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THE READINGS OF PLURAL NOUN PHRASES IN ENGLISH*

0. INTRODUCTION

The noun phrase which is the subject of the following sentence is susceptible to a collective construal as well as a distributive one.

(1) The men wrote operas.

If "the men" denotes Mozart and Handel, then the only construal on which it is true is the distributive one; if "the men" denotes Gilbert and Sullivan, then the only construal on which it is true is the collective one.

In this essay, I shall address two questions: First, what is the nature of the variation in construal to which plural noun phrases are liable? Second, what is the range within which these construals vary? The first question raises the issue of whether the variation in construal is one of ambiguity, as suggested by McCawley (1968, pp. 142–155) or not, as suggested by Harnish (1976, pp. 313–331), Katz (1977, pp. 127–128), and Higginbotham (1981, pp. 97–102). The second question broaches a descriptive problem: what is the range of variation in construal, be it a matter of ambiguity or not? In due course, I shall conclude that the variation in construal is due to ambiguity and I shall provide a more descriptively adequate characterization of the range of variation.

1. THE NATURE OF COLLECTIVE AND DISTRIBUTIVE CONSTRUALS

To address the first question, one needs to take care not to confuse the notion of ambiguity with such other notions as generality and indeterminacy. To this end, it is helpful to provide definitions and examples of these notions. But, as is well-known, definitions are notoriously difficult to come by. However, my purpose at this point is descriptive and not explanatory, that is, my purpose is to ensure that the reader recognizes examples to which these concepts apply paradigmatically, and it is not to provide a theoretical account of them. Therefore, I shall avail myself of the widely known traditional semantic concepts to define the notions of ambiguity, generality, and indeterminacy, and to distinguish them from one another.

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The notions from traditional semantics which are required, are meaning, denotation, and connotation. Meaning, as it will be used here, is cognitive meaning (in the sense of Alston, 1964, p. 74), or conceptual meaning (in the sense of Leech, 1974, pp. 10–13). The denotation of a word is the set of objects to each of whose members the word truly applies. And the connotation of a word is the property, or properties, possession of which by an object licenses the application of the word to it. These are, of course, the notions of connotation and denotation found in J. S. Mill (1843, Book I, Chapter 2). These notions can be connected in the following way: the meaning of a word fixes its connotation, and its connotation, in turn, fixes its denotation.

Now, a word is ambiguous just in case it has more than one meaning. Many words have more than one meaning. Consider the word "founder". On one meaning, it means the same as the phrase "one who establishes an organization"; on another, it means the same as the phrase "one who melts metal or glass". This ambiguity is reflected in the following pair of sentences.

(2.1) Ignatius of Loyola was the founder of the Jesuits.
(2.2) Wang An-zhi was a founder in the Shanghai Steel Works.

The fact that the word "founder" is ambiguous is an etymological accident: one meaning deriving from the Latin "fundare" (cf., the French "fonder") and the other deriving from the Latin "fundere" (cf., the French "fondre" (Lyons, 1977, pp. 20–22). But ambiguity need not result only from etymological accident: it may be productive, as linguists say, resulting from, for example, metaphorical extension. Such a word is "hand", which usually designates part of the human anatomy, and which also, through metonymy, designates a human being. Sentences illustrating this are given below.

(3.1) All hands are in the pockets.
(3.2) All hands are on the deck.

Though I am concentrating on lexical semantics, I should mention in passing the notion of amphiboly, that is, phrasal ambiguity. This sort of ambiguity obtains when a sentence has distinct meanings, not in virtue of any ambiguity of its words, but in virtue of different phrasal structures which the sentence can accommodate. The sentence

(4.0) The men saw their wives drunk,

can accommodate two distinct parsings, namely,

(4.1) The men saw [their wives drunk].
(4.2) The men [saw their wives] drunk.

In the first case, the wives were drunk when their husbands saw them; in the second case, the men were drunk when they saw their wives.

Turning from the notion of ambiguity to that of generality, one can define the latter as the case in which a word's connotation is a genus of more than one species. Examples of words which are general are: "metal", "color", "tree", "parent".

(5)
metal:	gold, copper, iron, mercury, . . .
color:	red, green, blue, . . .
tree:	birch, maple, oak, . . .
parent:	mother, father.

Generality and ambiguity are distinct: a word may be general without being ambiguous and a word may be ambiguous without being general. A word may be ambiguous, that is, have more than one meaning, though the connotation fixed by each meaning is a property which is not a genus of distinct species. A word may be unambiguous, that is, have only one meaning, though its meaning fixes a connotation which is a genus of distinct species.

