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47. Genericity

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Abstract

Generic and habitual sentences are how that natural language expresses regularities, laws, generalizations, habits, dispositions, etc. One example would be "Bears eat honey." They are opposed in concept to episodic sentences, whose truth conditions concern whether or not an event of a given type occurs or fails to occur in a world of evaluation, whether as singular events or quantified over. An example would be "Some bears are eating some honey". Generic sentences often include as a part a generic noun phrase such as "bears" whose denotation is argued to be a kind of thing, rather than

being some quantification over individuals. This article reviews the recent conclusions and points of contention in both how noun phrases are represented in a semantics, and how the semantics of the whole sentences are to be represented.

1. Preliminaries

Genericity is a phenomenon whereby generalizations are expressed by sentences that typically abstract over events, situations, etc. So if one says

(1) Bears eat honey.

one is saying something to the effect that there is a strong tendency for this type of situation—one where a bear or some bears are eating some honey—to recur, without direct reference to any particular such situation. Opposed to genericity is discussion of the particular in sentences that directly talk about such situations, as (2) below:

(2) This morning, a bear ate some honey.

Such *episodic* examples (to use a term originally suggested by Gennaro Chierchia) talk non-generically about what occurred, and not about generalizing over such occurrences.

There is another side to genericity as well. In uttering a sentence like (1), there is the intuition that one is doing something more than generalizing over situations; one is also somehow generalizing over bears as well, discussing them "as a class", without reference

to any particular bears, unlike the example found in (2). It is common to understand examples such as (1) as discussing some distinctive characteristic that is attributed to "all" bears. Krifka (in collaboration with C. Gerstner) (1987) distinguishes these two faces of genericity terminologically, referring to the generalization over situations, events, etc., that have to do with sentence semantics ("IP" semantics) as *I-genericity*. The reference to things "as a class", without discussion of particular individuals, is *D-genericit*y (involving the semantics of generic DP's), a property of noun phrase meanings, and not entire sentences. While these two sides of the phenomenon of genericity often cooccur, they are separable not only in this intuitive way, but also empirically, since each may occur without the other.

We can distinguish these different faces of genericity by examining a few examples. There are versions of a sentence like (1) where all of the noun phrases in the sentence (henceforth, DP's for "determiner phrases") almost certainly refer to individuals of an ordinary sort. So, in an example like (3), the NP's refer to specific individuals (John, his office, and Elm Street), yet the sentence expresses a generalization:

(3) John drives to his office via Elm Street.

Such examples would commonly be described at talking about a habit or propensity of John's. While such sentences may only have individuals referred to in its noun phrases, they are unlike similar examples such as (2) in that they still report something more general. Examples like (3) are often called "habitual" sentences in the descriptive

literature (though their semantic range is much wider than discussion of habits alone), and the term "generic" is then sometimes reserved for examples such as (1), in which a D-generic expression also appears, typically as sentence subject. In this work, however, habituality is going to be considered a type of genericity, so that (3) is also a "generic' sentence.

The difference between examples (1) and (3) is that (1) contains as its subject a bare plural DP, which expresses a general term "bears" (as well as the general term "honey" in the direct object position), which is over and above the genericity originating from the sentence itself. Thus, we have on the one hand what the sentence contributes—something like the habituality as in (3)—and what the general noun phrases introduce in addition to the dimension of (3), both occurring in (1).

This contribution of D-genericity alone can be witnessed by placing general terms in the context of episodic examples (such as (2)), in which the generalizing character of the sentence as a whole is absent. Consider an example of a sentence exhibiting the "avant-garde" reading of generic DP's (Krifka et al. 1995):

(4) a. *The potato* was first cultivated in South America.

b. *Potatoes* were first cultivated in South America.

These examples are about potatoes in general, and not about any particular potato or potatoes. The implicit comparison drawn by the adverb "first" is when potatoes—again,

not any particular potatoes-- were cultivated at another time, and makes the assertion that of all those instances of potato-cultivation, the initial instance in South America occurred earlier than all others. It is not that similar examples cannot be about particular individuals. We easily say things like "Einstein first visited Princeton in 1953" about particulars, but example (4) is not about particulars on the only sensible reading of the examples. The particular type of example in (4) is not some isolated instance; many other types of sentences might have been employed to illustrate the same point about the independence of D-genericity.

Research on genericity has for the most part dealt with both sentence-meaning (I-generic) and noun phrase meaning (D-generic) more or less side by side. We will, however, continue make a somewhat artificial division between the two and discuss them separately. We will first discuss the sentence semantics required for I-genericity, and then return to the semantics of generic non phrases (D-genericity) a little later on.

2. Sentential genericity

2.1. Bases for generalization in the semantics

The central problem of generic sentences as currently framed by research is understanding the relationship between an underlying set of instances or particulars, and the overall generalization expressed by the sentence. So, for instance, in (1) the underlying instances might be some bears eating some honey, and the overarching generalization would be what is expressed by the sentence, perhaps some propensity

bears have. In (3) it is, perhaps, instances of John driving to work via Elm St., and the generalization is something about the habit of John's the sentence expresses.

Since the early semantic work of Lawler (1973), determining the truth conditions of the whole sentence based upon something about the occurrence of the instances has persisted as the framing of the problem, much in the same way as the problem of induction is framed. The central representational claim is that the type of instances from which a generic generalization is derived forms a component of the interpretation of the sentence itself. By this, I intend that a generic/habitual such as "John wears a hat" is based upon instances of hat-wearings by John, and that the sentence structure contains as part portions whose denotation is hat-wearing events by John, which forms the *base* for the generalization. Events (using the term in its general sense, i.e. to include processes, states, accomplishments, etc.) serve as the base for all habitual sentences.

However, in a sentence such as "Horses have manes," the base for the generalization is not such an event, but rather an instance of a given, particular horse being in the state of having a mane; for "Giraffes are tall" it is an instance of a giraffe being tall, etc. In these cases, the statement about the individual (having a mane, being tall, etc.) does not readily appear to be a habitual generalization based upon an event instance, though we will briefly return to this matter briefly below.

In many instances of generic sentences, there is a double generalization involved. Take an example like "Lions eat meat." This is at once a generalization about lions, based upon

instances of individual lions being meat-eaters, and also, a habitual generalization over individual lions, with the base being events of eating meat by an individual lion. The claim seems to be saying that lions, in the first generalization, are individuals that, in the second generalization, engage "habitually" in events of eating meat. Whether there are "direct" generalizations between non-individual subjects such as "lions" and habitual events that dispense with the intermediate generalization based on individual properties remains unclear. Carlson (1979) suggests some possible instances, but we set aside such cases for the present, as most generics with a habitual base appear to be double generalizations.

We can see the effects of this generalization structure, which includes as a part the base for the generalization within the compositional semantics of the sentences. This can perhaps be most clearly seen in sentences involving anaphora. Consider example (5):

(5) Bob's cat Fred eats his evening snack and *then* sharpens his claws.

Suppose this is a habit Fred the Cat has that has persisted for years, say. Clearly, the meaning of the sentence takes as its base particular event-pairs, one is an eating by Fred, and the other an ensuing sharpening of claws. It is the pair that forms the base for the generalization. *Then* makes anaphoric reference to a particular instance of eating, and situates a particular event of claw-sharpening after it. So then the base of the generalization is a pair of events e_1, e_2 such that $e_1 < e_2$. Were the episodic event structure not within the compositional semantics of the sentence, such a straightforward analysis of

then in this sentence would not be possible. The claim is, however, that it is operating in exactly the same way it does in (6).

(6) Fred ate his evening snack and then sharpened his claws.

At the level of individual properties being generalized over, such cases as (7) are commonly found:

(7) Mammals tend to *their own* young.

The base of the generalization to mammals here is a property of tending to an individual's young (x tends to x's own young). There needs to be an anaphoric connection drawn between an instance in the subject position of the base, and the pronoun, an individual mammal. Again, absent a substructure encoding the base for the generalization in the semantics, the function of "their" would be unclear; in this case, it functions exactly as it does in an ordinary nongeneric.

This generalization structure from events or individual instances can easily accommodate cases of event modification. For instance, in (8):

(8) In cooking, Sam tastes the soup *just once*.

If we assume that this has no generalization structure in its semantics, it is hard to make sense of what 'just once' is modifying. After all, one might reason, we are discussing here something like a habit of Sam's, something which by its very nature recurs repeatedly, so there are many tastings, not just one. However, given a generalization structure within the semantics of the sentence, this becomes a relatively straightforward case of event modification within the episodic base of the generalization, so we get the intended sense that there is just one tasting per soup-making event.

This generalization structure also can give rise to scoping effects, depending upon what we take the base to be. Take an example such as (9):

(9) Sam took out Sarah and then took out Mindy.

