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Fuzziness---Vagueness---Generality---Ambiguity¹

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Abstract

In this paper, I attempt to distinguish four linguistic concepts: fuzziness, vagueness, generality and ambiguity. The distinction between the four concepts is a significant matter, both theoretically and practically. Several tests are discussed from the perspectives of semantics, syntax and pragmatics. It is my contention that fuzziness, vagueness, and generality are licensed by Grice's Co-operative Principle, i.e. they are just as important as precision in language. I conclude that generality, vagueness, and fuzziness are under-determined, and ambiguity is over-determined. Fuzziness differs from generality, vagueness, and ambiguity in that it is not simply a result of a one-to-many relationship between a general meaning and its specifications; nor a list of possible related interpretations derived from a vague expression; nor a list of unrelated meanings denoted by an ambiguous expression. Fuzziness is inherent in the sense that it has no clear-cut referential boundary, and is not resolvable with resort to context, as opposed to generality, vagueness, and ambiguity, which may be contextually eliminated. It is also concluded that fuzziness is closely involved with language users' judgments. An important implication of this is that for meaning investigations, an integral approach combining semantics, pragmatics, and psycholinguistics would be more powerful and beneficial.

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0. Introduction

In this paper, the distinction between fuzziness, generality, vagueness, and ambiguity will be discussed primarily from the perspectives of semantics, syntax, and pragmatics. More attention has been paid in the linguistic literature to generality, vagueness, and ambiguity than to fuzziness. Fuzziness remains an underdeveloped area, but one that is important to explore.

Although some work has been done on the matter (e.g. Kempson, 1977; Geeraerts, 1993; Tuggy, 1993; Kooij, 1971; and McCawley, 1981), considerable confusion between the four above-mentioned concepts still exists. Vagueness and fuzziness, in particular, have been used interchangeably by some investigators. For instance, at the beginning of this century, Peirce (1902: 748) gave as his definition of vagueness: "A proposition is vague when there are possible states of things concerning which it is intrinsically uncertain whether, had they been contemplated by the speaker, he would have regarded them as excluded or allowed by the proposition." This definition of *vagueness* fits the characteristic of *fuzziness* in my terms (see Section 1.1). On the other hand, some researchers define *vague* in a different sense, such as Ullmann (1962) and Kempson (1977). Kempson also considers the concept of *vagueness* a superset of the concept of fuzziness.

Our discussion here also has some practical implications. For example, confusing ambiguity with the other three concepts may create problems for lexicographers, as it becomes difficult for them to decide whether a word in a borderline case should have one or more than one dictionary entry.

All four concepts share the characteristic of conveying imprecise/unspecified information, but the way they do this differs, and this is the focal point of this paper. Our discussion will also show some theoretical implications.

1 Definitions

In this section, four concepts are defined---fuzziness, generality, vagueness, and ambiguity.

1.1 Fuzziness

Suppose this might happen in real life. While preparing a party, Mary asked John to buy *about 20 beers* and *a few apples*. John had to decide exactly how many beers and apples he would buy. In the shop, he hesitated for a while, then bought 18 beers and five apples. Once Mary saw the things John bought she seemed satisfied. Although this is a hypothetical example of a communication using words like *a few* and *about 20*, in fact this kind of communication happens very often in our everyday life. If we closely examine our language, most expressions have a *fuzzy*² referential boundary. For instance, an essay could be *not bad*, a girl may be *rather pretty*, a pile of papers may be *20 or so*, and someone may have *many friends*.

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An expression is fuzzy if it has a characteristic of referential opacity, as in, for example, *about 20 students*. While its general meaning, *20 plus-or-minus*, may not be fuzzy, when we try to work out its denotation, however, a gray peripheral area may occur. Is 14 in the boundary of *about 20*? The answer varies from context to context, from individual to individual.

I will use *fuzzy* as a technical term, which excludes the negative part of its literal meaning, like *misused*, *mistaken*, or *not well defined*. It appears that the term *fuzzy* sometimes confuses people, so it has been suggested that the term *continuous* could replace the term *fuzzy*. For example, *fuzzy logic* (Zadeh, 1965) could be called *continuous logic*. However, it seems to me that whatever the concept is called makes little difference, as long as we keep it well defined.

In the same vein, Crystal (1991: 148) defines *fuzzy* as:

"... a term derived from mathematics and used by some LINGUISTS to refer to the INDETERMINACY involved in the analysis of a linguistic UNIT OR PATTERN. For example, several LEXICAL ITEMS, it is argued, are best regarded as representing a SEMANTIC CATEGORY which has an INVARIANT core with a variable (or 'fuzzy') boundary, this allowing for flexibility of APPLICATION to a wide range of entities, given the appropriate CONTEXT. The difficulty of defining the boundaries of *cup* and *glass* has been a well-studied example of this indeterminacy. Other items which lend 'fuzziness' to language include *sort of*, *rather*, *quite*, etc."
[Capitals in original for purposes of cross-reference]

Crystal says that *fuzzy* is derived from the fuzzy mathematics developed by Zadeh (1965). Zadeh suggests that fuzziness can be formally handled in terms of a *fuzzy set*, a class of entities with a continuum of grades of membership. Such a set is characterized by a membership function (characteristic), which assigns to each entity a grade of membership ranging between zero and one, notated as [0, 1].

Lakoff (1973), as well as McCawley (1981), applies Zadeh's fuzzy set theory to the study of meaning. Lakoff points out that there is a certain degree of *fuzziness* around componential boundaries. If we consider *bird-likeness*, it appears that *robin* is a central member, as it belongs to *bird-likeness* completely. *Bat* is a peripheral member, as it hardly belongs to *bird-likeness*. Thus, a better way of representing the meaning of *bird-likeness*, especially the referential meaning of it, is to rank relevant members as to the degree of their *bird-likeness*---the degree to which they match the core member of *bird-likeness*. Here is a *bird-likeness* hierarchy, reproduced from Lakoff (1973):

robins
eagles
chickens, ducks, geese

penguins, pelicans
bats (1.1)

Suppose that instead of asking about category membership, we ask about the truth value of propositions that assert the category membership. The degree of truth, corresponding roughly to the ranking of category membership in (1.1), is listed in (1.2) (see also Lakoff, 1973):

- a. A robin is a bird. (true)
- b. An eagle is a bird (less true than *a*)
- c. A chicken is a bird. (less true than *b*)
- d. A penguin is a bird. (less true than *c*)
- e. A bat is a bird. (false, or at least very far from true)
- f. A cow is a bird. (absolutely false) (1.2)

The examples given here have to be understood in terms of ordinary language. Scientists may make (a), (b), (c) and (d) absolutely true, and (e) and (f) absolutely false. The scientific conception that a penguin is not a typical bird does not make it less true than that a penguin is a bird.

