General Semantics and Non-Declarative Sentences

A common approach to semantics is to do intensional semantics, i.e. to identify meanings of sentences with the things that determine when the sentence is true and meanings of sub-sentential parts of languages with how they contribute to the thing that determines when a sentence is true. If one proposes intensional semantics as the right or best way to do semantics, one needs to show how questions and commands fit within an intensional semantic theory. However, one might object and some have, that meanings of questions and commands are not truth-valued entities and, hence, there is no way to account for their meanings within a theory of semantics that roughly speaking identifies meanings with what determines when a statement is true. Hence, since all natural languages contain questions and commands, any intensional semantics is at best an incomplete semantic theory for natural languages. Some objectors might argue that questions and commands are clear evidence that intensional semantic theories are wrong.

In this paper, I attempt to answer the intensional semanticist's burden to give an intensional semantics for questions. I take David Lewis's *General Semantics*¹ as a paradigmatic intensional semantics and outline it in section 1. In section 2, I discuss a few proposals for dealing with non-declarative sentences and give reasons to worry that they are inadequate. In section 3, I present a novel theory of question semantics and briefly discuss commands and other putative sentences. In section 4, I answer a few objections to the theory of question semantics presented in section 3. It will be clear that, any intensional semantics with a similar categorical approach to grammar will be able to adopt the proposals given below.

1. Categorial Grammars, Intensions and Transformations

David Lewis's semantics for declarative sentences is as follows. A categorial grammar is given for each language. For each of the basic categories of a categorial grammar, one stipulates a kind of extension and an appropriate kind of intension for expressions of that category. Each lexical item of the language is then assigned a category and an intension appropriate to that category. There may be a distinction between surface grammar and grammar at a "lower level" because of the rigid structures of a categorial grammar; in such a case, a transformational element is introduced. Meanings are identified with intensionally isomorphic phrase markers, minus their lexical items.

A categorial grammar consists of a set of basic categories; Lewis' consists of three: sentence (S), name (N) and common noun (C). Further, there are infinitely many derived categories; for any categories $c, c_1, ..., c_n$ there is a derived category, $(c/c_1, ..., c_n)$. In addition to the categories, there are context-free phrase structure rules corresponding to each derived category. These rules specify that if any expression of some derived category, $(c/c_1, ..., c_n)$, is concatenated with an expression of the category c_1 , then ..., and ultimately with an expression of the category c_n , then the result is an expression of the category c. Finally, each item of the lexicon of the language is assigned to a category.

There are different kinds of meaningful entities. The meaning of a sentence determines whether it s true or false in a context of use. The meaning of a name determines the thing that it picks out in a context of use. The meaning of a common noun determines the set of things that it picks out in a context of use. Accordingly, the

extension of a token of a sentence is its truth-value; the extension of a token of a name is the individual to which it refers; the extension of a token of a common noun is the set of things to which it applies. The extensions of tokens of the same type sometimes vary. At least one of the features of a meaning is that a meaning determines how the extension of a token of language is dependent upon a number of other factors. A good semantic theory will thus tell two things: what factors combine with a meaning to give an extension and what kind of entities are these meanings that determine extensions of expressions.

The package of factors that combine with meaning to give an extension is an index. Each index is an ordered set with coordinates that have as their domain different kinds of things that are features of what determines the relation of a meaning to an extension of an expression that has that meaning. There is a possible worlds coordinate; there are six context coordinates: a speaker coordinate, an audience coordinate, a previous discourse coordinate, a time coordinate, a place coordinate, an indicated-objects coordinate; finally there is an assignment coordinate, which is an infinite sequence of things that gives the values of any variables in open sentences such as 'x loves Frodo'.² Lewis is open to the possibility that this is incomplete. This incompleteness would not be a concern since adding or even subtracting coordinates from the index is only a minor modification of the theory. (Below I shall discuss a theory on which the index is just a possible world and indexicality is treated apart from the index.)

Lewis says that, since functions are entities that determine the relation of dependence of one thing upon another, meanings are (in part) a kind of function. Lewis has in mind functions in the "most general set-theoretic sense" in which any in which the domain of arguments and the range of values may consists of any kind of entities and in

which the relation between the two need not be specifiable by any simple rule. Any function from indices to appropriate extensions for sentences, names or common nouns is an intension. An *appropriate* intension for any basic category is a Carnapian intension, i.e. a function from indices, which are arguments, to extensions, which are values. An appropriate intension for a sentence is any function from indices to truth-values; an appropriate intension for names is any function from indices to individuals, an appropriate intension for common nouns is any function from indices to sets.

The appropriate intensions for derived categories are not Carnapian intensions.³ Most adjectives, (C/C)'s, for example, do not have an extension. Rather, adjectives take a common noun and make a new, (usually) different common noun; the intension of such a compound common noun is determined by the intension of the common noun and the intension of the adjective. Generally speaking, the intension of any derived category, $(c/c_1, ..., c_n)$, is a function from c_1 -intensions, ..., and c_n -intensions to c-intensions. Specification of the intension of complex derived categories becomes fairly complex. (Says Lewis of adverbs, (S/N)/(S/N): "I promised simplicity; I deliver functions from functions from functions to functions to functions from functions.")