The meaning of a word fixes its connotation and the connotation must be possessed by each entity in its denotation. In this way, a word determines that entities in its denotation possess certain properties, namely, the properties which are in its connotation. It does not determine any other properties. And it is with respect to these other properties that the word is indeterminate. In other words, a word is indeterminate with respect to a property just in case the property is neither the word's connotation nor a species of the word's connotation. For example, the word "square" is indeterminate with respect to being any particular size, and the word "mother" is indeterminate with respect to being of any particular ethnic origin. The word "parent" is general with respect to being a mother or being a father, but is indeterminate with respect to being of any particular height.

Although the definitions of ambiguity, generality and indeterminacy are useful in sharpening the intuitive distinctions one makes among the cases surveyed, nonetheless the notions providing the basis for the definitions – namely the notions of meaning, connotation, and denotation – are not theoretically robust enough to sustain the former notions applied to a wider set of cases. One is forced, then, to seek other ways to

distinguish ambiguity, generality, and indeterminacy from one another. The following criterion offers a way to distinguish ambiguity on the one hand from generality and indeterminacy on the other, without requiring recourse, or at least immediate recourse, to the notions of meaning, connotation, and denotation.

(6) A sentence is ambiguous iff, with respect to a given state of affairs, the sentence can be both truly affirmed and truly denied.

Notice that this criterion does not diagnose the source of ambiguity in a sentence determined by it to be ambiguous. For that, extra assumptions are needed: but what they are, for any application of the criterion, is usually evident. Notice also that the criterion does not identify what the readings of an ambiguous sentence are. Again, for that, extra assumptions are needed.

Contrary to the claims of some, for example, Kempson (1977, Chapter 8.2), this criterion is not "an alternative, equivalent formulation of" (Kempson, 1977, p. 128) the following:

(7) A sentence is ambiguous iff the sentence is true in quite different states of affairs.

First of all, one cannot find anywhere near the same degree of pre-theoretic agreement about what it is for two states of affairs to be quite different, as one can find about what it is for a sentence to be both truly affirmed and truly denied of a given state of affairs. Moreover, neither Kempson, nor anyone else for that matter, has provided any theoretical elucidation of what it is for two states of affairs to be quite different. These points alone are sufficient to render suspect any claim of equivalence between (6) and (7). Kempson herself provides an example which, prima facie at least, overturns the alleged equivalence. She invites her reader to consider this sentence:

(8) John killed Bill.

She points out that for John to have killed Bill deliberately and for him to have killed Bill accidentally are very different states of affairs. By (7), then, the sentence in (8) is ambiguous. Now, departing from Kempson for a moment, apply the criterion in (6). Consider any state of affairs in which John killed Bill intentionally. Can the sentence in (8) be both truly affirmed and truly denied? Evidently not. Now consider any state of affairs in which John killed Bill unintentionally. Can the sentence in (8) be both truly affirmed and truly denied? Again, evidently not. So, by the

criterion in (6), the sentence in (8) is not ambiguous. Thus, (6) and (7) are not equivalent. Curiously, though, Kempson rejects the criterion in (6) on the basis of this thought: if the criterion in (6) indicates ambiguity for one speaker and fails to do so for another, then the criterion can not distinguish ambiguity from non-ambiguity. But she does not assert that the sentence in (8), or any other sentence for that matter, is a case where the criterion in (6) indicates ambiguity for one speaker and fails to do so for another. Yet, this is precisely what must be asserted if her claim is to be anything more than a methodological commonplace. In fact, the judgmental evidence here, and in innumerable other cases, is to the contrary.

Now to see just how well the criterion in (6) works, one should apply it to the cases of ambiguity, generality, and indeterminacy adduced above. First, consider the state of affairs in which each member of a crew is on the deck of a ship, each with his hands in his pockets. Suppose that the first officer reports to the captain on the bridge: "All hands are on the deck, sir"; and the captain replies: "No, they are not; they are in their pockets". Second, consider the state of affairs in which some men see their wives, and though the men are sober, their wives are drunk. Suppose someone says: "The men saw their wives drunk"; and someone else responds: "No, the men were perfectly sober when they saw their wives". In each situation the first sentence uttered is ambiguous, thereby susceptible of being truly affirmed and truly denied. Making uncontroversial assumptions, one diagnoses the source of the ambiguity in the first situation to be the word "hand" and in the second situation to be the fact that the sentence in question accommodates two distinct phrasal structures.

In contrast, consider the situation where Graeme's mother resigned from the board of directors of Exxon. Someone might remark: "Graeme's parent resigned from the board of directors of Exxon"; but no one could coherently respond: "No, Graeme's parent didn't resign from the board, his mother did". So a general word does not, as such, permit a sentence to be both truly affirmed and truly denied of a given state of affairs. Nor does a word, even insofar as it fails to determine properties of the entities in its denotation, permit a sentence to be both affirmed and denied of a given state of affiairs. Given the same state of affairs as before, one might still remark: "Graeme's mother resigned from the board of directors of Exxon"; but no one could coherently rejoin with: "No, Graeme's mother did not resign from the board; she's oriental".