Some experiments carried out by Heider (1971) have shown a distinction between central members of a category and peripheral members of the category. She surmised that if subjects have to respond *true* or *false* to sentences of the form *A (member) is a (category)*---for example, *A chicken is a bird*---the response time would be faster if a member is a central member (a good example of the category) than if it is a peripheral member (a poor example of the category). Some of the examples of central and peripheral category members that emerged from her study are listed in Table 1:

Table 1: Heider's (1971) examples

Category	Central Members	Peripheral Members
toy	ball, doll	swing, skates
bird	robin, sparrow	chicken, duck
sickness	cancer, measles	rheumatism, rickets
metal	copper, aluminum	magnesium, platinum
sport	baseball, basketball	fishing, diving
vehicle	car, bus	tank, carriage
body part	arm, leg	lips, skin

Heider's work shows clearly that category membership is not simply a yes-or-no question, but rather, a matter of degree. Different individuals may have different category-rankings depending on their experiences, their world knowledge, and their beliefs.

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1.2 Generality

The meaning of an expression is general in the sense that it does not specify certain details; i.e. generality is a matter of un specification. For example: the meaning of *city* is general because it does not specify whether or not a city is big or small, modern or ancient. *My friend* is general, as it could mean a female friend, a male friend, or just a friend from New Zealand.

Let us now examine the following sentences:

- a. Mary saw John.
- b. Mary changed a baby.
- c. Mary received a degree. (1.3)

The meaning of sentence (a) is general because it does not specify whether or not Mary saw John in a shop, or in a school, or any other place. In (b), Mary could be changing her own baby, or a baby belonging to her husband's ex-wife, or a baby she had kidnapped. The question of whose the baby it is, is left open. In (c), Mary could have an art degree, or a science degree; a BA degree, or a Ph.D degree. Again, the sentence does not say specifically what kind of degree Mary received.

1.3 Vagueness

Vagueness is defined here as an expression which has more than one possible interpretation (i.e. is polysemous). For example, *good* has a range of interpretations: *good (fine) weather*, *good (hard-working) student*, *good (warm-hearted) people*, *good (sexy) legs*, etc. Similarly, the sentence *Mary has my book* could mean 'Mary has a book written by me'; 'Mary has a book owned by me'; 'Mary has a book borrowed by me', etc.

Another type of vague meaning is expressed by 'either...or'. For example, the sentence *I either go to school or stay at home* has at least two possible true readings: 'I go to school' vs. 'I stay at home'. Moreover, in the sentence *I either eat an apple or drink a glass of milk*, the unique meaning of *either ... or* is such that there are three possible true statements involved: 'I eat an apple', or 'I drink a glass of milk', or 'I eat an apple and drink a glass of milk'.

1.4 Ambiguity

Ambiguity is defined as: expressions which have more than one semantically unrelated meaning. In other words, an expression is ambiguous if it has several paraphrases which are not paraphrases of each other. One example often quoted is:

Flying planes can be dangerous. (1.4)

This sentence is ambiguous, since the expression *flying planes* itself has two unrelated meanings: *planes which fly* and *the flying of planes by people*. That is, *flying planes* has two paraphrases which are not paraphrases of each other. Similarly in Chinese, *xinIshengI*³ means 'new student' or 'new life', these two meanings are semantically distinct. Also, *mi3* has two different meanings: 'rice' vs. 'meter'.

2 Kempson's (1977) and Fine's (1975) works

There is a great diversity among linguists in defining fuzziness, generality, vagueness, and ambiguity. As an illustration, here is how Kempson (1977: 124-128) defines four types of what she calls *vagueness*:

- (1) Referential vagueness, where the meaning of a lexical item is in principle clear enough, but it may be hard to decide whether or not the item can be applied to certain objects;
- (2) Indeterminacy of meaning, where the meaning of an item itself seems indeterminate;
- (3) Lack of specification in the meaning of an item, where the meaning is clear but is only generally specified;
- (4) Disjunction in the specification of an item's meaning, where the meaning involves an either-or statement with different interpretation possibilities.

What happens in (1), referential vagueness, is that we do not have clear-cut criteria to distinguish the referential boundary of expressions like *city* or *town*; *mountain* or *hill*; *forest* or *wood*; *house* or *cottage*. For example, the relationship between the expression *city* and a place called *Perth* in Scotland is not absolutely clear, i.e. it is not certain if Perth in Scotland can be called a city. Type (1) it exactly covers the case of what I would call *fuzzy*.

Let us look at Kempson's example, *John's sheets*, to illustrate (2): indeterminacy of meaning. The expression may be used to describe not only the sheets John owns, or the sheets he has made or designed, but also the sheets which go on the bed in which he is sleeping. *John's sheets*, taken in isolation, allow for several possible interpretations; hence there is indeterminacy of meaning. The example is used by Kempson to illustrate the phenomenon of one term (e.g. *John's sheets*) having different possible interpretations, as shown in Fig. (1a) below. However, it is not a case of fuzziness (on my definition), because if we talk about the fuzziness of *John's sheets*, we would examine whether or not the referential boundary of *John's sheets* is clear-cut. This can be represented in Fig. (1b):

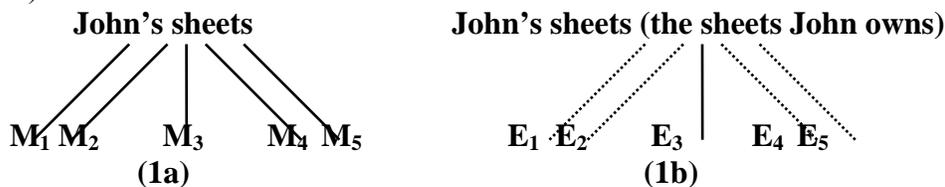


Figure 1: John's sheets

In (1a), the relation between *John's sheets* and its possible interpretations (i.e. M₁, M₂, ...) is clear: M₁, M₂, ... definitely belong to the semantic domain denoted by *John's sheets*, as shown by Kempson's example. By contrast, (1b) reveals the uncertainty between a particular interpretation of *John's sheets* (e.g. *the sheets John owns*) and its referential applicability. This is what a fuzzy expression would depict. In Fig. (1b), a solid line (e.g. E₃) denotes a typical member, and a dotted line indicates a less typical member,

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such as the case in which John and Mary bought the sheets together, but John only paid 45% of the total amount. In this case, John's ownership is not a clear-cut one.