Understood as a past generalization (the past tense in English usually allows a very salient episodic reading in addition), the sentence can be understood in two ways. One is the more plausible interpretation that Sam dated Sarah for a time, and, after he took her out on dates no more, took Mindy out on dates. Here, there are two generalizations attributed to Sam, and the temporal order of when the generalizations held is indicated by "then". There is, however, another reading, where on a given evening, Sam's habit was to, say, take out Sarah, and then having taken her home, go get Mindy and take her out on that same evening. We might schematically represent the situation in this way:

Reading 1: Sam (Gen: take out S) & then (Gen: take out M)

Reading 2: Sam (Gen: take out S. and then take out M)

On the level of generalizations from individual properties, we find similar effects. Consider (10):

(10) Stoves use just one type of fuel.

This can be construed as saying there are different types of stoves, each using a single fuel (wood, coal, gas, etc); or it can be understood as saying, contrary to reality, that there is just one type of fuel that stoves use (e.g. wood but not coal, gas, etc). It depends on whether the quantifier 'one' is within the scope of the generalization (in which case, a given stove uses just one type, but fuel type can vary from stove to stove), or outside the generalization (there is just one type, x, such that stoves use x). A somewhat more complex example of scoping is suggested by Schubert & Pelletier (1987):

(11) Storks have a favorite nesting area.

Allowing for the fact that 'favorite' requires implicit indexing, this could either be a generalization about individual storks favorite areas (in which case, there are many such areas), or about the fact that there is a favorite nesting area for storks in general, outside the generalization, and hence the reading that there is only one such area (with "favorite" implicitly indexed to one thing, the kind storks).

A generalization structure of this sort also allows for a natural account of "modal subordination" type phenomena (Roberts 1989). Roberts examines sentences in which overt modals appear, which allow for subsequent pronominal reference to intensional entities. An example is (12):

(12) A thief might break into the house. *He* would steal the silverware. (Cf: #He is/was wearing a hat.)

The presence of the modal permits the subsequent sentence to be interpreted as modally subordinate to the first proposition, allowing for such reference in intension. Absence of modals (without supplanting them with other intensional operators) results in a lack of anaphoric reference by subsequent pronouns. Schubert (1999) and Carlson & Spejewski (1997) argue that modal subordination structure appear with generalizations as well.

(13) On weekends, John catches fish. He eats *them* fried in butter. (#We are eating *them* now).

We now examine in a little more detail questions about how a given generic sentence is composed, and then consider the difficult question of what the semantics of the result of that composition is supposed to be. We will then turn to the question of generic reference, where we focus on the character of generic noun phrases themselves.

2.2. The generic operator

Kuroda (1972) discusses two types of sentences that he calls "categorical judgments" and "thetic judgments." The difference between the two is that categorical judgments involve a two-part structure, similar to a topic/focus kind of arrangement: of *that* one says *this*. Thetic judgments have only a single part structure (*this holds*). While the aims of Kuroda's work do not directly include a comprehensive semantics for generic sentences, in retrospect an asymmetry reveals itself. Most, nearly all, instances of generic and habitual sentences would naturally be analyzed as categorical judgments; nearly all natural instances of thetic judgments are episodic sentences, though categorical judgment analysis applies commonly to them as well.

The same general idea — that generics have a two-part structure — emerges in the Krifka et al. (1995) framework that has provided a setting for much work on genericity to date. The task in analyzing the semantics of a generic is to provide a means of identifying two distinct pieces of the interpretation, and then relating them to one another "appropriately" (a matter we turn to in the next section). In the simplest cases, it is fairly clear that the two parts are the subject, and the predicate:

(14) a. Birds fly.

b. John smokes.

c. Ravens are black.

In Carlson (1977a and elsewhere), this subject-predicate form led to an analysis whereby there was a "generic operator" posited that had the effect of mapping episodic predicates

(in the analysis, “stage-level predicates”) to their habitual counterparts. So the habitual sentence (14b), setting aside tenses and intensions, would have the form

Gn(smoke) (j)

while the nongeneric counterpart (again, setting aside tense and intensions) would be the expected

smoke (j)

This analysis makes the implicit claim that habituals and generics are more complex semantically than their episodic counterparts.

However, it is very clear that even just examining English, the subject-predicate form while perhaps the most common, is by no means privileged. Consider a case from Carlson (1988), due to Barbara Partee:

(15) A computer computes the daily weather forecast.

Typically, a generic sentence with an indefinite singular subject says something vaguely “definitional” about the subject (Cohen 2001; Greenberg 2003).

(16) A triangle has three sides.

(15) however is not a generalization about computers. It is instead a generalization about the daily weather forecast (that it is created by a computer model), despite the noun phrase appearing in direct object position of the sentence, and not the subject. Further, what the generalization is about need not be an argument noun phrase at all. Consider the 'when' clause in (17):

(17) When a crack appears in a ceiling, a handyman should fill it in.

This is not a generalization about cracks, ceilings, or handymen, but about times or situations where a crack appears, roughly, the contents of the 'when' clause.

In the past couple of decades, it has been common to account for genericity by positing a covert generic operator which takes sentential scope and has the logical form of an adverb of quantification, akin to "usually, generally, often" etc, as was originally argued for in Farkas & Sugioka (1983). The analysis presented in Krifka et al. (1995), due in main to Krifka (1987), posits an operator GEN that, like a quantificational adverb, takes two arguments (a restrictor, and a matrix or nuclear scope), whose contents is largely determined by the two parts of the sentence identified. The nuclear scope is the portion that functions as the base for the generalization, In the rendering, the analysis is situated within a version of the theory of indefinites derived from DRT and related work (Kamp 1981, Heim 1982) which included unselective binding, and a general theory of tripartite

operators that encompassed a range of quantificational or quantification-like operators (e.g. determiners, frequency adverbs, modals, focus operators, etc.; Partee 1992, 1995).

In the simplest cases, the representation of restrictor and matrix (or base) is fairly straightforward. (16) above, with a subject-predicate structure, comes out as:

GEN(triangle x; x has three sides)

GEN is to be understood provisionally as something like a universal that allows exceptions; it binds free variables within its scope variables unselectively. One might paraphrase this formula as saying that *generally*, if something is a triangle, it has three sides. Taking some technical liberties, (15) would be perhaps represented thus:

GEN(daily weather forecast x; ∃y computer y & y compute x)

In some instances, portions of the contents of the restrictor need to be drawn from context. Consider the simple case of "Daffy flies", where Daffy is a duck. This is, as you recall, a generalization over events, or situations. But this does not mean anything like "Daffy is generally flying", so one needs to narrow down the set of situations considered to achieve anything like universality-with-exceptions. The contents is not easy to articulate, but let us use "F" to indicate situations in which it is appropriate/expected of Daffy (d) that he'll be flying, and add that to the restrictor, we can get a representation that stands some decent chance of being an appropriate analysis.

GEN(s is a d-situation & F(s); d flies in s)

There is ample precedent for this extra contents attributed to the restrictor coming from context. To mention just one instance, the domain of interpretation for quantifiers is just one such example (e.g. saying "Everyone is in the elevator" in a given situation clearly restricts the interpretation to a smallish number of all people). See also von Fintel (1994) for discussion of contextual restriction on frequency adverbs in particular.

One issue that arises almost immediately is the status of "individual-level" predicates that are not based upon generalizations over events (or event-like instances). Intuitively, the same type of considerations that go into classifying "Birds fly" as a generic also apply equally well to sentences such as the following:

(18) a. Ravens are black.

b. Houses are expensive.

c. Bears are mammals.

On the one hand, such examples could easily be represented by:

GEN (Raven(x); Black(x))

The question this gives rise to is why such sentences need to have a GEN operator in them to combine subject and predicate. In the theoretical setting of the Krifka et al. (1995) formulation, one would have also expected an existential reading for these, which simply does not occur—examples like those in (18) are unambiguous. It appears that matters of topicality and information structure more generally must be taken into account. One line of research that offered promise is Diesing's (1992) "Mapping Hypothesis," which applies to generics as a special case and offers insight into how such a division might take place. Diesing argues in particular that there are two positions subject noun phrases can appear in, one being internal to the predicate of the sentence ("VP-internal"), and the other being in a higher position, outside the sentence predicate. The higher position is the one reserved for generic subjects, and the lower one for weakly-interpreted noun phrases. Jäger (2001) makes use of this difference in positions in assessing the distinction individual-level and stage-level predicates, concluding that topicality is actually the feature associated with the upper subject position, and that individual-level predicates require their subjects to be topics. Chierchia (1995) offers a slightly different approach in which he argues that individual level predicates such as those in (18) have as a part of their lexical meanings a GEN operator which binds, within the lexical semantics, situation or event-type variables. In any event, it is common to posit a generic operator for examples such as (18) as well as for event-based instances like (15), and it is the perspective we will take in much of what follows.

That a GEN operator would appear with individual-level predicate examples such as (18) is by no means the only alternative out there. For example, Dayal (2004) presents a

framework in which the attribution of predicates like “be black” or “be a mammal” to bare plural and other kind-denoting expressions takes place via type-shifting of the predicate, which has correlated semantic effects.