How, then, does the criterion apply to sentences with plural noun phrases, which are liable to collective and distributive construals? As was

implied at the beginning of the essay, such sentences can be both truly affirmed and truly denied of a given state of affairs. After all, "the men wrote operas" can be both truly affirmed and truly denied of Mozart and Handel: they never collaborated on even one opera, but each did write operas. Examples of this sort abound and are often pointed out in elementary textbooks on logic. Consider the examples below (Copi, 1953, p. 125).

(9.1) The buses in this town consume more gasoline than the cars.
(9.2) The conventional bombs dropped in World War II did more damage than the nuclear bombs dropped in World War II.

The first sentence is true when "the buses" and "the cars" are each construed distributively, but false when each is construed collectively; conversely, the second sentence is false when "the conventional bombs dropped in World War II" and "the nuclear bombs dropped in World War II" are each construed distributively, but true when each is construed collectively.

As already indicated, several authors have claimed that the discrepancy between collective and distributive construals of plural noun phrases is not a matter of ambiguity. Only Harnish, of the ones surveyed, puts forth arguments to support this claim. Harnish (1976, p. 330) maintains that a sentence is not ambiguous unless, when augmented to include information superfluous on one of its alleged readings, it is judged to be redundant, as one judges the following sentence to be redundant:

(10) The tall man is tall.

He also maintains that sentences with plural noun phrases cannot be so augmented. By way of example, he contrasts the following pair of sentences:

(11.1) He fed her dog biscuits.
(11.2) The men went to Cleveland.[1]

The first of the two is phrasally ambiguous: "her dog" may be the indirect object and "biscuits" the direct object of the verb or "her" may be the indirect object and "dog biscuits" the direct object of the verb. These alternatives are represented below:

(12.1) He [$_{VP}$ fed [$_{NP}$ her dog] [$_{NP}$ biscuits]].
(12.2) He [$_{VP}$ fed [$_{NP}$ her] [$_{NP}$ dog biscuits]].

The second sentence may be construed, Harnish claims, either as the

men going to Cleveland together or as the men going to Cleveland separately. Now applying his test, he augments the pair of sentences in (11) as follows:

(13.1) He fed her dog biscuits for dogs.
(13.2) The men went to Cleveland and they went together.

The latter does not sound redundant, though the former does, provided that one parses it as in (12.2), that is, one takes "dog biscuits for dogs" as the direct object of the verb.

It would be helpful, at this point, to explore Harnish's criterion. On reflection, one sees it to depend on there being a superfluity of cues for isolating one reading from the others. Whether or not a speaker detects a superfluity of cues may depend, in turn, on his non-linguistic knowledge and expectations. So, given the sentence,

(14) Rick lost his hat while at the bank,

one might wonder whether he lost his hat near a river or in a building. Certainly nothing could be a more unequivocal application of Harnish's criterion than to add an appositional phrase to the word "bank" in (14) stating the relevant sense of the word.

(15) Rick lost his hat while at the bank, that is, while on the land next to the river.

If one were unsure where Rick had been, (15) would not be regarded as containing a redundancy, but rather relief from ambiguity. Notice that if (14) had come with an additional cue whereby the ambiguity could have been eliminated, then the augmentation in (15) would have been judged to be redundant.

(16) Rick lost his hat while at the bank fishing, that is, while on the land next to the river fishing.

If the speaker makes the usual assumption about where fishing takes place, then the appropriate sense of "bank" will have been isolated and appositional phrase judged redundant.

When (13.1) sounds redundant, it is because the speaker is given and recognizes more than one cue whereby to isolate the same reading. The fact is that (12.1) and (12.2) each have associated with them a distinct pattern of stress. A sequence of words in compound typically has a pattern of stress which differs from the same sequence not in compound (Bauer, 1982, Chapter 5.2). So, for example, the word "black" when followed by the word "bird" has equal stress when they form a noun

phrase whose first constituent is an adjective phrase and whose second constituent is a noun; but when they form a compound (technically called a *karmadhāraya*), only "black" receives stress.

(17) There are no blackbirds on the lawn, but there are black birds on it.

This contrast in the pattern of stress is reflected in the pair of sentences in (12), where the sequence "dog biscuits" forms a nominal compound (technically, a dative *tatpuruṣa*) in (12.2) and does not form a compound in (12.1). By the way, this contrast in stress is further re-enforced by the fact the juncture between the two noun phrases occurs between "dog" and "biscuits" in (12.1) and between "her" and "dog" in (12.2). So, whether or not (13.1) is considered to contain a redundancy depends on the presence or absence of the cue provided by the phonological reflex of the syntactic structure.

