

SYNTHESE LANGUAGE LIBRARY

TEXTS AND STUDIES IN  
LINGUISTICS AND PHILOSOPHY

*Managing Editors:*

JAAKKO HINTIKKA, *Academy of Finland, Stanford University,  
and Florida State University*  
STANLEY PETERS, *The University of Texas at Austin*

*Editorial Board:*

EMMON BACH, *University of Massachusetts at Amherst*  
JOAN BRESNAN, *Massachusetts Institute of Technology*  
JOHN LYONS, *University of Sussex*  
JULIUS M. E. MORAVCSIK, *Stanford University*  
PATRICK SUPPES, *Stanford University*  
DANA SCOTT, *Oxford University*

VOLUME 6

# MASS TERMS: SOME PHILOSOPHICAL PROBLEMS

*Edited by*

FRANCIS JEFFRY PELLETIER  
*University of Alberta, Edmonton*



D. REIDEL PUBLISHING COMPANY  
DORDRECHT : HOLLAND / BOSTON : U.S.A.  
LONDON : ENGLAND

## NOTES

\* This paper is part of a longer work on mixture and combination, some of which was read at California State University/Northridge in 1974, and to the American Philosophical Association, Pacific Division, in 1976. I have benefited from the comments of F. Jeffrey Pelletier and discussions with Lucy Carol Davis, Mark Nixon, and R. K. Hsueh. This work was supported by a grant from the California Employment Development Department.

<sup>1</sup> In fact the word is used by certain North Americans when stimulated by kernels of corn and lima beans cooked together. The *American Heritage Dictionary* gives a Proto-Algonquian, specifically Narraganset, etymology.

<sup>2</sup> Or perhaps their unit classes. I include singular as plural, so that being men is a property of Socrates as well as of the men in Oregon.

## BIBLIOGRAPHY

- Aristotle, *De Generatione et Corruptione* I 1, 10; II 6-8. *De Caelo* III 3-7.  
 Cartwright, Helen Morris, *Classes, Quantities, and Non-Singular Reference*, University of Michigan dissertation, 1963 (Ann Arbor: University Microfilms 64-6661), Chs. X, XI.  
 Cartwright, Helen Morris, 'Quantities', *Philosophical Review* 79 (1970), 25-42.  
 Cartwright, Helen Morris, 'Amounts and Measures of Amount', *Noûs* 9 (1975), 143-64; reprinted in this volume, pp. 179-198.  
 Parsons, Terence, 'An Analysis of Mass Terms and Amount Terms', *Foundations of Language* 6 (1970), 362-88; reprinted in this volume, pp. 137-166.  
 Quine, W. V., *Word and Object*, (Cambridge, Mass.: MIT Press, 1960), Chs. II, III.  
 Quine, W. V., 'Ontological Relativity', in *Ontological Relativity and Other Essays* (New York: Columbia Univ. Press, 1969): 26-68.  
 Quine, W. V., 'On the Reasons for Indeterminacy of Translation', *Journal of Philosophy* 67 (1970), 178-83.  
 Sharvy, Richard, 'Maybe English Has No Count Nouns: Notes on Chinese, Semantics,' *Studies in Language*, forthcoming.

## SHARVY ON MASS PREDICATION\*

The property of being a mixture, the concept of mixture, the predicate 'is a mixture', and the physical mixtures themselves present complicated and confusing mixtures of conflicting linguistic data, conflicting conceptual intuitions, and conflicting physical analyses of the stuffs. For example, we can find question-begging definitions in chemistry texts such as "A solution of  $x$  in  $y$  has  $x$  uniformly distributed in a continuous medium of  $y$ ", we find Quine and H. Cartwright have different intuitions on whether 'furniture' and 'luggage' are mass terms, and we find that people divide on whether the one cc. of water we add to a cup of coffee becomes coffee, or is coffee, or is a part of a quantity of coffee, etc. Sharvy also has no qualms about holding that two empirically distinct predicates can pick out the same region of space-time.

There is, says Sharvy, something special about mass terms in the way the following conclusions of his paper hold. (1) Predicates with different extensions might have identical mereological fusions, (2) Predicates with distinct extensions might pick out the same region of space-time.