One feature of the framework, as well as the Krifka et al. (1995) analysis, is that more than one element from the sentence may be “extracted” to form a part of the restrictor. Krifka (1987) considers examples that have been observed to be ambiguous between an “existential” and “universal” reading (Lawler 1973; Dahl 1975). The following sentence is intuitively ambiguous:

(19) John drinks beer.

On the one hand, the sentence can be understood as saying that John has a beer-drinking habit; on the other, it can be understood to intend a willingness of John to drink beer on a given occasion (it might be said in considering, for instance, what to offer for beverages when John drops over). Krifka offers two potential analyses for (19) that he claims within the framework, positing a single unambiguous GEN operator that derives the readings via differential assignment of elements to restrictor and matrix.

The GEN analysis is both rich and complex, interacting with the context, information structure, and subtleties of the syntax in a variety of ways. While the details of various analyses that have employed it may be called into questions, that there is *some* kind of operator akin to GEN in generics is a reasonably secure claim at this point; this, despite

the fact that it does not have a direct and fully consistent morphological/phonetic realization in English or any languages that have been studied extensively to date (though many languages do have "habitual" markers, and other correlated phenomena, see Filip & Carlson 1997). The primary area of contention has to do with what a generic sentence means, and we now turn to considering that question.

2.3. The meaning of a generic

In considering the semantics of generics, it is important to bear in mind the distinction between quantification and (generic) generalization. Perhaps it is best to begin with an example, a variant of an example from Dahl (1975) intended to illustrate much the same point.

(20) All of John's friends are leftists.

The sentence has two readings. On one reading, perhaps the more prominent, if a, b, and c are all the friends John has, then the sentence is true just in case a, b, and c are leftists, and false in case one or more of them is not. Let's call this the quantificational reading. There is another reading besides, as Dahl notes. This is the one that would be used to speak about how John chooses his friends—he likes to make friends with leftists. This entails the quantificational reading, but is a stronger statement that goes beyond the present circumstances, placing a constraint on what it takes to be a friend of John's. Without putting too fine a point on it, we're generalizing about John's friends, bringing into play not only real but potential friends. We'll call this the generalization reading.

Note that the generalization reading (in this instance) does involve quantification, but it involves something more, namely, the generalizing on top of the quantification. The basic structure of the quantificational reading is, I will take it, characterized by generalized quantifier theory (Barwise & Cooper 1981; Keenan & Stavi 1986, among others). It is a very specific type of relation between sets. Its most prominent feature is that it is extensional. No truth conditions specified in generalized quantifier theory depend on anything other than the relevant two sets.

Generalizing, however, is intensional in character, since it "goes beyond" the sample that is present and serves as the base of the generalization. This is what makes it so difficult to evaluate the truth or falsity of a generic generalization, it's because the truth or falsity lies beyond the reach of the present circumstance one has access to. This makes generics different from accidental generalizations. Cohen asks us to imagine that, by some quirk, all supreme court justices of the United States to date who have been assigned social security numbers, have had even social security numbers. While it is true that "All supreme court justices have even SSN's", it seems intuitively false to claim that "Supreme court justices have even SSN's," since the latter suggests, contrary to supposition, that it is no accident. If one were, somehow, to discover that there was a way of assigning such numbers that systematically resulted in this assignment of even numbers (that, say, all federal employees are given even numbers), then our intuitions would change, as the generalization would "go beyond" the present sample.

In examples of sentences with bare plural subjects, the "quantificational" reading, consistent with accidental arrangements, is missing, leaving only the generalization reading.

(21) Socialists are leftists.

The reason the quantificational reading is missing is simply, many believe, that there is no quantifier in the sentence at all, so in such cases we are directly observing the effects of generalization without additional quantification. However, it should be pointed out that some English quantifiers favor a generalization reading. For instance, "all" with a simple noun following favors a generalization environment, whereas 'every' is more neutral.

(22) a. ?All men are here. vs. All men are mortal.

b. Every man is here. vs. Every man is mortal.

So certain quantifier expressions and generalization may be closely associated—this seems particularly so in the case of frequency adverbs functioning quantificationally.

(23) John's friends are always leftists.

The meaning of (23) corresponds to just the generalization reading of (20).

The initial instinct in analyzing examples like (24) is to treat them as generalizations involving universal quantification (this is stock in trade in introductory symbolic logic books, especially). While more sophisticated treatments may salvage a role for universal quantification, the straightforward truth conditions of an example like (24) are simply misrepresented by such quantification.

(24) Birds fly. ≠ ∀x (Bx → Fx)

The basic problem is that generics tolerate exceptions (and at times seemingly lots of them). If elephants are huge, then an occasional small elephant does not challenge the generalization about their size. However, treating exceptions as indicative of a weaker quantificational treatment will simply not work in any simple way. Most summaries of work on generics provide an overview of the challenges any theory faces which pins genericity on finding some adequate substitute for the universal quantifier, including Carlson (1977a,b), Schubert & Pelletier (1987), Krifka et al. (1995), Cohen (1999, 2002), Greenberg (2003). Delfitto (2002, ch. 4) provides extensive arguments from a syntax/semantics interface point of view that a quantificational analysis is going to be inadequate. One particular technical issue any proposed generic quantifier faces (whether as a nominal determiner or as a frequency adverbial) is that, unlike other quantifiers, it is not *conservative* (Barwise & Cooper 1981); see Cohen (1999, 53–54) for one exposition.

To sum up the arguments, no matter what quantifier one selects, counterexamples are easy to generate. For instance, if one considers that "more than half" is criterial, then

(25), which is plausibly considered true, would be false, and (26) normally considered false, would be true.

(25) Mammals give live birth. (The males, the young, and some females do not.)

(26) Sea turtles die at a young age. (Most are eaten by predators upon hatching.)

This has turned researchers towards analyzing generics in terms of intensional notions, rather than quantificational terms. Psychological notions such as prototypes would appear to hold some promise, but are too limited in their range to function in the general way demanded of a semantics, but if modeled in a semantics would clearly be intensional objects. One notion discussed in ter Meulen (1986) takes generics to be constraints on situations, that is, determinants of what the contents of any given situation might be. Barwise & Seligman (1994) develop an approach based upon notions about how information is transmitted ("channel theory") to provide an account of natural regularities. Another notion, inherited from computer science, is that of a *default* (Reiter 1980), and suggestions that generics be analyzed in this way go back at least to Platteau (1980). Intuitively, a default is what occurs if nothing special happens instead (the default then becomes the "normal" or "expected" case). Analyzing a system of such defaults and applying it to reasoning results in a non-monotonic logic. In such a system, the intensionality is indirectly represented by the inheritance being defined among categories in a system, with the categories understood as intensional objects like properties (i.e. not defined by their extensions). Such systems are known and have been explored for treating generics (see Asher & Morreau 1995, Pelletier & Asher 1997 for overviews). However,

since the systems are developed for reasoning purposes direct development in theories of formal semantics has been limited. An intrinsic limitation on their applicability is that their truth-conditions are unclear. If one wishes to say that redness is the default color of cardinals, for instance, one need to deal with the fact that one can as easily build a reasoning system employing that notion as selecting not-red (or, the brownish cast of the female cardinals) as the default. More needs to be said regarding how to derive the defaults in a compositional, truth-conditional semantics.

Probability (as opposed to frequency) is an intrinsically intensional idea that has been explored extensively in the work of A. Cohen (1999). The idea here is that probabilities are derived from the frequencies observed in the world. They are generated from a prior division of the sentence into two components as just discussed. In a sentence "A's are B" for instance, the probability of an A being a B is generated, with a condition imposed upon them of "homogeneity". The so analysis is a combination of an intensional notion, an alternatives structure, and a pragmatic condition. The probability condition will, among other things, prevent attributing accidental generalizations generically, and provides the basis for considering the sentence true. The pragmatic condition is present to deal with examples that seem not obviously true despite having a probability of occurrence higher than 50% (which, on his view, is sufficient). Consider the following:

(27) Buildings are less than five stories tall.

This seems a strange claim to make, but upon reflection one will agree that the majority of buildings in the world are less than five stories in height. Cohen's homogeneity condition states, however, that in partitioning the set in "salient" ways must result in the same probability occurring throughout. So, partitioning buildings by the function they serve is, let us assume, a salient partition. We quickly see that buildings serving as single-family houses have close to a 100% chance of being less than five stories tall, whereas office buildings would have a considerably smaller probability of being less than five stories tall. On the other hand, if we state "Buildings have roofs", we find the probability (hovering just short of 100%, one might guess) pretty much the same for houses and office buildings. One of the difficult issues for this analysis is articulating exactly what constitutes a salient partition, when it may be applied, as well as determining the appropriate criterial value of the probability (see Leslie 2007, 2008 for some critical discussion).