In addition, the indeterminacy of meaning of *John's sheets* in Fig. (1a) could be resolved in context. We may be able to pick up one of those interpretations which fits in a certain context. On the other hand, for Fig. (1b) context may not resolve fuzziness (see Section 5.2 for a further discussion on contextual effects).

As to (3), lack of specification, Kempson says: "The simplest example of lack of specification is an item like *neighbor* which is unspecified for sex, or for that matter, race, or age, etc. It can be applied to people as disparate as a tiny, five-foot Welshman studying Philosophy, and a six-foot Ghanaian girl who has seven children and who only did four years' schooling". In fact, it appears to me that this is a type of *generality* (see Section 1.2 for more discussion on this).

There is a distinction between *unspecified* and *fuzzy*. The concept of *unspecified* denotes an expression not constituting or falling into a specifiable category, whereas the concept of *fuzziness* means an expression having an uncertain extensional denotation. For instance, Kempson calls the expression *neighbor* unspecified in terms of sex, age or race. I would rather say that the expression is fuzzy, because we do not know whether or not a person living one mile away is a neighbor. Fuzziness is a matter of whether or not an entity is denoted by an expression; it does not touch upon the nature of the entity. As far as the example of *neighbor* is concerned, it can be either unspecified (as Kempson implies) or fuzzy (as I imply).

For type (4), disjunction, Kempson discusses *or* in the sentence *The applicants for the job either had a first-class degree or some teaching experience*. The implication that *or* contributes to the sentence is that one of the two conjuncts, or possibly both, are true. That is to say that *or* in this instance may or may not be used in the inclusive sense: an applicant could have a first-class degree, or some teaching experience, or both. Then, the sentence given would be either true or false. This is indeed a case of vagueness in my terms as defined in Section 1.3 above. It would not be a case of fuzziness, because a fuzzy sentence such as *About 200 students left* would have a degree of truth.

To conclude, of Kempson's four types of vagueness only type (1) presents a clear case of fuzziness in my terms, being characterized by having no precise reference for an expression. Types (2) and (4) are cases of vagueness, whereas type (3) is one of generality.

Fine (1975) also explores fuzziness, ambiguity and generality by discussing some hypothetical examples. Suppose that the meanings of predicates, *nice₁*, *nice₂*, *nice₃*, are given by the following clauses:

- (1) (a) n is *nice₁* iff $n > 15$,
- (b) n is not *nice₁* iff $n < 13$;
- (2) (a) n is *nice₂* iff $n > 15$,

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- (b) n is nice₂ iff $n > 14$;
(3) n is nice₃ iff $n > 15$. (2.1)

Predicate *nice*₁ is fuzzy, because it is under-determined. As shown in (1), n is *nice*₁ iff $n > 15$ and n is not *nice*₁ iff $n < 13$. That is, the range from 13 to 15 is a gray area; we do not know whether or not this area belongs to *nice*₁. To give an example, *The students' number is about 200*, we might say that 199 is definitely *about 200* and 500 is definitely not *about 200*, but we are less certain whether or not 290 is *about 200*.

On the other hand, *nice*₂ is ambiguous, because it is over-determined. Namely, if n is *nice*₂ iff $n > 15$ and n is *nice*₂ iff $n > 14$, then *nice*₂ could have two values simultaneously, i.e. 14 and 15. A term that has two values at the same time is over-determined. For example, *bank* is ambiguous because it has two readings: the rising ground bordering a lake or river, or a financial institution.

Finally, *nice*₃ is highly unspecific, because n is *nice*₃ iff $n > 15$. That is to say, any number above 15 is *nice*₃, its meaning thus is general (the meaning of *item* is considered to be general when it does not specify the nature of the entities it denotes).

3 Semantic tests

In this section, we primarily examine semantic evidence.

3.1 One or more than one meaning

An ambiguous expression has more than one meaning, and they are semantically unrelated. Consequently, ambiguous words tend to have separate dictionary entries. As an illustration, the Chinese word *mi3* is ambiguous, as it means either *rice* or *meter*; thus it has two entries in, for example, *Modern Chinese Dictionary* (1979: 773, Beijing: The Commercial Press). The two senses are not semantically related in any way.

A vague expression has one meaning but more than one interpretation, and the interpretations are semantically related. Thus, a vague word tends to have a single dictionary entry. For example, the Chinese vague word *kan4* has different interpretations: *kan4 dian4shi4* 'to watch TV'; *kan4 shu1* 'to read a book'; *kan4 peng2you* 'to visit a friend', etc., but only one dictionary entry in *Modern Chinese Dictionary* (ibid.: 625). The interpretations are all derived from the meaning of *kan4*--- an action involving some kind of eye motion.

Similarly, a general or a fuzzy expression has only one meaning. For example, the Chinese word *ren2* 'person' has only one general sense, and it does not specify sex, height, or nationality. Also, the Chinese word *gaol* 'tall' has one single sense, and any reference derived from this sense is undecided. Consequently, both general and fuzzy words have a single dictionary entry in *Modern Chinese Dictionary* (ibid.: 949 & 357).

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Let us now examine some English examples. *Bank* as an ambiguous word has two entries for its two distinct meanings: *a financial institution* and *a mound, pile, or ridge* in *Longman Dictionary of the English Language* (1984: 112, Madrid: Longman). On the other hand, a general word such as *sheep* (ibid.: 1372), or a fuzzy word such as *tall* (ibid.: 1531) has only one dictionary entry⁴.