Conclusion (1) is perhaps ambiguous. It might mean that, in the actual world, our two predicates with distinct extensions have identical fusions. This we should not find surprising: any predicate which describes something which can be broken into parts will yield cases of predicates with this feature, regardless of whether the predicate in question is mass or count, whether it indicates a mixture or not. Let  $F_1:x$  is a physical part of Richard Sharvy;  $F_2:x$  is Richard Sharvy. The fusion of  $F_1$  and  $F_2$  are identical, at least in the actual world. (In some world we might want to say that  $F_2$  is true of a certain amputee, but not of that amputee plus his ex-limbs; and we might also want to say that those limbs satisfy  $F_1$ ). We can invoke mass terms and construct easier examples than ones involving succotash. Let  $F_1$ : is a 1 cc. quantity of water;  $F_2$ : is a 2 cc. quantity of water. Both fusions are all the world's water. (But in some possible world there is only one cc of water, and hence  $F_1$  and  $F_2$  would have different fusions there). And perhaps more naturally:  $F_1:x$  is one of the (continental + Alaska) United States or  $x$  is the District of Columbia or  $x$  is a Canadian province or  $x$  is a Canadian territory;  $F_2$ :

$x$  is North American;  $F_3$ :  $x$  is North America. The fusions of  $F_1$  and  $F_2$  are identical, viz., all the land in North America; but  $F_2$  is true of various patches of land that  $F_1$  isn't. The fusions of  $F_1$  and  $F_3$  are identical, viz., a certain continent; but  $F_1$  is true of some parts of the continent whereas  $F_3$  is true of it only as a whole.<sup>1</sup> I therefore conclude that if this is what is meant by Sharvy's conclusion (1), it is without interest, for there is nothing special here about mass terms: all the examples constructed use at least one count term (even the ones which "invoke" mass terms are not themselves mass terms, since they are not cumulative in their reference). The crucial feature is rather that we can construct different ways of describing objects – and this means only that we need have some physical object so that it has parts.

So perhaps we should consider whether (1) means that there could be predicates which have distinct extensions in some worlds but for each possible world their fusions are identical. It is obvious that no two *independent*, *empirical* predicates have this property. For, if they were independent and empirical, there would be some possible world in which the extension of one predicate but not the other is empty, and so the fusions would be distinct.

Relaxing the requirement that the predicates be empirical will allow cases where the denotations of the predicates exist in all possible worlds. Let  $F_1$ :  $x = \{1\}$  or  $x = \{2\}$ ;  $F_2$ :  $x = \{1, 2\}$ . Their extensions are different: the extension of  $F_1$  is a set containing the two singletons,  $\{1\}$  and  $\{2\}$ ; that of  $F_2$  is a set containing the doubleton  $\{1, 2\}$ . Yet the fusions are the same, namely  $\{1, 2\}$ . So once again we see that there is nothing special here about mass terms. What is important for these kinds of cases is the property of empiricalness.

Relaxing the requirement of independentness, we can have cases like  $F_1$ :  $x$  is either the first half of a book or  $x$  is the second half of a book;  $F_2$ :  $x$  is a book. Or again,  $F_1$ :  $x$  is a husband or  $x$  is a wife;  $F_2$ :  $x$  is a married couple. Note that the extensions of the  $F_1$ 's and  $F_2$ 's are different: a half a book will satisfy  $F_1$  but not  $F_2$ . A whole book will satisfy  $F_2$ , but the sense in which it satisfies  $F_1$  is that "there are two of them". The notion of "independent" is not perfectly defined, but its general intent is clear: Whenever the one predicate's being true of something entails (in some suitable vague "relevance" sense) that the other predicate is true of something and vice versa, they are not independent<sup>2</sup>. In the examples given, the existence of something which is  $F_1$  entails the existence of something which is  $F_2$  and conversely. Furthermore, in

constructing the examples so that the fusions are identical, we guaranteed that the two disjuncts are dependent on each other. Finally, we note that the examples here given are count; being a mass term is not crucial to the "distinct extensions, identical fusions" conclusion. What *is* essential is that the predicates not be independent.