Another intensional notion with significant intuitive appeal, and promise, is that of normality. The notion that one can say "Dogs have four legs" depends, in some way, on the idea that it is normal for dogs to have four legs. Note that the intuitive notion of normality extends to generalizing over events as well (as when one talks about Aunt Sally's behavior, and what is normal for her, and what is not). One may think of analyzing in terms of normality as the outgrowth of a quantificational analysis employing a universal quantifier that derives its intensionality from extending the domain of objects quantified over to possible objects, as well as the real (or rather, the subset of the real) ones that are normal. Simply quantifying over all objects of the appropriate type in all

worlds will of course not do, since we do not wish to consider worlds too unlike our own, where dogs fly and fish talk, for instance. The notion of "normal worlds" was introduced in Delgrande (1987) as a means of restricting the intensional entities encompassed by the quantification. However, Pelletier and Asher find the approach problematic in its truth conditions; further, the simple, unanalyzed worlds accessibility structure proposed there is argued in Eckardt (1999) to find itself in difficulty with examples that introduce both normal objects, and normal behaviors (as in dogs biting postmen). The approach is elaborated and considerably refined within a compositional semantics in Eckardt (1999). Nickel (2008) also takes up a normality approach in a slightly different way, arguing that there are different ways of being normal for a given class. This allows for generic predication to hold of a smallish portion of a class, and still be considered a true generic.

Normality has an intuitive appeal. However, it must be emphasized that for natural language semantics, at any rate, normality is actually contingent upon what happens to be. If baseball players get paid nine hundred times what top teachers receive, or if some celebrity bathes daily in a tub of lime Jell-o, it's normal for them to be so compensated or for him to do so, because it happens to be. Normality also gets stretched and tested by the fact that it is normal for some percentage of a class to be abnormal (e.g. among humans schizophrenia is considered not normal, but it is normal for a smallish percentage of a population to be schizophrenic). Finally, in trying to articulate the accessibility relation to other worlds, there is potential for circularity to be achieved. If what we do in extending the domain of quantification to other worlds is to select those that are "close enough" or

"much like" our own, might the cashing out of that structure end up essentially selecting worlds in which (most of) the generics that hold in our own world, hold in theirs as well?

One theme that has emerged in work on genericity is to doubt that it is a single, unified phenomenon. It is clear that notionally, generics can be put to use describing a wide variety of phenomena, to include habits, dispositions, rules of games, cultural mores, functions, and more. It is usually assumed, and I believe quite correctly, that the notional categories do not determine true semantic distinctions. And, this is largely supported by facts about natural language forms across languages (see, for example, Filip & Carlson 1997), that the forms provide no hint of a cleavage into a rich set of notional domains. It seems, rather, that there is a single semantics that is put to use in a variety of ways. However, this uniformity has been put into some doubt by a number of researchers. In Eckardt's terms, there seems to be some kind of distinction between "normal-generic" and "ideal-generic" sentences, the former much more statistically-driven in conception, the latter more directive, relatively immune to statistical observation. If one asserts that "Turtles live 100 years or so" to be true, the masses of turtles that do not live to that age count for little if we are talking about the "ideal" turtle; normal-turtles do not live so long. It seems plausible that pondering a distinction somewhat along these lines will form a part of the continuing discussion on the semantics of generic sentences.

3. Generic reference

The term *generic reference* is used in a variety of ways in the linguistics and philosophy literature. Its root notional use is to provide a description of the meanings of nominals in a sentence which do not appear to make any reference, definite or indefinite, to particular individuals of that sort. So, for instance, in the compound noun "car-door", the term "car" is occasionally said to refer generically to cars since, from an intuitive point of view, no individual cars seem to be talked about in using that word in the context of the compound. Or, the nominal element typically understood as an object, that appears incorporated into verbs in languages that exhibit the structure is commonly talked about as referring "generically". Again, it does not appear that the construction's meaning requires any sort of reference to particular individuals.

More commonly, the term is used to talk about generic noun phrases, typically found in generic or habitual sentences, which likewise do not appear to make reference to particular individuals of the sort. Thus, in sentences like (1) the subject noun phrase is often said to refer generically.

However, as is common in discussion of purely notional terms, intuitions can only take one so far. In example (1), it does not appear that any particular honey is "under discussion" either, so does that mean that the NP "honey" refers "generically"? It may, or may not. The underlying descriptive intuitions would appear to include indefinite descriptions within the scope of other operators, such as negation (28), or even nonspecific indefinites, as in (29).

(28) The professor did not wear *a tie* to class last Thursday.

(29) *Some thief* took my computer!

One example among others that Quirk et al. (1985, 281) use to illustrate "the generic use of the indefinite article" has an indefinite appearing in an intensional context:

(30) The best way to learn *a language* is to live among its speakers.

Whether there is something "generic" about the noun phrase above and beyond its non-generic use appearing in an intensionalized context is a difficult issue to resolve by direct appeal to intuition.

This is all by way of introduction to the issue we are going to focus on: the theoretical question of whether there is something one can properly call "generic reference" in a semantic theory of natural language. Our primary focus will be on the types of noun phrases exhibited in the subject noun phrases in (1), since if such instances do not refer generically then it is likely nothing does. We return to consideration of remaining constructions only after an examination of the core constructions.

Let us first present a working definition of "generic reference". In the abstract, this is a reasonably straightforward thing to do within the confines of a truth-conditional approach to semantics. First, we take the phenomenon of "reference" to be that of semantic value; the reference of a phrase is just that object which determines the phrase's contribution to

the calculation of the truth or falsity of a sentence containing that phrase. So, for instance, if at the appropriate parameters the predicate "is smart" is some set of individuals *S*, and the phrase "Laura's sister" refers to a certain individual *a*, then the semantic value of the whole sentence "Laura's sister is smart" will depend upon the contribution the individual *a* makes to the whole. If, as is often assumed, a sentence of the form "NP is Adj" is true iff the reference of the NP is a member of the set denoted by the adjective, then the sentence's truth depends just on whether $a \in S$. If we take some object that the NP does not intuitively refer to, say, the individual *l* (let's assume this is Laura), then the truth value of the whole does not depend on whether $l \in S$, which is why we say that *a*, and not *l*, is the reference of the NP "Laura's sister". While a great deal more could be, and needs to be added, we deal with qualifications and questions as they arise.

The second part is also fairly straightforward, and that is, what makes a reference "generic"? The obvious answer would be that a reference is generic just in case the semantic value of a phrase in a sentence is an object that is, well, generic. Taking as a given that ordinary individuals, such as Laura and her sister, are not generic objects, then generics must not make reference to such things, but to some other things. For reasons we will go into later, groups or collections of individuals (let us call these "pluralities") are not appropriate candidates for such objects. From an intuitive standpoint, for an object *X* to be generic it must be related to particular individuals *y* by something like the "*y* is an instance of *X*/*y* an exemplar of *X*" relation. Its reference with regard to the exemplars needs to be in some sense "unbounded," in that it is also intended to include not only existent but also potential instances. This would appear to work for the core instances we

examine, such as (1). After all, I can point to an animal nearby and say "This (pointing at a certain object) is an exemplar of/is an instance of a bear". It would also seem to be an intuitive condition that if *y* is an exemplar of the generic object *X*, then the phrase used to refer to *X* must also be truly predicated of *y* (so, for instance, if *a* is an exemplar of a smart person, then *a* must be a smart person and not, say, enjoy surfing but may, or may not, be smart). This then will be our working definition of "generic reference".

There are two matters that need to be dealt before turning to the semantic issues. One is that of quantification. We are going to assume a traditional view for now that a quantified noun phrase has no reference of its own (though on a generalized quantifier treatment it may denote (the intension of) a set of properties). However, it still is germane to the question of generic reference. We will take a model of unrestricted quantification to be found in first-order predicate logic. A quantified formula consists of an open formula containing one or more instances of variables, and operators that bind those variables. The truth-conditions (in the simplest instances) consist of a) a set of truth-value calculations for each individual in the domain when assigned as a value of the bound variable, and b) a condition associated with the binder which designates certain sets of results as "True" and others as "False". For instance, if the domain is the odd numbers between one and ten and x is bound, then the open formula [x< 6] will be a set of evaluations [1<7]…[9<7] (coming out T, T, T, F F), which is a false pattern of results if the binder is ∀x, true if it's ∃x. In first-order predicate logic it is typically assumed that the values assigned to variables are just "ordinary" individuals. However, if the domain includes generic objects, then the possibility is raised that variable values may be

assigned from that domain as well. Thus, we might ask, alongside whether there is reference to generic objects, also whether there is quantification over generic objects as well.