The reason that (13.2) is not judged to contain a redundancy is that (11.2) does not contain any cues as to whether its noun phrase is to be construed collectively or distributively. Such cues are provided by adverbial modifiers. Predicates are usually neutral with respect to collective and distributive construals. This is borne out by the following examples.

(18.1) The man is left-handed.
(18.2) The men are left-handed.
(18.3) The team is left-handed.

It is clear that the predicate "is left-handed" applies to persons or to collections of persons, as is shown by (18.1) and (18.3) respectively. It is not clear whether the predicate applies to persons or to collections of persons in (18.2). Furthermore, a predicate which seems not to apply to a person may turn out, in the appropriate context, to apply to a person. Thus, "surrounded the town" does not seem to apply to an individual.

(19.1) The man surrounded the town.

certainly sounds odd. In contrast, there is no oddity about these sentences:

(19.2) The men surrounded the town.
(19.3) The army surrounded the town.

Now reconsider (19.1), when "the man" denotes Gulliver and "the town" denotes the capital of Lilliput.[2] So, for Harnish's criterion to be properly applied, one needs to select a predicate which prefers one construal to another. As will be seen below, "to go" does not supply such a predicate.

However, "is numerous" is such a predicate, the first sentence below being odd and the second not being odd:

(20.1) The man is numerous.
(20.2) The men are numerous.

Now, try the analog of (13.2) above:

(21) The men are numerous and they are numerous together.

This sentence contains a striking redundancy.

Harnish (1976, pp. 228–230) has another argument to the effect that the collective and distributive construals of plural noun phrases are not a matter of ambiguity. First, he assumes that these construals are a matter of ambiguity. He then proceeds to deduce a contradiction. To do this, he secondly assumes that the adverbs "together" and "separately", when appended to appropriate simple sentences with plural noun phrases for subjects, provide disambiguating paraphrases of the supposed collective and distributive readings. On the basis of this second assumption, he concludes that collective and distributive readings of the same sentence are contraries, that is, they cannot both be true at the same time. Harnish then invites the reader to consider this situation.

(22) John and Harry are travelling from Chicago to Cleveland. On the first half of the journey, they travel separately; on the second half, they travel together.

He infers that the situation renders the sentence,

(23) The men travelled to Cleveland,

(where "the men" denotes John and Harry) true on both the collective and distributive readings. But, he has claimed, collective and distributive readings are contraries; so, as a result of this contradiction, Harnish concludes that the collective and distributive construals do not involve ambiguity.

The argument has a number of flaws. Consider the least evident one first. Harnish deduces that the collective and distributive construals are contraries from the assumption that the adverbs "together" and "separately" are contraries. If this is so, then these adverbs do not provide adequate glosses of collective and distributive construals.[3] By way of illustration, consider the situation in which the Chicago Bears get on the same plane and travel to Cleveland to play the Cleveland Red Skins. It is certainly true that the team, the Chicago Bears, travelled to Cleveland. It is also true that each member of the team travelled to

Cleveland. If "the men" in (23) denotes those of the Chicago Bears who actually travelled to Cleveland to play the Red Skins, then (23) is true on both its collective and distributive construals, though only the first of the following pair is true.

(24.1) The men travelled to Cleveland together.
(24.2) The men travelled to Cleveland separately.

In any event, the fact of ambiguity is utterly irrelevant to the deduction of the contradiction. This follows from the fact that if "the men" in (24) denotes John and Harry of (22) then one is easily tempted to say that both sentences in (24) are true; after all, they did travel together half of the distance and they did travel separately half of the distance. There is no case of ambiguity here, on anyone's account, but there is still a contradiction, insofar as the pair of sentences in (24) are taken to be contraries. But the source of the contradiction is clear: a pair of contrary predicates, "travelled to Cleveland together" and "travelled to Cleveland separately", is being applied to a case which is on the fringe of the application of each. Notice that by tightening up the predicate, one can eliminate the ambivalence with respect to the situation specified in (22). Thus, consider the sentences:

(25.1) The men travelled from Chicago to Cleveland together.
(25.2) The men travelled from Chicago to Cleveland separately.

In this case, one is inclined to say that both sentences in (23) are false. Indeed, this fact provides one with a diagnosis of the provenience of the contradiction: vagueness.

Vagueness and ambiguity are easily confused with each other: the vagueness of an expression, like the ambiguity of an expression, appears to permit a sentence in which it occurs to be both affirmed and denied. But the affirmation and denial one is led to when applying the criterion of ambiguity in (6) to an ambiguous sentence is not a contradiction; whereas the affirmation and denial one is led to when applying expressions to instances manifesting their vagueness is a contradiction. The contradiction accruing from vagueness is easily overlooked since the cases manifesting the vagueness of the expression are ones for which it is unclear as to whether or not the expression in question even applies. Indeed, semanticists addressing themselves to vagueness feel that standard semantics applied in these cases do imply a contradiction, and so they resort to non-standard semantic devices, such as truth value gaps and multiple values, to eliminate it.[4] If what motivates the approach to vagueness of these semanticists is true, then the criterion in (6) dis-

tinguishes ambiguity, not only from generality and indeterminacy, but also from vagueness.