3.2 Referential or non-referential

As defined above, one distinct characteristic of fuzziness is that it has no clear-cut referential applicability. Take *tallness* as an example: its general or definitional meaning may be defined as *a greater height than a norm or an average*; thus, it is not fuzzy. Fuzziness emerges when we try to work out the concept's reference. That is, there is indeterminacy about whether or not a certain entity in the real world belongs to the semantic domain denoted by *tall*. How tall is tall? The norm of tallness varies, depending on many non-linguistic factors. A tall female may not be tall, compared to a standard for male; in turn, a tall male may not be tall compared to a tall professional male basketball player; a tall Chinese man may not be tall according to the New Zealand standard, etc. It appears that the reference of *tallness* is not clear-cut; hence it has to be pragmatically determined, if it can be determined at all.

On the other hand, ambiguity, generality, and vagueness are not much a matter of the referential meaning. They are more to do with sense or interpretation than with reference. For example, when talking about an ambiguous word, say *bank*, we refer to its two distinct senses. For a vague word, e.g. *good*, a number of possible interpretations would be in focus. A general word, e.g. *person*, is unspecified in terms of its sense, not as to its referential boundary.

Let us now have a look at fuzziness and vagueness. A fuzzy expression is defined as an expression which has no clear-cut referential boundary. By contrast, a vague expression is defined as an expression which has more than one related interpretation, and the question of whether or not these interpretations have a clear-cut boundary is simply irrelevant. For instance, the referential boundary of *about 200* is not determinate, but rather a matter of fuzziness. On the other hand, vagueness concerns more than one related interpretation. For example, *John's book* has the following possible interpretations: the book John owns, the book John wrote, the book he has been reading, the book he was carrying when he came into the room, etc. Whether or not these interpretations have a clear-cut boundary is not a relevant matter as far as vagueness is concerned. However, when we talk about the fuzziness of *John's book*, we would have to decide whether or not the denotation of a possible interpretation of *John's book* is determinate. For instance, *the book John wrote* is fuzzy, because (co-)authorship is fuzzy: for example, in the case of several authors, how much of the book would John have to write to become its author?

4 Syntactic tests

In this section, I will consider a number of tests based on syntactic evidence.

4.1 The identity test

A verb phrase pro-form test (e.g. Lakoff, 1970) can be used to distinguish ambiguity, vagueness, fuzziness, and generality. Let us examine:

- a. I went to a bank this morning; so did Mary.
- b. I have eaten; so has Mary.
- c. I am tall; so is Mary.
- d. I have a friend; so has Mary. (4.1)

The VP-deletion that occurs in these sentences requires identity, at least sloppy identity, of senses between the two conjuncts. Sentence (a) means either 'I went to a riverside this morning; Mary went to a riverside, too' or 'I went to a financial institution this morning; Mary went to a financial institution, too'; but not 'I went to a riverside this morning, Mary went to a financial institution'. The reason is that the two senses of *bank* here are not semantically related at all, so they cannot be used in one single sentence, due to their incompatibility. By contrast, (b), a vague sentence, could mean 'I have eaten some soup, Mary has eaten some bread', where 'eat (some soup)' in the first conjunct and 'eat (some bread)' in the second conjunct are compatible semantically. Similarly, the fuzzy sentence (c) can mean 'I am 5' 9", Mary is 6' 1"', where 5' 9" and 6' 1" are both denoted by *tall*. Finally, (d) is a sentence containing a general expression *friend* without specification of sex, nationality, etc. The sentence works in the same way as (b) and (c), in that it may mean, e.g. 'I have a Chinese friend, Mary has a New Zealand friend'. Both 'Chinese friend' and 'New Zealand friend' are denoted by the general expression *friend*, so the two expressions are not incompatible semantically.

It must be emphasized that this VP-deletion requires identity of senses between the two conjuncts, rather than identity of interpretations or references. If it required identity of interpretation or reference, then at least (b) and (c) would have failed the test, because its two conjuncts are not interpretatively or referentially identical. That is, for (c) one reference of *tall* (5'9") is not equivalent to the other reference (6'1")⁵.

4.2 The contradiction test

A contradiction test has been proposed to test ambiguity (e.g. Zwicky and Sadock, 1975 & Channell, 1994). The test is in the form of 'X predicate (positive) Y but X predicate (negative) Y'. Let us examine:

- a. It is a bank, but it isn't a bank.
- b. ?It is John's book, but it isn't John's book.

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c.?It is around two o'clock, but it isn't around two o'clock.

d.?It is a person, but it isn't a person. (4.2)

In (a), the first conjunct uses one sense of the ambiguous word *bank*, say 'a riverside'; the second conjunct uses the other sense, say 'a financial institution'. Because the two senses are not semantically compatible, the sentence makes sense as a contradiction. However, sentences (b), (c), and (d) do not make much sense, because the vague expression *John's book*, the fuzzy expression *around two o'clock*, and the general expression *person* do not have two meanings that are semantically incompatible, as discussed in the last section.

For example, *John's book* may have two possible interpretations: *a book John owns* or *a book John bought*. The two differ, but are not incompatible, since they both describe, or refer to, a possessive relation between John and the book. That is, the two interpretations cannot be totally contradictory, in which case (b) would be impossible. In (c), *around two o'clock* may denote 2:05 or 1:55. Thus, sentences like 'It's 2:05' and 'It's 1:55' would be both true. This compatibility is why (c) makes no sense. Finally, both females and males are persons, so (d) is not valid because of lack of specification in the meaning of *person*.

4.3 The 'how' test

As stated above, fuzziness is a matter of degree: a degree of membership or a degree of truth. For example, 2:05 is more of *around two o'clock* than 2:30, i.e. the former ranks higher on the membership scale than does the latter. Similarly, the sentence *It is 2:05* is more true of *It is around two o'clock* than that of *It is 2:30*.

For this reason, fuzziness may be tested out by a 'How' question, such as *How tall is tall?* or *How many is many?* This kind of question aims for the referential meaning of an expression. Because fuzzy expressions have no clear-cut referential boundaries, an answer to the 'How' question could be an *It depends*, or similar expression. The reason we can put a 'How' question to fuzzy expressions is that they represent a continuum. For example, in the sentence *Mary almost won the prize*, the referential applicability of *almost* cannot be pinpointed exactly, but is identifiable as belonging somewhere in a continuum. The 'How' question to ask would be *How much is almost?*; our answer would not be definite due to the fuzziness of *almost*.