In simply posing the question as to whether there is generic reference, one appears to be presuming a positive answer to the question of whether there are genera that can be referred to in the first place. Being a type of universal, their existence is bound up with the longstanding question of the existence and standing of universals in general. There are many candidates for that role that have been proposed, such as Plato's forms, Aristotle's secondary substances, Locke's "real essences," the quidditas of the medievals, sorts, properties, natural kinds, and so forth, to the extent such are defensibly distinct notions. Nominalists have in general been inclined to treat genera as abstractions, or as predicates applying to individuals. This is a common practice in advising students how to represent things in logical notation. For instance, Stebbing (1930, 149) advises that, "'The whale is a mammal' expresses a universal proposition and in this usage 'The whale' is not a definite description." This point also gets expressly argued for (and against). Bacon (1974) weighs in on a controversy between Lesniewski and Twardowski regarding whether the sentence

(31) The lion is a mammal.

is best analyzed as meaning the same thing as "All lions are mammals", i.e. as a universal proposition, or whether "The lion" can be understood as a "representative object." The

title of Bacon's article, "The untenability of genera", makes clear where he comes down on the issue (see also Bacon 1973, for a similar conclusion). On the other hand, Putnam (1975) in his often-cited article regarding the liquids water and XYZ, is perhaps best understood as relying upon the idea that there are natural kinds that can serve as the reference of indexicals and certain names. We will have a bit more to say about natural kinds below.

Having recognized the underlying metaphysical controversy, however, we are going to move on. In part, it is clearly outside the scope of this article, it is much too complex an issue, and there is no chance whatsoever of resolution here. More importantly, it is not clear that there be a resolution in order to construct a theory of semantics. Bach's (1981, 1986) idea that there may be a "natural language metaphysics" looms as one possibility that deserves consideration; the possibility that abstractions have reified interpretations is another; or that natural language semantics proper is a matter of creating "spontaneous fiction" (Kamp & Reyle 1994). So while, if semantics is about the relation between natural language forms and "the world", the structure of "the world" would seem to have *some* bearing on matters. But exactly what bearing it might have is, at this point, a matter without a clear consensus.

4. Rationale for generic reference

The beginning motivation for countenancing something like generic reference is found in those instances where a quantificational analysis would appear to be implausible. Moore (1942), for instance, notes that Russell's theory of descriptions will not get the sentence

"The whale is a mammal" correct in its generic sense (only possibly in the sense of referring to some particular animal in the context). He further notes such examples as, "The lion is the king of beasts," "The triangle is a figure to which Euclid devoted a great deal of attention," or "The right hand is apt to be better developed than the left." In such instances, these do not seem to be even universal propositions, not to say misanalyzed in the Theory of Descriptions. It does not seem plausible to say of each individual lion that that lion is the king of beasts, that Euclid paid particular attention to each individual triangle, or that a given right hand is "apt to be" more highly developed than the left (in a given instance, it either is, or isn't). And this sets aside any issues arising from consideration of phrases like "the left hand" or "the king of beasts".

It is not too difficult to find additional such examples, where any calculation based on the use of bound individual variables will lead to an implausible analysis. Consider the following:

(32) a. The lion is a type of mammal.

b. The helicopter is a kind of flying machine.

c. The praying mantis is a species of insect.

Predicates prefixed by such words as "kind", "sort," "type", "species", are systematically constructible for nearly any predicate nominal. Clearly, to say of this particular lion that it is "a type of mammal", or that this particular helicopter is itself "a kind of flying machine" is either patently implausible, or at least not at all what is intended in saying

such things.

A plausible reanalysis suggests itself, provided that one is willing to absorb the cost of positing genera as objects to which reference is possible. The extent to which one is unwilling to bear such costs will mostly determine the extent to which the analysis is objectionable. Consider first the analysis of an ordinary predicate nominal, as in (33).

(33) The house is a bungalow.

This is said with respect to a certain house in context (e.g. the one across the street). Its analysis, to a first approximation, is straightforward:

The phrase “the house” denotes/refers to a given individual house h

The phrase “is a bungalow” is a predicate B denoting/referring to the set of individual things that are bungalows.

The sentence (33) is true iff h is an element of B.

This analysis assumes that the subject noun phrase, a definite description, denotes a given object, and that the predicate denotes a set of objects. Truth and falsity are defined by set membership. Using genera, we can apply this straightforwardly to an example such as (32a):

The phrase “The lion” denotes/refers to a generic object l

The phrase “is a type of mammal” is a predicate M’ denoting/referring to generic things that are types of mammals.

The sentence (32a) is true iff l is an element of M’

We might do exactly the same thing with equative sentences, where the copula is plausibly analyzed as identity. We assume, again somewhat simplistically, that a sentence like (34) should be analyzed thus:

(34) The house (across the street) is the Smith residence.

The phrase “the house” denotes a given thing h

The phrase “the Smith residence” denotes a given thing h

(34) is true iff h=h

And once again a parallel analysis for a sentence like (33) is straightforwardly available:

(35) The lion is the king of beasts.

The phrase “the lion” denotes a given (generic) thing l

The phrase “the king of beasts” denotes a given (generic) thing l

(35) is true iff l=l

Considered as an argument, this does not establish the necessity of countenancing genera;

but any analysis that preserves such parallelism is surely worth considering further, since no additional, different-looking rules of semantic interpretation for copular structures or for definite descriptions would need to be constructed. So, for instance, we are no longer in a position of saying that some definite descriptions refer to objects, whereas others do not but are instead understood as expressions of universal quantification.

Krifka et al. (1995) and Carlson (1977a) point out that there are further predicate types beyond predicate nominals that likewise do not appear readily amendable to a quantificational analysis. These "kind-level" predicates include adjectives of distribution such as "widespread," "common," or "rare". Such properties are not readily predicated of individuals, nor are they readily predicated of groups or pluralities of individuals:

(36) a. The grizzly bear is common/widespread/rare.

b. ?? My neighbor's pet bear is common/widespread/rare.

c. ??Those bears are common/widespread/rare.

Other predicates which select for generic referents include "be extinct", "come in" (as in "Dogs come in a wide variety of shapes and sizes"), "be indigenous to," the object of the verb "invent" (cf. the object of "discover"), or, as observed by Schubert & Pelletier (1987), both the subject and object of "evolve from":

(37) a. Monkeys evolved from lemurs.

b. ??Jackie's monkey evolved from this lemur.

A wider class of predicates which do not seem to select for generic reference can nonetheless be identified, where the intended reading relies upon the referent being understood as generic, rather than as specific. Consider, for instance, the following sentence with the adjective "popular":

(38) In the months following the release of the movie "Jaws," *sharks* became highly popular among school-age children.

(38) is not making the claim that there was one particular shark, or even any particular group of sharks, of which it might be said that it is popular. It is easily understood as describing a situation where sharks as a species, or a type of thing, are popular without there being any increase in the "popularity" of any singular shark at all.

Similarly, it appears one can *fear* bears, or ghosts, without fearing any particular ones, one can *discuss* insects or bacteria without discussing any particular ones, or one can *worship* bears or eagles, again without singling out any particular ones, or even any particular groups of such things.

All these examples, and many more, also have individual readings alongside the generic ones. For example, the sentence "Jacob worships bears" does have a reading which is roughly equivalent to saying that Jacob has a propensity where, if he encounters a bear x, he will worship x. However, there is above and beyond this a reading where the object of

Jacob's attention is never any particular bear at all. (In Spanish, the two readings are formally distinguished from one another, Laca 1990.) For example, in the case of fearing ghosts, this is the plausible reading given normal assumptions about the existence of ghosts. This latter, generic reading of the noun phrase is the one that is a promising candidate for generic reference.

5. What types of English DP's can have generic interpretations?

Thus far, the use of particular noun phrases in the English examples has been aimed at creating a means of identifying when one has a generic reading for a given DP. The two types of English DP's used thus far have been the bare plural construction ("bears", etc.), and the definite singular construction ("the lion"), which is also systematically ambiguous between a generic and an individual reading (e.g. discussing a certain lion that is nearby).

As mentioned in the introduction, the indefinite singular is generally considered to have a truly generic reading. It often results in paraphrase for the other generics:

(39) a. *The lion* is ferocious.

b. *Lions* are ferocious.

c. *A lion* is ferocious.

However, the indefinite singular does not combine well, with distributional predicates:

(40) A grizzly bear is ??common/??widespread/?rare.

And results are somewhat mixed with other predicates which select for generic readings:

(41) a. ??A grizzly bear evolved from a cave bear.

b. ??Charles Babbage invented a computer (cf: the computer)

c. ?A grizzly bear is indigenous to North America.

d. ??A dodo is extinct.

Further, they generally do not have the generic reading in instances of predicates that can combine with individual-denoting or generically-denoting arguments. "John fears a ghost", for many speakers, has a generic reading only marginally at best.

On the other hand, indefinite singulars do set well in the copular constructions with kind-type predicates:

(42) a. A lion is a type of mammal.

b. A helicopter is a kind of flying machine.

c. (?) A praying mantis is a species of insect.

Thus, from an intuitive standpoint, indefinite singulars have a generic reading (along with its more common individual reading), the kind of evidence discussed so far does not clearly support this point of view. We are going to need to return to this issue of

indefinite singulars as generics further below.