Meanings are not just intensions. 'Frodo wears the Ring or he doesn't' and 'Gandalf likes Sam or he doesn't' both have the same intension, viz. truth at any index, but they differ in meaning. Thus, Lewis imports the notion of intensional isomorphism and identifies⁴ meanings with "semantically interpreted phrase markers minus their terminal nodes: finite ordered trees having at each node a category and an intension appropriate to that category." Each tree is a function that assigns to each member of the set of nodes of the trees an ordered pair of a category and an intension appropriate for

that category (hereafter, a 'category-intension pair'); the top most node is <>, <1> is the left most node under <>, <1 1 > is the left most node under <1>, <2> is the node immediately to the right of <1> and so forth. Trees "look" like this:



Each intersection and each terminus of a "branch" is a node. Lewis goes into greater and more formal detail than this; however, this should be sufficient for the purposes here.

One may define additional semantic features of a meaning such as meaning at an index with such and such coordinates fixed. For example, if one fixes the speaker coordinate value to Gandalf, one makes the category-intension pair of a speaker-referring pronoun semantically interchangeable with the category-intension pair of 'Gandalf'. (Below I shall consider an intensional semantics that takes into account an objection to this feature of Lewis' semantics.)

Lewis' treatment of quantification is complex. He presents several methods of treating quantification; I present only the first in which he uses binders since it requires the least modification to the rest of what I have presented. Under the quantificational structure of his theory he subsumes treatment of non-nominative noun phrases as well as quantifier phrases such as 'nobody', 'a hobbit', 'the elf', 'some man' and 'twelve dwarves'. Quantifier phrases take a verb phrase, an (S/N), and make a sentence, an S, but

they are not names. Lewis claims that they belong to the category S/(S/N), that is, they take a verb phrase and make a sentence. Determiners, e.g. 'the' and 'twelve', take a common noun to make a quantifier phrase, i.e. they are (S/(S/N))/Cs. Lewis treats quantifier phrase and noun phrase objects by introducing *binders*, which take sentences and range over a variable in them to create a verb-phrase over the form 'is a y such that $y \dots$ '.



(1A) is a sentence with the variable y and (1B) is a verb phrase constructed from (1A) with the binder _. For every variable, there is a corresponding binder. A little exploration of Lewis's semantics will reveal that binders are necessary to have noun phrase objects; (1C) is an example of such:



This structure of quantification demands transformation rules if it is usable in semantics for natural languages. Binders, for example, do not occur at the surface level of any natural language. Moreover, word orderings will be odd at the base level. A transformational grammar specifies a representation relation between meanings at the "lowest" level and expressions the "top" level. This representation relation is formally specifiable but the details of such a specification are beyond the scope of this paper. (See section VI of Lewis for his formal treatment.)

2. Non-Declarative Sentences, Round One

Lewis discusses two methods of treating non-declarative sentences: the method of sentence radicals and method of paraphrased performatives. (Lewis adopts the method of paraphrased performatives.)

The method of sentence radicals analyses all sentences into two parts, a mood and a sentence radical. The sentence radical specifies a state of affairs. According to Lewis, the mood determines whether the speaker declares that the sentence radical holds, asks whether it holds, commands that it hold, or whatever. That is one way of treating mood but it seems to me that the mood does not determine that, since often questions are used to command, declarative sentences to ask and so on. Moods might better be seen as determining whether *the sentence* commands, declares or inquires, i.e. moods determine the illocutionary force of the sentence. (I admit that this is slightly artificial, since sentences are not agents, but to say that the mood determines what the speaker is doing with the sentence seems artificial as well.) Lewis proposes that they might have base structures like this:



The method of sentence radicals bifurcates a theory of semantics into radical semantics⁵ and mood semantics. The role of referential semantics is taken on by the sentence radicals; they may be treated as the category S in Lewis's theory. Mood semantics will consist of rules for when to use a sentence with a type of radical.

The move to the method of sentence radicals is objectionable for several reasons. First, they seem ad hoc: it is not clear why we should be motivated to accept them except that they allegedly explain semantics for non-declarative sentences. Second, since the radical seems to do everything (or at least nearly everything) that declarative sentences do, the declarative mood seems superfluous. Third, while moods purport to be contentful additions to the theory, they are (at least close to) being dormitive virtues; the question of how sentences can be imperative and interrogative given an intensional semantics seems to have been answered by saying the sentences are imperative by being in the imperative mood and interrogative by being in the interrogative mood. The method of sentence radicals needs to give some account of moods that seems eliminates this dormative virtue in the theory. Such an account will run two risks. The account may slip into a suspect mood-ontology.⁶ The account may slip into pragmatics, which would seem to defeat the reason for mood semantics in the first place. Finally, as Lewis points out, moods fail for

questions outside the yes-no kind and fail to account for such alleged sentences as "hurrah for Frodo".