On the other hand, when confronted with an ambiguous, general, or vague expression, we would not normally ask a 'How' question, not giving a precise answer. For example, it does not really make much sense if we ask a 'How' question following the sentence *I went to a bank today*, if it is the ambiguous meaning of *bank* we are interested in. Rather, the kind of question we may ask is *What do you mean by 'bank'?* However, this does not mean that we cannot ask a 'How' question at all in the case of *bank*. One may ask *How big does a riverside have to be to be a bank?* to find out if there is a referential boundary for *bank*, meaning *riverside*. This time we are talking about the referential boundary of the expression, i.e. what we are concerned about in this case is a fuzzy

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meaning. Hence, the odds are that, when a 'How' question is asked with no precise answer being given (or even possible), we are dealing with fuzziness.

4.4 The hedge test

A hedge word is defined here as a word that brings in a fuzzy reading (e.g. *around* in *around two o'clock*), or modifies fuzziness to an extent (e.g. *very* in *very many*). For example, *two o'clock* could be precise on its own⁶, but it becomes fuzzy when combined with *around*. Hedges such as *about*, *or so*, *-odd*, *almost*, *-ish*, *nearly* behave in the same way as *around* in that they bring in a fuzzy reading. Also, the degree of fuzziness of *He is tall* can be modified by hedges. For example, *very* in *He is very tall* pushes the degree upwards; while *somewhat* in *He is somewhat tall* pushes the value downwards. Lakoff (1973), Channell (1994), and Zhang (1996) discuss the matter of hedges at length.

It appears that a test using a hedge can single out fuzziness. My assumption is that any expressions which may be modified by a hedge are fuzzy in nature. In other words, fuzziness can be tested by adding a hedge, such as *about*, *or so*, *sort of*, *very* or *somewhat*. A prerequisite for this kind of test is that the meaning of an expression can be measured in degrees, i.e. it must be able to be scaled. Let us examine:

- a. It is sort of a bank.
- b. It is sort of John's book.
- c. It is sort of a city.
- d. He is sort of an engineer. (4.3)

As (4.3) shows, all four sentences convey a fuzzy meaning regardless of what kind of meaning they denote without *sort of*. For example, *It is a bank* is ambiguous; while *It is sort of a bank* is both ambiguous and fuzzy. It is ambiguous because *bank* has two distinct meanings; it is fuzzy because *sort of* singles out the fuzziness in *bank*, whatever it denotes. If *bank* in (a) means a financial institution, then *sort of* indicates that for some reason (e.g. size, the nature of business) it is not quite a financial institution. If *bank* means a riverside, then *sort of* says that for some reason (e.g. size, location) it is not quite a river bank.

In the same vein, (b) is both vague and fuzzy. It is vague because we do not know whether *John's book* is interpreted as being a book John wrote, or a book John bought. Its fuzziness, on the other hand, is caused by adding *sort of*, i.e. whatever John's book is meant to be in this case, it has a fuzzy reference. (c) is originally fuzzy, with *city* undefined in terms of its reference. *Sort of* could either make the fuzziness more obvious or make the meaning fuzzier. Similarly, the meaning of (d) is general because of *engineer* (e.g. unspecification of sex, nationality, etc.), and fuzzy because of *sort of*.

4.5 The yes/no test

Fuzziness-vagueness-general-ambiguity. *Journal of Pragmatics* (Elsevier Science B.V. in New York & Amsterdam), 1998, 29 (1): pp 13-31.

The discussion in the last section implies that an entire expression may be ambiguous, vague, fuzzy, and general. For example, in Chinese the sentence *Zhang1 xian1sheng you3le xin1sheng1* is ambiguous, because it has two distinct meanings: 'Mr. Zhang has a new student' or 'Mr. Zhang has a new life'. The sentence is also general, because it does not specify whether the new student Mr. Zhang has is a woman or a man, tall or short. Moreover, the sentence is fuzzy because the referential boundary of *new* is indeterminate, e.g. we do not know precisely what kind of life is a new life.

A yes/no question test may help us determine what kind of meaning we are talking about. In answering a question like *Zhang1 xian1sheng you3 xin1sheng1 le ma?* 'Does Mr. Zhang have a new student/life?', the answer would be a straight yes or no, if there is an ambiguous meaning in focus, depending what we know about Mr. Zhang. That is, the answer would be either *Shi4, Zhang1 xian1sheng de2dao4 le xin1sheng1* 'Yes, Mr. Zhang has had a new student/life.' or *Bu4, Zhang1 xian1sheng mei2you3 de2dao4 xin1sheng1* 'No, Mr. Zhang has not had a new student/life'. Moreover, if it is a general meaning of the sentence we are interested in, the answer would still be a straight yes or no.

However, if it is the fuzzy meaning of the sentence that is intended, we may well be answering *You3 ji3fen1* 'kind of' in Chinese. Furthermore, to reply to a question like *Zhang1 xian1sheng you3 xin1sheng1 le ma?* 'Does Mr. Zhang have a new student/life?' where fuzziness is intended, one person may answer yes, another no, very much depending on the individual's interpretation of the word *new*. By contrast, we may have less disagreement regarding the answer if it is ambiguity that is in focus. In other words, if Mr. Zhang indeed has a new student and we all know that, then our responses to the question would be unanimously positive.

We may conclude that using an expression like *kind of* in answering a yes/no question indicates that it is fuzziness that is in focus, since only fuzzy expressions allow a scalar reading.

4.6 Homonymy and polysemy

Let us start by discussing the concepts of *word* and *lexical item*. It is considered in this paper that the set of lexical items is a subset of the superset of words. For instance, there is one word *tap*, but there are two lexical items: *to give someone a tap on the shoulder*, and *a water tap*. The Chinese word *hui4* has at least two lexical items: *ability* and *a meeting*. Moreover, each lexical item can be divided into different semes. For example, the lexical item *hui4* 'ability' has at least two semes: *can* and *understand*.

At the level of words, if a word corresponds to more than one unrelated lexical item, then we speak of homonymy. An example of homonymy is the word *tap*, since its two lexical items, as mentioned above, are not semantically related. At the level of semes, if the semes derived from the same lexical item are semantically related to each other, then we call this *polysemy*. Consider the Chinese word *hui4* in the following sentences:

Fuzziness-vagueness-generality-ambiguity. *Journal of Pragmatics* (Elsevier Science B.V. in New York & Amsterdam), 1998, 29 (1): pp 13-31.