The other type of noun phrase that gives rise to intuitions of genericity is the "free choice" sense of 'any', as in:

(43) Any lion is ferocious.

This does not, however, combine with any of the generic-selecting predicates or result in generic readings in the other instances mentioned above. Further, it does not allow for apparent external quantification, as the other generics do:

(44) A lion/The lion/Lions/??Any lion is/are usually ferocious.

In one form or another, the free-choice 'any' does appear to have inherent quantification over individuals as a part of its meaning.

Mass (or non-count) expressions, of English appear to pattern much like the determinerless bare plurals, and display the relevant patterning of the generically-referring count expressions:

(45) *Water/gold/mud* is common/widespread/rare.

(46) *Gold/iron* is a kind of metal.

The syntactic twist with mass and abstract terms is that they do not take a definite singular form—"the gold," "the water", etc. have only nongeneric reference (cf. German). So, while alongside "lions" there is the generic "the lion", there is no "*the water" alongside "water". However, the determinerless form functions the same as the definite singular does for count terms. Those few contexts that select just for the definite singular but discomfit the bare plural, such as the object of "invent", allow the determinerless mass expression there with ease.

(47) a. Babbage invented *the computer/?computers.*

b. The Italians invented *ice cream*.

Yet the determinerless mass expressions also parallel the semantics of the bare plural as well. They can, for example, occur with collective predicates which seem not to go with the definite singular generic at all easily, but with the bare plural form quite well.

(48) a. *Monarch butterflies/??The monarch butterfly* collect(s) each autumn for migration south.

b. *Algae* collects near river deltas due to the outflow of chemical fertilizers in the river water.

In addition, as traditional grammars of English unexceptionally note, there is one distinguished count term that appears in the singular without article, namely 'Man', in the

generic sense referring to people or mankind in general and not just to mature human males.

There is one other type of construction that plays a role here, albeit a marginal one. This is the use of Latinate generic terms naming species, phyla, orders, etc., such as the following:

(49) a. *Acer rubrum* (=the red maple tree) grows 40 to 60 feet tall.

b. *Ursus Malayanus* (=the sun bear) is native to southeast Asia.

These names are a consciously-produced scientific addition to any language that cares to try and add them, so it is a little difficult to assess their significance within the bounds of a discussion of the semantics of a language. For English, at any rate, the semantics of these stilted scientific names would appear to be most similar to that of the definite singular ("the sun bear", "the red maple", etc.), and possibly identical. Their significance could perhaps best be assessed within the context of a theory of naming, a matter beyond the scope of the present article.

There are also a couple of variants worthy of note. There is a use of distal demonstrative DP's that expresses some sort of affective attitude by the speaker towards things. This usage may appear with proper names of people, for example:

(50) *That Howard* is such a comedian!

The affect may be positive, as in this instance, or it may be negative in others. However, this is also applicable to generic terms. The following is from Bowdle & Ward (1995):

(51) *Those spotted owls* are constantly being talked about by environmentalists.

This means that spotted owls (in general) have the environmentalists riled, and the demonstrative adds affect (in this case, it could be positive or negative, depending on who is speaking).

In English, plural count nouns with the definite article are not typically understood generically. Thus, examples such as the following are a little strange if intended generically:

(52) a. ??The lions are ferocious/widespread/indigenous to the eastern hemisphere

b. ??The maple trees are related to roses.

However, when it comes to referencing people, the definite plural is much better as a generic, and in fact the definite singular, while interpretable and grammatical, sounds slightly demeaning, or is to be used in a jocular sense. Thus one normally talks about “the ancient Greeks” instead of “the ancient Greek”, or “the Russians” in place of “the Russian”. The bare plurals, “ancient Greeks”, and “Russians,” for instance, are perfectly normal as generics as well.

It is fairly well-known that there exist restrictions on the use of the definite singulars as well. Krifka et al. (1995) characterize the limitation to "well-established" kinds of things, but the nature of this restriction remains poorly understood and an open question (see Carlson 2009 for one attempt to understand the matter). Also unclear is the extent to which these restrictions in English are shared more widely by other languages.

An interim summary. The Latinate names aside, genericity in English is a feature of bare plurals and mass terms (i.e. determinerless DP's), definite singulars (on one reading) and definite plurals (on one reading) in some more limited instances, and perhaps indefinite singulars.

6. Generic quantification

However, complex expressions can also be systematically built up using expressions such as "kind", "type", "sort", etc., which have the hallmarks of a generic semantics as well:

(53) a. This kind of salamander (e.g. pointing at a given animal) is indigenous to Central Europe.

b. The largest type of mammal lives in the ocean.

One also finds such expressions in quantified DP's as well:

(54) a. Not every kind of fish has tail fins.

b. One species of snake eats only bird eggs.

c. Most breeds of dogs respond well to firm, consistent training.

Further, as the reader has doubtless already noted, the prefixed "sort/kind of" can easily be dropped, and one still find a reading quantifying over or referring to a kind of thing. This is the "taxonomic" reading. For instance:

(55) a. *Two birds* are common in Antarctica.

b. *Few minerals* are rare.

So then a sentence such as:

(56) *Several mammals* eat primarily nuts and berries.

is ambiguous between individuals, and types. This is a systematic ambiguity that is most often noted in discussions of mass terms. If one takes a mass term and uses it in a count sense, one prominent reading is a "kind" reading:

(57) *One liquid* (namely, water) is found nearly everywhere on earth.

The most straightforward analysis would seem to be one where the common noun, whether mass or count, which presumably has a "more basic" reading where it applies to individuals or perhaps particular quantities, can also be used then as a predicate that

applies to sets of kinds of things of that sort, which then may be quantified over by existing mechanisms. So while, in a context, "Every man (in the context)" quantifies over individuals Tom, Dick, and Harry, in another instance an expression like "Every tree (in the context)" quantifies over apple trees, peach trees, and cherry trees. If one posits a variable in the representations that takes on values, Tom would be the value of an assignment in the one instance, and apple trees (*malus domestica)* a value in the other. It appears that this process might be one that also allows for kinds of kinds to be values, though we omit discussion here. One apparent fact this points up is that it is difficult to find nouns which only designate sets of kinds, and not individuals. ?? brings up the case of the term "halogen", a chemistry term which seems best used as a classification of kinds of gases, but does not do well used to talk about individual quantities ("??Some halogen escaped into the air during the experiment"), or the word "element" used in the same scientific sense (?"The element fell into the waste basket"), though here again we may be dealing with the uneasy case of consciously-produced scientific classificatory terms as in the case of the Latinate names.

7. What types of DP's can express generic reference across languages?

Thus far, the sorts of noun phrases that may express genericity has been limited to the cases of determinerless expressions (bare plurals and mass terms) and definite singulars and some plurals. If we think of the bare plural in English as a type of indefinite (possibly with a null determiner), and include the indefinite singular, we find that the phenomenon of genericity is limited to expressions of definiteness and indefiniteness. The question is whether this represents a general pattern throughout the world's languages. A number of

authors have examined a variety of languages, some examining a wide range of languages (Gerstner-Link 1998), and others a more limited range of languages but in great theoretical depth (Chierchia 1998, Dayal 2004, Krifka 2004, Behrens 2005). From these studies, and a wider range of descriptions which do not necessarily focus on genericity, it is possible to draw some conclusions. One thing that is perhaps a little surprising is that there has yet to be uncovered an instance of a language which clearly has a specifically generic article or quantifier. Perhaps the closest are languages with classifiers, which have a "general" classifier roughly equivalent to the word "kind", also present for taxonomic readings (Gerstner-Link 1998). However, it appears that nominal genericity does not make use of specific morphological devices. Linguists have had some time to examine this claim, and thus far not a single serious contender has been put forward. So if there is specifically nominal genericity overtly marked, it is certainly not at all common. This is quite different from the case of I-genericity or "habituality", where specifically habitual markers, typically a part of the verbal complex, can be found with some ease, even if not especially common (Dahl 1985, 1995). This suggests, albeit only generally, that the referential and quantificational resources of natural language that are adequate for the discussion of individuals and their groups or quantities, is also adequate for the discussion of genera, and that genera require no special devices to enhance that machinery.

Discussion of the particulars of generic reference has tended to focus on the status of the bare plural construction. This is in part because the bare plural appears to play the role of a generic on the one hand (e.g. as in (1)), and a sort of plural indefinite on the other (58).

(58) *Policemen* arrived at the scene with *sirens* howling and *lights* flashing.

These two meanings—generic reference and plural indefiniteness—seem, intuitively, distant from one another. The formulation of Carlson (1977a,b) sought to close the gap between the two, treating the bare plural in (almost) all instances as the name of a *kind*, and deriving the usage in (58) from the interaction of the semantics of the bare plural with the semantic context it appears in; chiefly, if the context required reference to particulars, as in (58), then one got the effect of existential quantification over instance of the kind named by the bare plural.