However, there is an easier way to see how vagueness differs from ambiguity, generality, and indeterminacy. An expression is vague, according to Alston (1964, p. 84), inasmuch as there are cases in which no definite answer exists as to whether or not the expression applies. Vagueness is especially well exemplified by such words as "middle-aged". Though a definite answer does exist as to whether or not, say, it applies to a five-year old child, or an eighty-year old adult, or a fifty-year old man; nonetheless, no definite answer exists as to whether or not it applies to a thirty-nine year old man or to a fifty-nine year old woman. Nor is the lack of an answer here due to ignorance: no amount of knowledge about thirty-nine year old men or fifty-nine year old women will settle whether or not "middle-aged" applies. Any case in which further knowledge will settle whether or not an expression applies is not a case manifesting an expression's vagueness; rather it manifests the ignorance of its user. So, for example, the planet Mars considered by those living two-hundred years ago would not have been a case manifesting the vagueness of the word "inhabited", for it was ignorance which precluded a definite answer as to whether or not the word applied to Mars. Vagueness is not alleviated by the growth of knowledge, ignorance is.[5]

It should be clear already that vagueness differs from ambiguity, generality, and indeterminacy. To begin with, indeterminacy and vagueness are clearly distinct: indeterminacy has to do with connotation, and vagueness has to do with denotation. An expression is indeterminate with respect to those properties which are neither the expression's connotation nor a species of its connotation. An expression is vague inasmuch as no definite answer exists as to whether or not some object is in the expression's denotation. Similarly, generality and vagueness are distinct; for again, generality has to do with connotation and vagueness has to do with denotation. Moreover, the fact that an expression connotes a property which is a genus of distinct species does not give rise to an expression being vague. After all, if an object is clearly a lump of gold or copper, it is clearly a lump of metal. Finally, vagueness and ambiguity are different from each other: when one disambiguates an expression one does not thereby eliminate its vagueness. Earlier the word "founder" was disambiguated. This disambiguation did not settle the question as to whether or not the word applies to someone who has melted metal many times but who does not do it regularly, or to someone who has contributed a noteworthy amount of money to establish an organization but

whose activities to that end have been much more curtailed than others who have contributed less money.

In any event, it is clear that expressions may be indeterminate, general, and ambiguous without being vague. Consider the domain of solid Euclidean geometry. There, terms like "point", "line", "polygon", "circle", and "sphere" are without vagueness. A sphere is the set of points equidistant from a given point in three dimensional Euclidean space: an item with one point more or one point less is simply not a sphere. There is never a question as to whether or not the term "sphere" applies. In contrast, in the real world one can find cases in which no definite answer exists as to whether or not it applies. True enough, the term does not apply to filing cabinets and books; and true enough the term does apply to finely honed ball-bearings, despite deviation from the mathematical definition; but what about oranges, pears, hot air balloons, etc.? So while terms of the informal mathematical language of Euclidean geometry lose their penumbra of vagueness when applied in their intended model, three-dimensional Euclidean space, they retain their features of indeterminacy, generality, and ambiguity. The term "line" is indeterminate with respect to being any given length. The term "polygon" is general with respect to being a pentagon, hexagon, septagon, etc. And, the term "circle" is ambiguous between denoting the line which is the set of points at some fixed distance from a point (the perimeter) and denoting the area included within such a line. But more important here is the fact that collective and distributive construals of plural noun phrases are used freely in the language. Consider, by way of illustration, this sentence:

(26) The lines form a set of points.

It has a distributive construal in which each line forms a set of points and it has a collective one in which the lines, taken together, form a set. On the first construal there are as many sets as there are lines; on the second, there is only one set. Examples like (26) can be multiplied.[6]

So, ambiguity, generality, and indeterminacy can be distinguished from vagueness: ambiguity, generality and indeterminacy can be found even after the cases which show an expression to be vague have been eliminated from the domain of discourse. Moreover, the criterion in (6) permits one to distinguish ambiguity on the one hand from generality and indeterminacy on the other. In this way, it has been shown that the construals to which plural noun phrases are susceptible are neither a matter of vagueness nor a matter of generality or indeterminacy, but rather just a case of ambiguity.

2. THE RANGE OF COLLECTIVE AND DISTRIBUTIVE CONSTRUALS

Are the collective and distributive readings the only ones to which plural noun phrases are susceptible? If the collective reading is the one where a predicate is taken to hold only of the collection of entities designated by the plural noun phrase, and if the distributive reading is the one where a predicate is taken to hold only of the entities in the collection designated by the plural noun phrase, then they are definitely not the only readings. To see this, recall sentence (1), repeated below as (27).