- a. Wo3 hui4 shuo1 Ying1wen2.
 'I can speak English.'
- b. Wo3 hui4 yi4 de dian3dian3tou2.
 I understand meaning particle nod
 'I nodded understandingly.' (4.4)

The two semes---*can* and *understand*---in (a) and (b) represent two related semes: presumably, if one can do something, then one also understands what one is doing. The taxonomy in Fig. 2 illustrates homonymy and polysemy, using the Chinese word *hui4*:

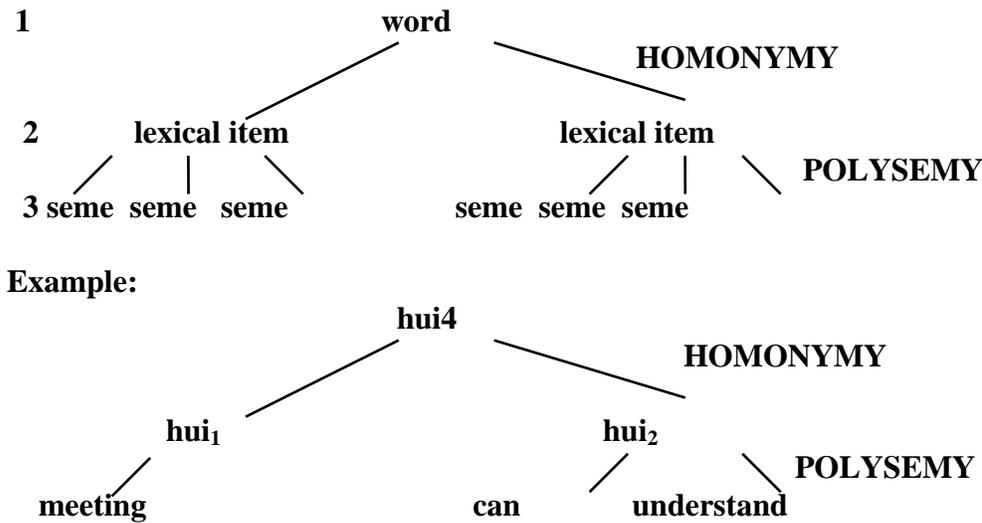


Figure 2: A Chinese example of homonymy and polysemy

Between the three levels of word, the lexical item, and seme, two relations obtain: homonymy and polysemy. Homonymy is a property of a word represented by the relation between its lexical items. Polysemy is a property of a lexical item represented by the relation between its semes. The question is how these three levels and two relations are connected to the distinction between ambiguity, vagueness, generality, and fuzziness. Let us examine Fig. 3:

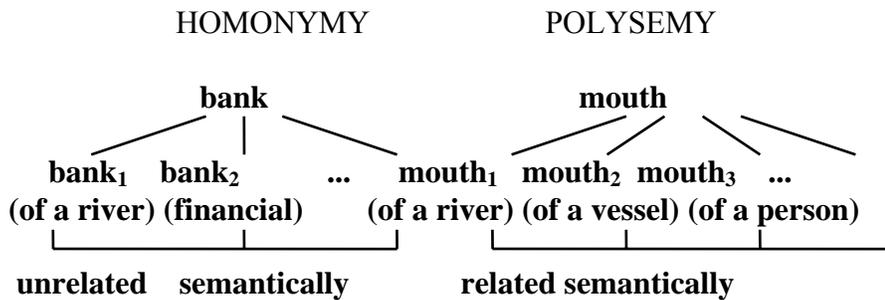


Figure 3: English examples of homonymy and polysemy

Fuzziness-vagueness-generality-ambiguity. *Journal of Pragmatics* (Elsevier Science B.V. in New York & Amsterdam), 1998, 29 (1): pp 13-31.

It appears that ambiguity exists on the word level and is connected with homonymy only, e.g. the word *bank*, illustrated in Fig. 3. Vagueness, on the other hand, is represented by polysemy, as *mouth* in Fig. 3. Fuzziness is also not connected to *homonymy*. For instance, fuzziness between *dark red* and *pale red* exists in terms of polysemy under *red*. In terms of levels, fuzziness and vagueness may occur at all three levels---the word, the lexical item, and the seme.

With regard to generality, this may occur with a word, a lexical item, or a seme (as in the case of *person*). Here, the matter of homonymy vs. polysemy appears not to be relevant. For example, *person* is general because it does not specify sex, height, nationality, etc. Thus, generality has no connection with the two discussed phenomena.

Finally, ambiguity has two forms: syntactic and lexical. To take an example of syntactic ambiguity: the sentence *Young men and women came to the party* has at least two readings. Since generality, vagueness, and fuzziness are primarily involved with meaning per se, different syntactic structures do not produce general/vague/fuzzy meanings. This further differentiates ambiguity from the rest.

5 Pragmatic tests

A discussion of pragmatic factors helps us to further identify the distinction among ambiguity, vagueness, generality, and fuzziness, as there are some testable differences between the four concepts with respect to pragmatics.

5.1 Language users' judgments

Fuzziness has to do with language users' different judgments. For example, the sentence *Grace is beautiful* may be true as far as John is concerned, but it may not be quite true according to Mary's standards. Hence, individually differing judgments may create fuzziness.

On the other hand, vague, general, and ambiguous meanings do not depend on an individual's judgment, as least not as much as does fuzziness. For example, in working out the truth value of the sentence *Grace went to a bank*, we depend primarily on whether or not Grace went to a bank (a riverside or a financial institution). An individual such as Mary or John's judgment does not count much here. Similarly, as far as the general meaning of *person* (e.g. woman or man) or the vague meaning of *good* (e.g. a good student or good food) is concerned, our individual judgments do not play a significant role. For example, in the sentence *I need a person to help me with this*, whether this person is male or female will not affect its truth value; our judgments have no business here. Also, among the possible interpretations of *good* are *a good (student)*, *good (food)*, *good (legs)*, etc.; again, this vagueness does not depend on people's judgments. For example, in the sentence *John is good at doing his studies*, we would not disagree that this means: *good* as in *a good student*, rather than *good* as in the case of *good food*.

Fuzziness-vagueness-generality-ambiguity. *Journal of Pragmatics* (Elsevier Science B.V. in New York & Amsterdam), 1998, 29 (1): pp 13-31.