The analysis relied upon motivating the needs for a "generic" operator that expresses I-genericity or "habituality". In the Carlson (1977a) formulation this takes the form of a predicate operator which maps predicates that are "stage-level" to ones that may apply directly to individuals (thus "individual-level" predicates), and can subsequently be "raised" to apply to kinds ("kind-level" predicates). Nothing but a programmatic semantics suggested for it. However, it is the ingredient that introduces I-genericity into the semantics of the sentence.

Compelling subsequent work reconstrued this analysis within the context of the "theory of indefiniteness", a line of work initiated by the discourse-oriented work of Kamp (1981) and Heim (1982). The primary feature of this approach is that the contribution of an indefinite (as well as a definite) expression was a property, and a variable construed in

Kamp (1981) as a "discourse marker" or in Heim (1982) as affecting a "file" of discourse markers. So, for instance, the contribution of the DP "a man" would be effectively *man*(x) with conditions concerning what values x may take. The primary effect of interest is that a variable is thus introduced into the structure of the semantic interpretation via the semantics of the indefinite DP itself, and that this variable then can be bound by other operators (though if not bound by other operators, a default existential closure operation binds the free variable).

Put in spare form, a sentence like (59a) below might be represented as (59b).

(59) a. A cat is walking.

b. ∃ [*cat*(x) & *walk*(x)]

c. ∃x [*cat*(x) & *walk*(x)]

The unselective existential binds all free variables within its scope, and so (59b) is equivalent to (59c).

However, the default existential is not the only available binder, as other elements of the sentence may also play that role as well. Consider a generic-seeming sentence with a frequency adverb "often" in it:

(60) Cats *often* have sharp claws.

(60) appears to about the same thing as (61):

(61) Many cats have sharp claws.

This result can be derived if we treat 'often' as an instance of A-quantification (Bach et al. 1995, Lewis 1975) and as an unselective binder as well. The spare form of (60) would then be something like (62a), which again ends up equivalent to (62b), treating the meaning of 'often' as represented by *Many***.**

(62) a. *Many* [*cat*(x) & *have-sharp-claws* (x)]

b. *Many*(x) [*cat*(x) & *have-sharp-claws* (x)]

The treatment of (63) is parallel provided the generic operator GEN is, as presented in Krifka et al. (1995), a tripartite operator that binds variables within its scope.

(63) A cat has sharp claws.

This contains a "generic" indefinite singular. The GEN operator remains, in English and many other languages, morphologically unexpressed. Assuming this, the representation of (63) then becomes:

(64) GEN [*cat*(x); *have-sharp-claws* (x)]

with the GEN operator binding the free variable and providing the relation between the two parts of the formula in its scope (in this instance, roughly an "if…then…" structure, e.g. "If something is a cat it normally has sharp claws").

On this analysis then, it is plausible that the indefinite singular (e.g. "a cat") is generically referring at all. It results from the binding of the variable introduced by the indefinite NP by (mostly) independently-motivated operators already in the sentence. If one can do this with the singular indefinites, one can do the same with the bare plurals provided one takes the (plausible) step of assuming they are also indefinites. Unlike the indefinite singulars, however, one assumes that the plural forms may also range over sums of individuals of that sort, perhaps in addition to the individuals. So, a sentence like "cats have sharp claws" will, aside from the range of the variable being restricted to singular individual cats in (64), be otherwise identical to it:

(65) GEN [*cats*(x); *have-sharp-claws* (x)]

The upshot is that given an already well-developed theory of indefinites, with some seemingly minor adjustments such as including a GEN operator, generic sentences with indefinite singulars and bare plurals very much seem to fall right out. This basic idea was developed considerably by Wilkinson (1991), Diesing (1992), Kratzer (1995), and Krifka (1987), among others. One of the chief strengths of the analysis is that it quite successfully predicts the interpretations of various generic readings of the same sentence according to its focal structure.

This approach has a number of consequences. For one, while it gives a uniform treatment of existentially-quantified and generic indefinites in terms of the contribution of the meaning of the noun phrase to the whole, the initial cost is to assume that bare plurals are also kind-denoting when combined with the "kind-level" predicates exemplified above in (32), (36) and (37), as these do not appear easily represented as a quantification over individuals. This leaves lingering the question then of why, if a generic reference analysis is required there, then why might it not be carried through more generally? Since this is an argument from parsimony, its force is unclear, as a whole set of additional theoretical assumptions come along with the compared analyses.

The consequence that is perhaps most important for present purposes is it suggests the intuitive phenomenon of genericity is associated with the phenomenon of indefiniteness, rather than definiteness. It is doubtful that this holds cross-linguistically as the appropriate association. A number of articles discussing this issue include de Swart (1993), Dobrovie-Sorin & Laca (1997) and Cohen & Erteschik-Shir (1999). Gerstner-Link's survey, which keyed into the parameters of definiteness and number, yields in fact very few languages of the forty examined which allow for a "generic" reading of the indefinite article, as appears to be found in English. In general, it was the determinerless forms, and even more frequently the definite forms that had genericity associated with them. No clear cases are cited where clearly indefinite forms are associated with generic reference to the exclusion of definites.

Gerstner-Link (1998) points out that the type of definiteness is also of interest. In general, definites appear to have two (possibly non-distinct) uses: an anaphoric use to refer to something that has just been mentioned, for example, as in "John bought a car. *The car* was expensive." Or, it can refer to something known to be unique or familiar from background information, such as the earth or the sun. Some dialects of German, as well as Frisian, use two different forms of the definite article to distinguish these uses. Only one of them may be used generically, which is the form used also to refer to unique or contextually familiar things like the sun or the earth. In the Amern dialect of German, the non-anaphoric form is 'der' and the anaphoric form 'dä'. Only the former may be used to refer generically.

(66) Der/ *dä Fuchs stiehlt Hühner.
'The fox steals hens/ Foxes steal hens'

Not all languages, however, have articles, and those languages which lack articles altogether always use the bare forms to express genericity (e.g. Chinese, Russian). I will not discuss any details at this point as they are substantially covered in article 44 (Dayal) *Bare noung phrases*. Such languages are discussed at length in Chierchia's landmark (1998) article. Chierchia raises the issue of whether nominal forms in different languages can have different type properties, aiming at an analysis that makes significant use of type-shifting devices to arrive at the appropriate interpretations and to make predictions about which determiners will be used, and why; in particular Chierchia presents an account of why bare singulars in languages with a singular/plural distinction are not used

generically, and why it is the definite article that so often appears, even with singular forms in such languages. Chierchia's analysis has been ably evaluated by others. In Krifka (2004), a somewhat different set of assumptions are introduced concerning bare plurals, and concludes they are neither kind-referring nor indefinites, but instead designate properties. Dayal (2004) takes matters a step further in the discussion of whether indefiniteness is a feature of genericity. Languages that do not make use of articles appear to have both definite and indefinite interpretations available for the determinerless forms. The interpretation is mostly sensitive to the context of usage, but such matters as local construction demands, and especially sentence position may limit the choices. As a rough generalization, the earlier in a sentence a bare nominal appears, the more likely it is to be interpreted as a definite—or as a generic. This is expressly noted in Cheng & Sybesma (1999) with regard to Mandarin and Cantonese both; the fact that preverbal bare plurals in Romance are unacceptable (or require extra material to be acceptable as generics), while postverbal bare plurals are natural but only interpreted indefinitely has been pointed out by e.g. Contreras (1986), Torrego (1989), and Longobardi (1994). Dayal argues in fact that a detailed examination of languages such as Russian and Mandarin which have no articles shows an affinity between the definite reading and the generic, to the exclusion of the indefinite interpretations. This is consonant with the kind-referring analysis of Carlson, in which it was argued that bare plurals are names of kinds of things, and names are normally taken as a species of definiteness. (See section 1.8 of article 41 (Heim) *Definiteness and indefiniteness* for some further discussion).

8. Indefinite singulars

Carlson also attempted an analysis of the indefinite singular in terms of kind-reference as well. Essentially, the analysis treated the indefinite singular as a set of properties of the kind, less those that were not also properties of individual instances of the kind (this eliminated "widespread, common", etc. from the property set). However, it would appear that a kind-referring analysis of the indefinite singular is perhaps not correct, and that something akin to the GEN-binding analysis might be more to the point. Gerstner-Link (1998) and Cohen (2001) point to the fact that indefinite singular generics do not appear to make very good topics, and topicality is a sign of reference. This was noted by Reinhart (1981), using example such as the following:

(67) a. She said about sharks that they will never attack unless they are very hungry.

b. She said about a shark that it will never attack unless it is very hungry.