(27) The men wrote operas.

Suppose "the men" denotes Mozart, Handel, Gilbert, and Sullivan. Surely the sentence can be truly affirmed. However, it is not true on the collective reading, since the four men did not collaborate on any opera; and it is not true on the distributive one, since neither Gilbert nor Sullivan ever wrote an opera on his own. How then can it be truly affirmed? And more generally, what is the range of readings to which plural noun phrases are susceptible?

Higginbotham (1981) seeks to formulate the last question in terms of a truth-schema for (simple) sentences which have plural noun phrases for subjects, as given below.

(28) $[_S\ NP_{+PL}\ VP]$ is true iff there is a ____ of the set denoted by NP such that VP is true of each element in it.

The question becomes, then, how is the blank in the truth-schema to be filled in?

Higginbotham (1981, p. 102) suggests that the term "partition" be put in the blank. Now a partition is a family of sets, each of which is a non-empty subset of given set, distinct sets in which family are disjoint, and the union of which family yields the given set. This can be put more formally as follows:

(29) A partitions B iff $A \subseteq P(B) \wedge \emptyset \in A \wedge UA = B \wedge \forall x, y \in A\ (x \cap y = \emptyset \rightarrow x = y)$,

(where "P(B)" denotes the power set of B). Filling out the truth-schema in (28) in this way not only encompasses the collective and distributive readings, which correspond to the greatest and least partition of the set denoted by the plural noun phrase respectively, but also encompasses the case considered just above; for the relevant partition of the set of composers consisting of Gilbert, Sullivan, Mozart, and Handel is the

three-membered family of sets, one of which contains Gilbert and Sullivan, another Mozart, and the last Handel and "wrote operas" is true of each of the three.

That this condition is too strong (a possibility acknowledged by Higginbotham) is made evident by a sentence which is only a slight variation of (27), namely,

(30) The men wrote musicals.

Suppose "the men" denotes Rodgers, Hammerstein, and Hart. (30) is true, on at least one reading, when they are the denotation of the subject noun phrase. However, there is no partition of the set containing those three men in which "wrote musicals" is true of each member. Rather, the sentence is true because Rodgers and Hammerstein collaborated to write musicals and Rodgers and Hart also collaborated to write musicals.

To accomodate the fact that the truth condition in (28) formulated in terms of "partition" is too strong, Higginbotham mentions a second way to fill out (28): fill the blank with "cover". A cover is like a partition, except that it is not restricted to disjoint sets. It is, in fact, a generalization of the notion of a partition, as is made clear by the following formal definition.

(31) A covers B iff $A \subseteq P(B) \wedge UA = B \wedge \emptyset \in A$.

It is evident that such a notion, applied to the denotation of plural noun phrases, will capture each of the cases discussed so far: in every case but the last, the denotation of the plural noun phrases has admitted of a suitable partition – and, of course, every partition is a cover; and in the last case, the family of two sets, the first of which contains Rodgers and Hammerstein and the second of which contains Rodgers and Hart, covers the set containing Rodgers, Hammerstein, and Hart.

Another proposal for the truth-conditions of plural noun phrases has been given by Langendoen (1978) and Carlson (1982). When rephrased to address the kind of sentence given in (28), it states:

(32) $[_S\ NP_{+PL}\ VP]$ is true iff $(\forall x \in NP^D)(\exists Y)(x \in Y \wedge Y \subseteq NP^D \wedge VP$ is true of Y),

(where "NP^D" means the denotation of the noun phrase in the situation with respect to which the sentence is to be evaluated). It says that the sentence is true just in case each member in the denotation of the noun phrase is contained in a subset of the denotation of which subset the verb phrase is true. It turns out that this proposal is logically equivalent to the one in which (28) is filled by the term "cover".[7]

The fundamental problem with these proposals is that, as they stand, they cannot do justice to the fact that sentences with plural noun phrases can be both truly affirmed and truly denied. So, for example, if a sentence with a plural noun phrase as subject can be truly affirmed, then there is a cover of the denotation of the subject of each of whose members its verb phrase is true; but, if the sentence can be truly denied, then there is no such cover.[8]

This problem is not one specific to sentences with plural noun phrases; rather, it is an instance of the general problem of stating truth-conditions for ambiguous sentences. An illustration will make the point clear. The sentence "each hand is on the deck" can be both truly affirmed and truly denied in a situation in which each member of the crew is on the deck with his hands in his pockets. But if the truth conditions for this sentence are stated as follows:

(33) "Each hand is on the deck" is true iff the verb phrase "is on the deck" is true of each member of the denotation of "hand",

then the sentence can only be false in the situation stated above, since the verb phrase is not true of some members of the denotation of "hand", that is, the set of all things of which "hand" is true. After all, in the situation stated, some members of the crew have their hands in their pockets. So, if (33) is the truth-conditions of the sentence in question, then it can only be truly denied and never truly affirmed. The upshot is that truth-conditions must be stated for disambiguations of sentences, not for sentences as such.