The point being made here is that fuzziness is more closely related to language users' judgments than are vagueness, generality, and ambiguity. For example, *bank* is ambiguous not because of people's different judgments, but because it has two senses, and thus is ambiguous in its own right. However, *beauty* is fuzzy due to the fuzziness of the concept it denotes, to the fuzzy nature of language users' perceptions on its referential boundary, etc. This implies that when we study fuzziness, we may also take certain non-linguistic factors into account. (For further discussion, see Zhang (1996).)

5.2 Context

From what was stated in the last section, viz., that fuzziness has to do with our individual judgments, it follows that fuzziness may not be 'defuzzified' by a linguistic context alone; whereas disambiguation, 'de-vaguefying', or 'de-generalisation' could be done in and by a linguistic context. The reason is that it is difficult for human beings to reach an agreement on the referential applicability of fuzzy expressions.

The elimination of ambiguity can be carried out if an ambiguous word occurs in a given context. For example, *punch* is ambiguous in isolation, but it may not be ambiguous in a given context. *Punch* means *to hit* in *I was punched by him*; or *a kind of drink* in *I made gallons of rum punch for the party*. Channell (1994: 35) argues correctly that ambiguity is rarely a factor in real communication, because hearers read off a meaning without even realizing that there could have been another one.

The same may be the case for vagueness, i.e. vagueness may also be removed by referring to a context. For instance:

- a. I read John's book, which was written by his father.
 - b. John and Mary have both written books and I have just managed to get John's book.
- (5.1)

From the context we know that in (a) *John's book* means the book he possesses, not the one he wrote; whereas in (b) *John's book* means the book he wrote. When *John's book* stands in isolation, it is vague; but the vagueness could be removed once it is associated with context. Similarly, *person* is no longer general in the sentence *I need a person to help me with this heavy lift*; in this case we would think that a man, rather than a woman, is referred to by *person*.

However, in the case of fuzziness, context is irrelevant to 'defuzzification'. For instance, *Mary is about 20 years old* is fuzzy, because we cannot reach an agreement on the exact numerical value of *about 20 years old*. The sentence remains an approximation in whatever context. Whereas vagueness, generality and ambiguity are contextually resolvable, fuzziness may be inherent.

5.3 Grice's co-operative maxims

Fuzziness-vagueness-generality-ambiguity. *Journal of Pragmatics* (Elsevier Science B.V. in New York & Amsterdam), 1998, 29 (1): pp 13-31.

Grice's (1975) Co-operative Principle assumes, at its simplest, that language users follow four rules for conversation: the maxim of Quality (be truthful, according to the information one has); the maxim of Quantity (be informative, but not overinformative); the maxim of Relevance (be relevant to the conversation) and the maxim of Manner (be clear and brief).

The relevance of the four maxims to our discussion is that they may license generality, vagueness, and fuzziness, but not ambiguity. For example, although the meaning of *Mary is tall* is fuzzy, and *Mary hit me* is general in terms of intentionality (i.e. whether or not she hit me on purpose), we use such expressions in communicating and have no problem with them. The reason is that these kinds of sentence comply with Grice's maxims. Saying *Mary is tall* is co-operative because one either may try to be truthful, as one who genuinely does not know Mary's exact height while knowing she is at least of some height; or one may not want to be overinformative because information about a person's exact height is simply not needed in everyday conversation; or one may try to be relevant because a precise figure of Mary's height is not relevant in a particular situation; or finally, one may try to be brief by not mentioning any exact figure.

However, if one knows Mary's exact height, but still says *Mary is tall*, one may violate the rule of being truthful or clear by not specifying an exact height. According to Grice, this kind of violation may create certain effects called implicatures. The implication intended by the speaker here may be that 'the exact figure of Mary's height does not need to be specified: what is important is my judgment that Mary is a tall person', according to whatever criteria for *tallness* the speaker has in mind.

In the same vein, if one utters the sentence *Mary hit me*, one follows the maxims. The reason is that there may be no need to specify whether or not Mary hit me on purpose: all we need to know is the fact that Mary hit me. Also, saying a vague sentence, such as *John has Mary's book*, is being co-operative, as we normally do not need to specify what exactly *Mary's book* means. When we hear the sentence, do we really care whether that book is written by Mary or owned by Mary?

However, an ambiguous sentence may not be appropriate in a co-operative setting, as it creates confusion, such as the Chinese sentence *Wo3 you3le xin1sheng1* means 'I have a new student' or 'I have a new life'. Uttering this kind sentence without further specification flouts the maxims: i.e. one is not being co-operative. To be more specific, the speaker of the ambiguous sentence is effectively untruthful, uninformative, and unclear. There is no question that the speaker knows what he means by the sentence, but he should make this meaning clear, rather than leave it ambiguous. Neither would it be a matter of creating some kind of special effect, because if my reading (as a hearer) of the sentence *Wo3 you3le xin1sheng1* 'I have a new student/new life' is unclear, I don't know what precisely the speaker tries to convey by this sentence. Consequently, whatever the speaker wants to imply by saying this sentence seems to miss the mark.

I conclude that while vagueness, generality, and fuzziness may fit within Grice's conversational rules, ambiguity does not. It follows that fuzziness, generality, and

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vagueness are appropriate and effective: the role they play in communication is just as important as that of other linguistic phenomena (see also Channell, 1994 and Zhang, 1996 for details). By contrast, we should try to steer clear from using ambiguous sentences.

Finally, here is an overall profile of the four concepts corresponding to the various parameters discussed above, as summarized in Table 2:

Table 2: Ambiguity---vagueness---generality---fuzziness

	Semantic tests	
	One or more than one meaning	Clear-cut reference
Ambiguity	more than one	n/a
Vagueness	one	n/a
Generality	one	n/a
Fuzziness	one	no

	Syntactic tests					
	Identity	Contradiction	How	Hedge	Yes/no	Homonymy/polysemy
Ambiguity	no	yes	no	no	yes	homonymy
Vagueness	yes	no	no	no	yes	polysemy
Generality	yes	no	no	no	yes	n/a
Fuzziness	yes	no	yes	yes	no	polysemy

	Pragmatic tests		
	Judgment	Context	Grice's co-operative principle
Ambiguity	no	yes	no
Vagueness	no	yes	yes
Generality	no	yes	yes
Fuzziness	yes	no	yes

As Table 2 shows, different tests single out various differences among the four concepts. In general, vagueness, generality, and fuzziness are under-determined, whereas ambiguity is over-determined. Fuzzy expressions have no clear-cut referential boundary; their very nature enables them to pass tests like the 'Identity' test, the 'How' test, and the 'Hedge' test, but makes them fail tests like the 'Contradiction' test and the 'Yes/no' test.