It is clear that Sharvy's succotash examples for conclusion (1) depend upon non-independence. The existence of B-succotash entails the existence of C-succotash; the existence of these entails the existence of SCB-succotash (since it is only the mereological sum of any B- plus C-succotash). The converse implications all hold also. The existence of any one of these entails the existence of ACB-succotash; and the existence of ACB-succotash entails the existence of at least one of these and hence of all of them. Note though, that just as in the count case, it is different stuff that these predicates are true of. The lack of independence amounts to the fact that the predicates are defined in such a way that in order for one to have an extension they all must. In this respect KCB-succotash is different: 'KCB-succotash' is true of a sub-portion of what 'SCB-succotash' is true of – KCB-succotash is just a special kind of SCB-succotash, namely that kind which has the corn and beans *actually* mixed together. The fusions of KCB-succotash and SCB-succotash are identical, however; therefore, the third disjunct in the definition of 'ACB-succotash' could have been " $x$  is KCB-succotash" – or (in light of the remarks made above) a third disjunct could have been eliminated, since the predicate " $x$  is C-succotash or  $x$  is B-succotash" would have the same fusion as SCB-succotash without any other disjunct. So why did Sharvy add the third disjunct of " $x$  is SCB-succotash"? Merely to make " $x$  is ACB-succotash" be a mass term, for with only the two disjuncts this would not be a mass term (it would not be cumulative in its reference); and with the addition of " $x$  is KCB-succotash" as a third disjunct it is still not cumulative in its reference and so not a mass term. (The beans on my plate plus the corn on your plate satisfies neither of the first two disjuncts nor does it satisfy 'is KCB-succotash'). But this just shows how irrelevant the mass term is in establishing the indeterminacy-of-fusion-reference thesis. In order to even make up examples of such mass-indeterminacy, Sharvy needed to invoke the machinery of mereology (with his 'is SCB-succotash'). The moral of this should be that the indeterminacy of reference is there, but that it's there for the very reasons Quine suggested for count terms. There is no special indeterminacy of mass predication to be found here.

Is there anything to conclusion (2) – that predicates with distinct extensions and distinct fusions can be indiscernible – other than the fact that pointing underdetermines spatiotemporal spread intended?<sup>3</sup> Sharvy would have us consider cases such as (macroscopically) homogenous succotash baby food, salt water, grog, etc. Isn't this merely a case of being unable to "carefully point to" the relevant parts of the mixture? It may be true that the parts, while being discrete from each other, "virtually occupy the same space at the same time" and that "at least they come close enough to inhibit macroscopic linguists." But that is surely just a case of the indeterminacy of pointing. Rather than saying that the parts occupy the *identical* region of space-time, we would be happier with an account of mixtures which took into account a notion like concentration. Surely the result obtained by adding a little water to a lot of pure alcohol is alcohol and perhaps more of it; but it isn't more *pure* alcohol. Adding a tablespoon of salt to 200 litres of pure water will yield 200 + litres of impure water. For some mixtures, certain concentrations have special names. For 43% (by volume) alcohol, 56+ % water, and other traces we call it 86-proof scotch. A *little* more water added, and it is still scotch, but not 86-proof scotch. For mixtures of water and scotch between 1/4 and 3/4, we call it scotch 'n' water. Add a *little* more water and we have more scotch 'n' water. In the former case you *might* be tempted to say (before reflection) that the water became part of a quantity of scotch; in the latter case that the water became part of a quantity of scotch 'n' water (but not of scotch). But let me enter here a plea for common sense: after reflection it is clear that talk of concentration and atoms is preferable. And I don't think this is merely a parochial, 20th century, North American prejudice. It is part of what we mean by "mixtures".

I think that the underlying reason Sharvy believes conclusions (1) and (2) is this: he thinks that a mereological-like logic is appropriate for describing the "logical form" of mass predication (or rather: of sentences invoking mass predications). If this is not antecedently believed, one can hardly even state conclusion (1). And if one takes mereology seriously, one will take mass terms as (completely) disjunctive. This leads directly to a view that atomism is false (not of course in the sense that there aren't what we call atomic particles, but rather in the sense that even their parts can be truly characterized by the mass term; I think the problems with this view are obvious). And this leads one naturally to a view of mixtures that holds that language does not rule out the possibility

of finding mixtures such that, no matter how small a volume one picks, there is each element of the mixture in that volume (i.e., to conclusion (2)).

These consequences ought by themselves to dissuade one from thinking mereology appropriate to mass predication, but there are other compelling reasons also.

Let us therefore briefly consider what Sharvy takes to be the usefulness of mereology. The scope of his inquiry which explicitly invokes mereology is circumscribed indeed: it is of sentences wherein (a) the predicate is a mass term, and (b) where the subject is a "quantity" or a variable ranging over "quantities". Sentences like 'This electron in the third orbit is gold', 'My ring is gold', and 'This puddle is water', etc., are excluded from the enquiry on the grounds that the subject is not a "quantity". I shall not raise any of the obvious issues here (of how we ever can tell), but do wish to question the wisdom of separating the role of the general term 'gold' as it occurs in the aforementioned sentences and as it occurs in sentences like 'The metal in my ring is gold', 'The fluid in this puddle is water', etc. It is not by any means obvious that the principle of compositionality of denotation or even of meaning can be maintained if we have to antecedently know that in 'Gx' the 'x' ranges over quantities or objects.