With this observation it becomes clear that before one can state the truth-conditions of a sentence of the form of $[_S\ NP_{+PL}\ VP]$, one must ascertain what the readings are of which the plural noun phrase subject is susceptible. But this is just the question with which this section began. The example just discussed has a further lesson for the question now under consideration. The fact that the situation specified above permitted the sentence to be both truly affirmed and truly denied is taken as indicative of there being at least two readings of the word "hand", one in which it designates part of the human anatomy and another in which it designates a member of a crew. Now consider the situation in which each member of the crew is on deck with his hands on the deck. No one thinks that such a situation isolates a third reading of "hand". To the contrary, one concludes that such a situation encompasses both readings of "hand". Notice, moreover, that a situation may embody more than one reading and can still be truly affirmed and denied. Consider this sentence

(34) A slip gave Ron away.

Suppose Ron had purchased a slip for his mistress, and although he had successfully disposed of the sales receipt, nonetheless he had carelessly allowed his wife to see the purchase. In this situation, (34) is true on two counts but false on a third. Again, no one thinks this situation isolates a reading of "slip" over and above its reading as a receipt, an error, and an article of women's apparel.

The same point can be made, *mutatis mutandis*, about plural noun phrases. The sentence

(35) The men wrote songs,

can be truly denied and affirmed when "the men" denotes, say, Gordon Lightfoot and Bob Dylan, for each has written songs on his own but they have never collaborated with one another to write even one song. However, when the subject denotes Paul Simon and Art Garfunkel, the sentence can only be affirmed, for they have not only collaborated with one another to write songs, but each has written songs independently of the other. In this case, although the set denoted by "the men", namely, the set containing Paul Simon and Art Garfunkel, is covered by the family of sets, the first of which contains both Paul Simon and Art Garfunkel, the second of which contains just Paul Simon, and the third of which contains just Art Garfunkel; and although the verb phrase "wrote songs" is true of each member of the cover, nonetheless the fact that (35) can only be truly affirmed and not truly denied indicates, not that this cover isolates a new reading of "the men" under its assigned denotation, but that it encompasses all readings for its assigned denotation.

Again, a situation can encompass more than one reading even though the sentence can be truly denied as well as truly affirmed. Recall the very first sentence considered in the essay:

(1) The men wrote operas.

Suppose that "the men" denotes Tom, Dick, and Jerry. Suppose as well that the three of them collaborated on an opera, and that Tom and Dick collaborated on another opera, and that Dick and Jerry did on a third. In other words, the predicate "wrote operas" is true of each set in the cover given next:

(36) {Tom, Dick, Jerry}, {Tom, Dick}, {Dick, Jerry}.

The sentence can be truly affirmed and truly denied: none of them has written an opera on his own, but the three have collaborated on at least

one. This situation does not isolate an extra reading of "the men"; rather, it encompasses two readings, the collective reading and a non-collective non-distributive one:

(37.1) {Tom, Dick, Jerry}.
(37.2) {Tom, Dick}, {Dick, Jerry}.

The same point applies even if Tom happened to have written an opera on his own. The idea is that the situation is richer than what is needed to get a reading.

What, then, is the range of readings for plural noun phrases in subject position? Earlier discussion has shown that there are more readings than there are partitions of the denotation of the subject plural noun phrase. The immediately preceding discussion has suggested that there are fewer readings than there are covers. Indeed, if a cover contains two distinct elements, one of which is a proper subset of the other, the cover in such a situation is too rich. In (36), the second and third elements are proper subsets of the first. The proper subsets could be discarded from the cover, and if the sentence were true to begin with, it would remain true. Yet, the condition can be further strengthened: if a cover contains an element which is a proper subset of the union of its other elements, it can be discarded. Such a cover is illustrated below:

(38) {Tom, Dick}, {Dick, Jerry}, {Tom, Jerry}.

Let us call a cover in which this situation does not occur "a plurality-cover".[9]

(39) A plurally covers B iff A covers B $\wedge \neg \exists x \in A x \subseteq U(A - \{x\})$.

It turns out that such covers are just minimal covers.[10] So, the readings for plural noun phrases in subject position bijectively correspond with the minimal covers of the set denoted by the subject plural noun phrase.