Fuzziness-vagueness-generalness-ambiguity. *Journal of Pragmatics* (Elsevier Science B.V. in New York & Amsterdam), 1998, 29 (1): pp 13-31.

Also, fuzzy expressions depend intimately on language users' judgments and cannot be resolved by context, whereas they are compatible with Grice's maxims.

One important point, worth to mention, is that we tend to examine an expression in a uni-dimensional manner, i.e. as either ambiguous or vague. In fact, an expression can be ambiguous, vague, general, or fuzzy, depending on how we look at it. For example, the Chinese word *mi3* can be ambiguous, because it has two different senses ('rice' vs. 'meter'); it is general in terms of unspecification of color or shape for *rice*, and it is also fuzzy, as the reference to *rice* may not be clear-cut. This indicates that we may have to use a multi-dimensional approach to examine an expression with respect to the four linguistic phenomena.

The task of distinguishing the four concepts is by no means an easy one, as many of the matters discussed here are extremely complex and controversial. The work reported in this paper leave open some questions, for which further research is called.

6 Conclusions

The discussion in this paper shows that *fuzziness*, in my terms, has little to do with *misuse*; it is, indeed, a technical term. Fuzziness differs from ambiguity, generality, and vagueness in that it refers to an indeterminate referential boundary. Fuzziness is inherent in the sense that it is not resolvable, even with resort to context. On the other hand, vagueness, generality, and ambiguity may be contextually resolved, i.e. some readings can be eliminated by their incompatibility with a given context. An implication of this may be that ultimately ambiguity, generality, and vagueness are not as pervasive and important as is fuzziness in the study of meaning.

I also conclude that fuzziness, generality and vagueness are licensed by Grice's conversational co-operative maxims. This opposes the conventional notion that these concepts represent 'bad things' in language, as it has long been taken for granted. In fact, the three are normal and useful linguistic phenomena, rather than abnormal and undesired. All four, and fuzziness in particular, play a unique role in language communication.

Finally, our discussion has shown that some non-linguistic factors (e.g. language users' judgments) also have an important impact on fuzziness. This leads us to speculate that it may be beneficial to not only ask questions about language per se, but to also explore psychological factors. A meaning study would be more adequate if we conduct an integral investigation combining semantics, pragmatics, and psychology.

References

Channell, Joanna, 1994. *Vague language*. UK: Oxford University Press.

Fuzziness-vagueness-generality-ambiguity. *Journal of Pragmatics* (Elsevier Science B.V. in New York & Amsterdam), 1998, 29 (1): pp 13-31.

Crystal, D, 1991. A dictionary of linguistics and phonetics. Oxford: Blackwell Publisher.

Fine, K, 1975. Vagueness, truth, and logic. *Synthese* 30: 265-300.

Geeraerts, Dirk, 1993. Vagueness's puzzles, polysemy's vagaries. *Cognitive Linguistics* 4 (3): 223-272.

Grice, H.P, 1975. Logic and conversation. In: P. Cole and J.L. Morgan, eds., *Syntax and Semantics* (Vol. III), 41-58. New York: Academic Press.

Heider, E.R, 1971. On the internal structure of perceptual and semantic categories. Berkeley: University of California, ms.

Kempson, Ruth, 1977. *Semantic theory*. Cambridge: Cambridge University Press.

Kooij, Jan G. 1971. *Ambiguity in natural language*. Amsterdam: North-Holland Publishing Company.

Lakoff, George, 1970. A note on vagueness and ambiguity. *Linguistic Inquiry* 1(3): 357-359.

Lakoff, George, 1973. Hedges: a study in meaning criteria and the logic of fuzzy concepts. *Journal of Philosophical Logic* 2: 458-508.

McCawley, James D. 1981. *Everything that linguists have always wanted to know about logic but were ashamed to ask*. Oxford: Basil Blackwell.

Peirce, C.S, 1902. Vagueness. In: J.M. Baldwin, ed., *Dictionary of philosophy and psychology*, (Vol. II). New York: Macmillan.

Sainsbury, R.M, 1991. *Concepts without boundaries*. Department of Philosophy, King's College, University of London, monograph.

Tuggy, David, 1993. Ambiguity, polysemy, and vagueness. *Cognitive Linguistics* 4 (3): 273-290.

Ullmann, S, 1962. *Semantics*. Oxford: Blackwell.

Zadeh, Lotfi A, 1965. Fuzzy sets. *Information and Control* 8: 338-353.

Zhang, Qiao, 1996. *The Semantics of fuzzy quantifiers*. Ph.D. thesis, Department of Linguistics, University of Edinburgh, U.K.

Zwicky, Arnold M. and Sadock, Jerrold M., 1975. Ambiguity tests and how to fail them. In: John P. Kimball, ed., *Syntax and Semantics*, 1-36. New York: Academic Press.

Notes

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² Sainsbury (1991) argues that it is inappropriate to say that some concept has a fuzzy boundary, because the term *boundary* must be understood as a precise one, otherwise there is no boundary at all. Therefore, Sainsbury suggests using *boundariless*. Nevertheless, it seems to me that something with a fuzzy boundary is not the same as something without a boundary at all. Take *about 20 years old* as an example; there either is uncertainty about its boundary or there is disagreement on the precise boundary of the concept. That is, whether or not 16 or 26 is within the boundary is undetermined. However, this does not mean that the concept is boundariless, because we would not agree if one says that a one-month old baby is within the boundary of *about 20 years old*.

³ Expressions in Chinese (Mandarin) are represented in *pinyin*---a common phonetic system used to symbolize Chinese characters. Also, the number in the end of each syllable denotes one of the four Mandarin tones. Those syllables without a tone mark are neutral tones. The English translation is in single quotes.

⁴ All we can say here is a trend that an ambiguous expression tends to be given more than one dictionary entry. However, the unreliability of dictionary entries must also be stressed.

⁵ It should be emphasized that there is some gray area with this kind of test (see Zwicky and Sadock (1975) for details).

⁶ Precise numbers may be used as approximations, though. For example, *I will meet you at two o'clock* could mean 'I will meet you at around two o'clock'.