Quine had said that a mass term in predicative position is true of each portion of the stuff in question excluding only the parts too small to count. Sharvy perversely interprets this as meaning that there is some *volume* for which any smaller part cannot count as an instance of the mass term and for which any larger part does count. Clearly Quine has some notion that every stuff described by a mass term is composed of some smallest *naturally occurring* part (or something like that), and that the parts of such a part are not truly described by the mass term nor is just *any* arbitrary combination of parts of these parts truly described by the mass term. So, for example, Quine thinks water has water molecules as smallest naturally occurring parts, and the oxygen parts of the molecules are not water nor is a combination (or sum) of the oxygen parts truly described as water. The idea is that 'part', in the relevant sense, means 'part with such-and-so structural properties'. A mereological-like logic with this notion as primitive was given by Julius Moravcsik. However it seems that it is impossible to give an adequate account of such a mereology.<sup>4</sup>

Some final, perhaps idiosyncratic, objections to mereology are these.

Suppose we do find some way to allow a transcription of 'There is some mucus in my nose' in terms of an existential quantifier whose values are quantities. It would seem that allowing quantifiers and quantities would give legitimacy to

$(\exists!x)(x \text{ is mucus in my nose})$

And yet such a sentence would be necessarily false, given Sharvy's understanding of 'quantity'. A related difficulty with quantities is that 'quantity', by itself, seems to have no amount function associated with it: you can't simply measure quantity A and compare it in amount with quantity B. You have to know first what kinds of stuff A and B are. If they're both the same, then (perhaps) the comparison goes through, but if they're different kinds of stuff we need some other convention (like volume or weight) to measure the amounts. Consider, for instance, whether a bucket of sand and a bucket of mucus are the same in amount – the answer is that it depends on whether amount is being measured by weight, volume, etc. Or consider whether a cup of flour directly out of a bag is the same in amount as a cup of sifted flour. This seems to imply that quantification over quantities (simpliciter) is improper; yet mereology assumes that it can be done.

For these reasons, it seems best to me to reject mereology as a way of accounting for mass predication. I have no alternative to offer, but am firmly convinced that one will have to be found.

*University of Alberta*

#### NOTES

\* The present paper revises my comments made on Richard Sharvy's 'Mixtures', which were read to the Pacific APA in 1976. My thanks go to Richard Grandy both for his help in formulating the comments and for reading the paper at the meeting.

<sup>1</sup> This example is for those of us who think that Mexico, Central America, Hawaii, Greenland, and the Carribean are not North American. Those who think otherwise can construct their own examples.

<sup>2</sup> I add the "suitably vague" qualification, because I do not want "is F or not F" and "is G or not G" to be dependent even though if the one is true of something then so is the other. I have in mind something like "essentially entails".

<sup>3</sup> In introducing this problem, Sharvy claims that the linguist could rule out "C-succotash" and "B-succotash" as translations of the native's 'succotash' by "carefully pointing to [the relevant part of the stuff] and noting the native's affirmation of 'succotash'." He claims that this procedure cannot decide among "ACB-succotash", "KCB-succotash", and "SCB-succotash". This claim depends for its truth upon our

not being able to find the native's term for 'mereological sum' (and upon our not being able to teach it to him). For, if we have the term (say that it is 'sulp'), then we can "carefully point to" the corn on Lucy's plate and "carefully point to" the beans on Benjamin's plate and ask whether the one sulp the other is succotash. If he denies it, we can rule out both "ACB-succotash" and "SCB-succotash" as translations of the native's 'succotash', and hence 'succotash' is to be translated by "KCB-succotash". If he affirms it, then we can rule out "KCB-succotash" as translation of the native's 'succotash'. We are then left with "ACB-succotash" and "SCB-succotash" as possible translations. We can do no better; since, under the assumption that 'succotash' does not translate as either "B-succotash" or "C-succotash", it follows that "ACB-succotash" and "SCB-succotash" have identical extensions. (I.e., the first two disjuncts in the definition of "ACB-succotash" are otiose – it isn't because the stuff is B-succotash or C-succotash that it is ACB-succotash). So, if we can be careful enough in our pointing to rule out B-succotash and C-succotash, and if the concept of mereological sum is a legitimate enough concept for the native to have or be taught, then we can also be careful enough in our pointing to rule out all Sharvy's predicates (except the ones which are logically equivalent).

<sup>4</sup> Julius Moravcsik, 'Mass Terms in English' in Hintikka, Moravcsik, and Suppes (eds.), *Approaches to Natural Language* (Reidel, 1973). For criticism, see Richard Grandy 'Response to Moravcsik' in the same volume and F. J. Pelletier 'On Some Proposals for the Semantics of Mass Terms', *Journ. Phil. Logic*, 1973.