3. Conclusion

To the first question, namely, what is the nature of the variation in construal to which plural noun phrases are liable, has come the answer, ambiguity. This followed for two reasons. First, the variation is intrinsic to the structure of language and not an artifact of the application of terms to a domain. Hence, the variation is not a matter of vagueness. Second, the variation passed the test of ambiguity, and is thereby to be distinguished from the related phenomena of generality and indeterminacy. At the same time, examination of arguments purporting to show

the contrary, namely that the variation is not a matter of ambiguity, were shown to be unsound. And to the second question, namely, what is the range of variation of this form of ambiguity, has come a specification of exactly what readings a plural noun phrase is susceptible to.

Further evidence that the approach to the semantics of plural noun phrases urged here is the correct one accrues from the fact that the semantic principles adopted here together with the independently grounded syntactic principles of Chomsky's Extended Standard Theory, as developed, say, by Higginbotham (1983), permit a natural and comprehensive treatment not only of the semantics of sentences with reciprocal pronouns, which, up to now, have eluded such a treatment (cf., Langendoen, 1978), but also of the differing semantics of singular and plural quantified noun phrases.[11] These principles converge to provide a straight-forward and unexotic analysis of the semantics of the so-called Kaplan-Geach sentence:

(40) Some critics only admire one another.

Appendix 1

To show that a family of sets is a plurality cover just in case it is a minimal cover:

$\forall A, B$ (A plurally covers B iff A minimally covers B).

Definition: A minimally covers B iff A covers $B \wedge \forall X$ (X covers $B \wedge X \subseteq A \rightarrow X = A$)

(1) Suppose A minimally covers B. So, A covers B. But, suppose that A does not plurally cover B. Then, A has an element x which is a subset of the union of all of A's other elements, that is, $x \subseteq U(A - \{x\})$. But then $A - \{x\}$, which is a proper subset of A, also covers B. So A does not minimally cover B. But this contradicts the first assumption, so the second, namely A does not plurally cover B, must be rejected. In sum, if A minimally covers B then A plurally covers B.

(2) Suppose A does not minimally cover B but A covers B nonetheless. Then, some proper subset of A covers B. Let x be a member of A which is not in a proper subset of A covering B. This proper subset, call it A^*, is a subset of $A - \{x\}$. $UA^* = B$, since A^* covers B. So $U(A - \{x\}) = B$ as well. Since x is a member of A, which covers B, x is a subset of B. So x is a subset of $U(A - \{x\})$. Thus, while A covers B,

A has x which is a subset of $U(A-\{x\})$. Therefore A does not plurally cover B. In sum, if A does not minimally cover B, then A does not plurally cover B.

APPENDIX 2

To show that the right side of (28) with "cover" in the blank is equivalent to the right side of (32).

(1) Suppose that for a given sentence of the form $[_S\ NP_{+PL}\ VP]$ there is for each member of the denotation of the NP a subset of the denotation containing that member and the VP is true of the subset. To show that the collection of those subsets covers the denotation of the NP. First, it is clear that the collection of subsets is non-empty and does not contain the empty set, provided of course that the denotation of the NP is itself non-empty. Since each member of the denotation must be in some subset of denotation, it is clear that their union equals the denotation and this collection is a subset of the power set of the denotation of the NP.

(2) Conversely, suppose that for a given sentence of the form $[_S\ NP_{+PL}\ VP]$ there is a cover of the denotation of the NP such that a VP is true of each element. Now consider any member of the denotation. It must be in one of the elements of the cover, otherwise the denotation of the NP would not be covered. This set is a subset of the denotation of the NP, since a cover of the denotation of the NP is a subset of the power set of the NP's denotation. And finally the VP is true of this set, by the initial supposition.

NOTES

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[1] Harnish's actual example has "John and Harry" instead of "the men". This alteration brings his point into line with my discussion without misrepresenting, as far as I can tell, anything essential in what Harnish is arguing.

[2] For extensive discussion of this point, see Gillon (1984, Chapter 4.2).

[3] For further discussion of cases where the collective and distributive construals of plural noun phrases are compatible, see Gillon (1984, Chapter 4.2) and Ware (n.d.).
[4] For extensive discussion of this point, see Black (1937), Tondl (1966, Chapter 7), and Ballmer and Pinkal (eds., 1983).
[5] These, among other, points are made by Alston (1964, Chapter 5).
[6] Of particular interest here is the extensive use of so-called covert reciprocal predicates like "intersect", "are parallel", etc. The account of the semantics of these predicates, as well as predicates with reciprocal pronouns, turns out to be a special case of the account of plurality treated here. For details, see Gillon (1984, Chapter 4.3.1).
[7] See Appendix 2 for a proof.
[8] This point was brought to my attention by Daniel Laurier.
[9] This strengthening was suggested to me by Rick Lathrop. The weaker condition was taken to be a plurality cover in Gillon (1984).
[10] See Appendix 1 for a proof.
[11] See Gillon (1984) for details.

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