While (67a) has a sensible generic reading for the underscored phrase, with the bare plural, the indefinite singular in (67b) has only an existential reading, if that. The relevance of topic and focus structure on the interpretation of generics in general is fairly clear. It has been known among semanticists for some time that Japanese topic-marking (-wa) is a feature of Japenese generics (see Brockett 1991 for extended discussion). Krifka (2004) makes a similar point about the sensitivity of generic reference to the information structure of a sentence. Jäger (2001) discusses the role of topicality in the (putative) stage-level/individual-level contrast; Kiss (1998), Longobardi (1994) and Erteschik-Shir (1997) note that focus structure of a sentence can affect the interpretation

of bare plurals.

Two more recent analyses of the indefinite singular, by Cohen (2001) and Greenberg (2003), key on the idea that (English) indefinite singulars have a special "flavor" to them that distinguishes them from the definite generic and the bare plural forms. Cohen notes that they often have a 'normative' type of reading. Following Burton-Roberts (1976), he notes that of the following sentences, only the first has a reading of "moral necessity".

(68) a. Gentlemen open doors for ladies.

b. A gentleman opens doors for ladies.

Cohen characterizes this property in terms of Carlson's (1995) distinction between "rules and regulations" and "inductive" readings of generics, with indefinite singulars having only the former reading because such sentences do not require topics—they function as topics themselves in their entirety. In support of this view, Cohen cites the example from French with the partitive *des* construction (unusually) in subject position:

(69) a. Des agents de police ne se comportent pas ainsi dans une situation d'alarme.
'INDEF-PL police officers do not behave like that in an emergency situation.'

b. Les agents de police ne se comportent pas ainsi dans une situation d'alarme.

'DEF-PL police officers do not behave like that in an emergency situation.'

(69a) can only be understood as a normative statement, and not as a description of typical police officer behavior, unlike (69b). So while there is no generic reference, one still gets the effect of a generic sentence.

Greenberg's treatment is more extended and has a slightly different emphasis, but like the Cohen analysis it takes as its main interest the distinction between indefinite singular generics, and those with bare plurals or definite singulars (again, in English). Her lead examples concern a distinction between "accidental" and "principled" generalizations. For example, the pair in (70) seem pretty much synonymous, while the pair in (71) has only the (71a) version seeming at all natural.

(70) a. Carpenters in Amherst earn very little.

b. A carpenter in Amherst earns very little.

(71) a. Carpenters in Amherst gives all his sons names ending with 'a' or 'g'.

b. ??A carpenter in Amherst gives all his sons names ending in 'a' or 'g'.

One can imagine (71a) being a slightly strange generalization to arrive at, but if one were to arrive at it, (71b) would not be its expression.

Similarly, one might observe the following as a generalization:

(72) Uncles like marshmallows.

But to put this banal generalization in the indefinite singular would likewise seem very strange:

(73) ??An uncle likes marshmallows.

Greenberg makes the case that indefinite singulars have an "in virtue-of" reading and presents a formalization of the contents and presuppositions of indefinite singular generics which model that lead intuition: That what is wrong with examples like (71b) and (73) is that one is reluctant to say that a carpenter in Amherst give his sons such names *by virtue of being a carpenter in Amherst*, or that uncles like marshmallows *by virtue of being an uncle*. The bare plural alternatives are acceptable because they have no such presuppositions associated with them. In the end, Greenberg's analysis, like Cohen's, does not rely upon making the indefinite singular a generically referring term. For Greenberg, it contributes a property (being and uncle, or being a carpenter from Amherst), and the originality of the analysis lies in the way the property relates to its predicate.

9. If there are genera, what are they?

If the mechanisms of quantification and reference that are available to the discussion of

individuals and their groups, are also automatically transferable to the task of referring to and quantifying over genera, it would seem a rather odd situation if genera were something completely alien to the world of individuals and their sums. It cannot of course be ruled out. Carlson (1977a,b) suggests that genera, like individuals, are entities of the model, and are of the same type as individuals. In particular the inherent intensionality of individuation is stressed, relating it to the intensionality of kinds.

One point of view, discussed in this volume (cf. article 41 (Heim) *Definiteness and indefiniteness* 1.8.), is that kinds are the maximal sum individuals of the individuals of that kind in a world. Assuming, in line with work by Link (1983) that individuals form an atomic join semilattice defined by a sum operation * and a part-of relation ≤ with atoms A. The meaning of a plural noun is, let us assume, is the transitive closure of the lattice generated by A, minus the atomic individuals themselves. If we also assume that the iota-operator ι is a maximality operator. If we have a plural noun Ns which is interpreted as a lattice, then ι[[Ns]] will always be unique, i.e. the lattice supremum, or the largest sum available.

If this is the meanings of a plural noun, e.g. 'polar bears', then ι[[polar bears]] will be the sum of all the world's polar bears. Ojeda (1991, 1993) refers to such a sum as a 'kind'. Now suppose we take the world as it is to be the way it always has been with respect to bears, especially that polar bears are the only white bears in the universe. Then ι[[white bears]] = ι[[polar bears]]. If this sum is the kind, then the two kinds are identical. However, one's (slippery) intuitions seem to be that white bears and polar bears are not

the same kind of thing. And if we confine ourselves to extensional predication, anything we say about white bears will be what we can say about polar bears. If I am attacked by one, I'm attacked by the other. The two also share individual-level properties. If one swims, the other swims; if one hunts seals, the other does too. The two also share those kind-level predicates of distribution: if one is widespread or rare, the other is too. In short, one can get a lot of mileage out of taking such a sum to be the kind.

But they are clearly not the same in terms of modalized properties, such as found in contrafactuals. Clearly, if polar bears were no longer white, they would no longer be white bears, and they could still be polar bears. But it's far from clear that if white bears were no longer white, they would no longer be white bears, but could still be white bears. It would also seem a necessary truth that white bears are white, but a contingent truth that polar bears are white. White bears do not seem to be a species of bear, whereas polar bears do seem to be such a species. If polar bears evolved from ancestor X, do we say that white bears did as well? But clearly, polar bears did. It becomes something of a matter of terminology as to whether one treats a sum individual in a world as a 'kind', or whether the 'individual concept' that picks it out the sum individual in this particular world and all others is 'the kind'.

There is also another distinction between polar bears and white bears. The English definite singular generic sounds natural with one, but not the other:

(74) a. The polar bear is slowly disappearing.

b. ??The white bear is slowly disappearing. (cf: "White bears are…")

This is the phenomenon mentioned above of reference to "well-established" kinds. It is tempting in this instance to think that perhaps the definite singular is limited to *natural kinds*, as polar bears, and not white bears, would seem to be the natural kind. It is quite clear that if there is kind reference, it is not confined to reference to 'natural kinds' as commonly understood in the philosophical literature. Natural kinds are assumed to be those underlying structural capacities, such as atomic structure or genetic endowment, that create the distinctions of the world. The term 'natural' here does not rule out such things as 'plastic' or 'polio vaccine' as such terms, even if they do not occur in nature. Kripke's (1980) examples of natural kind terms include 'water', 'gold', 'cat', 'tiger', 'whale', 'heat', 'hot', 'loud', 'red', and 'pain'. But typically excluded are artifactual or social kind terms like 'money', 'pencil', 'tennis match', 'hammer', 'marriage', etc. (Braun 2006). Discovery of natural kinds is the product of scientific investigation. For example, one might think, for instance, that trees form a natural kind, but this turns out not to be so.

Language, however, is indiscriminate in its applications, even in the definite singular. There are no *linguistic* distinctions that will discriminate natural kinds from others kinds (often called 'nominal kinds'). We can easily speak of "the modern wedding ceremony", "the ball-point pen", "the symphony", "the wine bottle", and so forth with great ease. The bare plural form is even more widely applicable, it would appear, also allowing us to speak of, beyond white bears, wounded white bears, people with suntans, groggy

students, unsalted stone-ground wheat crackers, and so on. In general, it appears that (nearly) any nominal meaning can be made to refer to a 'kind', which obviously takes us far beyond the range of natural kinds alone. Chierchia's (1984) original idea, inspired by Cocchiarella's work, that bare plural noun phrases make reference to the nominalization of the property expressed by the nominal, and the nominalization's denotation is to be found in the domain of entities, would seem to be an excellent program for representing the nature of kinds (if one takes these entities to play the role of "individual concepts" as mentioned above).

Not absolutely every nominally expressed property may be turned into a kind. Carlson (1977a) notes that such examples as found in (75) cannot function as kinds, by the criteria given there:

(75) a. Parts to this (particular) machine

b. People in the next room

c. Books that John lost yesterday.

Intuitively, such expressions have a finite, limited extension that does not generalize beyond that limited extension. Getting at precisely what this intuition amounts to is not entirely clear, particularly when we observe that such examples as "polar bears" also have a finite, though not especially small, extension as well. ∪[[parts to this machine]] will be just as well-defined as ∪[[polar bears]], yet it appears the two need to be distinguished. Chierchia (1998) proposes an elegant partial solution to the problem,

suggesting that it is not possible to nominalize such phrases (which then invokes a type-shifting operation of another sort that results in existential quantification).

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