n)$ counts for something in the determination of ψ, without saying how much any of them counts. There is no *a priori* assignment of weights.

7. CONCLUSION

I will not attempt to "define" any more interesting concepts here, so as not to introduce extraneously controversial material. My purpose in this paper has been only to provide a set of formal schemas that might prove useful to those with substantive analysis in mind, and to those who wish to argue that a useful analysis of meaning is still possible. In general, it should be clear that modeling natural language in CL-structures allows for sets of terms to be related analytically, but in a sliding way, not pegged to any one set of standards. A whole system of such partial definitions would provide not a rigid set of categories, but rather a flexible network of terms, which can adjust to fit the world as it is seen from different points of view, or as it changes, or as more of its features are discovered. This sort of partial, formalizable semantic holism may be a step toward satisfying some of the critics of logical empiricism since Quine, while retaining reasonably traditional notions of meaning and analyticity.

ACKNOWLEDGEMENTS

I would like to thank David Brink, Michael Byrd, Daniel Finer, Richard Fumerton, Carl Ginet, Sally McConnell-Ginet, Alan Sidelle, Stephen Sullivan, Jack Temkin, Winifred Wood, departmental audiences at Cornell and the University of Iowa, and especially Robert Stalnaker for many useful comments on early drafts of this material; also three helpful reviewers for this journal.

NOTES

[1] Everett 2000. I now refer to my system as *simple* comparative logic in deference to Ettore Casari's (1987) independently developed, much more complex and powerful framework.

[2] I am sorry for pretending that every answer to the question "how much?" can be crammed into the range [0, 1]. Obviously, there is no absolute upper limit for the applicability of such predicates as "tall", so Casari's (1997) use of unbounded sets of positive and negative truth degrees has a big advantage here. I am also pretending that all predicates are uniformly comparable, as if all that mattered were our overall degree of confidence in every proposition. It follows that my system cannot resolve the ambiguity of a sentence like "Sally is taller than Jack is wide around", which may be true if both sub-propositions are considered on the single scale of 0 to 1, but false if both are to be measured in feet. Here some representation of units of measurement, or at least of different scales of comparison (as in Cresswell 1976) would seem to be required, *in addition to* a single (bounded or unbounded) scale of overall evaluation. I have excluded such things for simplicity's sake, in the hope of making my main points with a minimum of formal machinery. For a detailed discussion of these issues, see Keefe 1998.

[3] See also Paoli 1996. I do not claim that comparisons formed between non-atomic sentences cannot make sense. A full treatment of the semantics of comparisons would have to comprehend, at a minimum, such statements as "Frank is taller than Larry, (by) more than Larry is taller than Sue". I do, however, find it hard to make clear sense of comparisons formed between traditional truth-functional molecules, such as "If Larry is tall then Frank is short, more than it is not the case that Sue is tall".

[4] I realize that this use of meaning postulates (along with talk of analyticity in general) will probably strike some readers as an attempt to ride a long dead horse. But one reason for their moribund status is their past failure to explain, in the too-simple language of classical logic, those very features of vagueness that I claim can be analyzed in CL. Katz and Nagel (1974), for example, list this as one of their main complaints against meaning postulates.

[5] Carnap himself maintained that meanings were properties.

[6] See for example Putnam 1975; also Boyd 1991.

[7] That is the formula for one-place expressions. For n-place expressions the formula is: $\forall x_1 \ldots \forall x_n \forall y_1 \ldots \forall y_n((\phi x_1 \ldots x_n > \phi y_1 \ldots y_n) \leftrightarrow (\psi x_1 \ldots x_n > \psi y_1 \ldots y_n))$. Similar expansions are possible for all the other formulas discussed in this section.

[8] My analysis of relativity here is sharply different from Paoli's (1999), which is based on Casari's arithmetic of truth degrees. Paoli employs a new conjunction connective for $\phi/\psi x$ which assigns to this relativization the *product* of the truth degrees of ϕx and ψx. Perhaps this works well enough in simple inferences, though it is not intuitively clear just why it ought to. I take it as a virtue of my analysis that it avoids the need for any special connectives. Paoli also claims that simple predications like "A is tall" are either relativized implicitly, or are equivalent to higher-order statements like "A is tall by any (plausible) standard", meaning under any plausible relativization. I think that such predications are often made very loosely, without any particular (or general) relativization in mind, though when *pressed* for a more determinate statement, we are usually able to come up with something else – a different statement that is more precise.

[9] This is the "cluster theory" often attributed (falsely, I think) to Wittgenstein. Saul Kripke (1980) argues at some length against this L-based theory.

REFERENCES

Boyd, R.: 1991, 'Confirmation, Semantics, and the Interpretation of Scientific Theories', in R. Boyd, P. Gaspar, and J. D. Trout (eds), *Philosophy of Science*, MIT Press, Cambridge, MA.

Carnap, R.: 1952, 'Meaning Postulates', *Philosophical Studies* **3**, 65–73.

Casari, E.: 1987, 'Comparative Logics', *Synthese* **73**, 421–449.

Casari, E.: 1997, 'Conjoining and Disjoining on Different Levels', in M. L. Dalla Chiara et al. (eds), *Logic and Scientific Methods*, Kluwer, Dordrecht, pp. 261–288.

Everett, T.: 2000, 'A Simple Logic for Comparisons and Vagueness', *Synthese* **123**, 263–278.

Katz, J. and Nagel, R.: 1974, 'Meaning Postulates and Semantic Theory', *Foundations of Language* **11**, 311–340.

Keefe, R.: 1998, 'Vagueness by Numbers', *Mind* **107**, 427–441.

Kripke, S.: 1980, *Naming and Necessity*, Harvard University Press, Cambridge, MA.

Paoli, F.: 1996, 'On Strong Comparative Logic', *Logique et Analyse* **39**, 271–283.

Paoli, F.: 1999, 'Comparative Logic as an Approach to Comparison in Natural Language', *Journal of Semantics* **16**, 67–96.

Putnam, H.: 1975, 'The Meaning of "Meaning"', in *Mind*, *Language and Reality*, Cambridge University Press, Cambridge.

Quine, W. V. O.: 1951, 'Two Dogmas of Empiricism', *Philosophical Review* **60**, 20–43.

SUNY Geneseo
Department of Philosophy
1 College Circle
Geneseo NY 14454-1401
U.S.A.