The method of paraphrased performatives treats allegedly non-declarative sentences as paraphrases of a corresponding performative sentence; thus, 'Keep the Ring but do not wear it' paraphrases and has the same base structure, intension and meaning as 'I command you both to keep the ring and not to wear it'. If the method of paraphrased performatives is right, questions and commands are declarative sentences.⁷

The method of paraphrased performatives also encounters objections. First, the claim that 'Where is Frodo' and 'I ask where Frodo is' have the same meaning is counterintuitive. Second, the claim that interrogative and imperative sentences have truth conditions is counterintuitive. Third, the relation between an interrogative sentence and the performative that corresponds to it is vague. Fourth, in most contexts substitution of a non-declarative sentence for the corresponding performative and vice versa yield sentences that seem semantically different. Contrast 'I ask whether Frodo is a hobbit therefore someone asks whether Frodo is a hobbit' with 'Is Frodo a hobbit therefore someone asks whether Frodo is a hobbit' and 'That I command Frodo not to wear the Ring explains that Frodo will not wear the Ring' with 'Do not, Frodo, wear the Ring explains that Frodo will not wear the Ring.' Someone might counter-object that I have given some very forced sounding examples but that isn't my fault: blame the method of paraphrased performatives. Someone might also claim that transformations prevent such substitutions. However, while this seems to be possible it also seems to be ad hoc. The fifth and final objection that I raise is that performatives are explicitly, intrinsically indexical in a way that questions and commands are not indexical; specifically,

performatives necessarily, explicitly refer to the speaker, while neither commands nor questions do this.

I do not suppose that these objections are decisive. A few tweaks to either the method of paraphrased performatives or sentence radicals may save them from some or all of these objections. However, I think that the worries are deep enough to warrant seeking a new proposal.

3. Non-Declaratives: a new proposal

My proposal is that the intension of a question is the function that determines which sentence meanings are answers to that question. The kind of functions with which I am identifying question intensions differ from the kinds of functions that have been introduced thus far; in a semantics like that of Lewis they are functions from indices to meanings. Question-meanings, like declarative sentence-meanings, are identified with semantically interpreted phrase markers minus their terminal nodes. Since this proposal holds that the intensions and grammatical roles of questions differ from those of previously introduced kinds, it is necessary to introduce a new category for questions.

Let the category for questions be Q. Introducing Q implicitly introduces a new class of derived categories of the form $(Q/c_1...c_n)$; for convenience I shall call any expression belonging to this kind of category a 'question phrase'. Words (such as 'who', 'what', 'where', 'why' et al.) that introduce questions are examples of words that are question phrases.

An appropriate extension for a question is the set of answers to the question. An appropriate intension for a question is any function from indices to the set of (possible) answers to the question, where answers are construed not merely as responses to the

question but as responses that could directly inform a sincere asker of what he or she wanted to know. An appropriate intension for a $(Q/c_1...c_n)$ is any function from c_1 -intensions and ... c_n -intensions to O-intensions.

The claim that Q-intensions are functions from indices to the set of sentences that are answers to the question is motivated by the same kinds of considerations that motivate the claim that S-intensions are functions from indices to truth-values If one were to ask 'With what did Gandalf entrust Frodo' and a responder were to say 'Gandalf entrusted Frodo with the One Ring', 'Gandalf entrusted Frodo with the phial of Galadriel', or 'Gandalf entrusted Frodo with a bottle of absinth', one would be inclined to say that the responder understood the question; further, each of these responses would inform the asker of what she or he wanted to know if it were correct. If the responder were to say 'Oh, I loved Gandalf', 'Yes' or 'I would like a mint julep', one would be inclined to say that the responder didn't understand the question (at least if one were to try several times and repeatedly get the same response as if it were a good response); further, these sentences couldn't inform the sincere asker of what she or he wanted to know, even if they were true.

However, this rough and intuitive notion of answers fails to be theoretically adequate. One wants a formal definition of 'answer'. Such is difficult to deliver since what answers a question, q, depends on the kind of question that q is and the category-intension pairs besides $Q/c_1...c_n$ in q.⁸; the relation between the question 'Who loves Frodo?' and the answers to that question and differs in kind from the relation between the question 'Why does Sam love Frodo?' and the answers to that question is substituted for 'x', are all answers

to the former and sentences of the form 'Sam loves Frodo because p', where a sentence is substituted for 'p' are all answers to the later. However, answers are always semantically interpreted sentences that contain category-intension pairs at nodes below <> many of the category-intension pairs at nodes below <> in the question that they answer and the relationship between a question, and its answers is determined by the $Q/c_1...c_n$ of the question. Much of the kind of intentional semantics that I propose deals with specifying intensions of phrase belonging to the category $Q/c_1...c_n$.

For each kind of question there is a formal specification of the answers to questions of that kind, i.e. a specification of the intention of the question-phrase. Questions of the kind 'Who loves Frodo' and 'with what did Gandalf entrust Frodo' are formed by the concatenation of an Q/(S/N) with an S/N. For 'With what did Gandalf entrust Frodo?', each declarative sentence of the form 'Gandalf entrusted Frodo with x' is an answer and answers to other what-questions should be similarly related to the question. An important sub set of the set of answers to a what-question is the set of semantically interpreted phrase markers such that

- (1) each category-intension pair that both is at a node just below the node <> in the question and is not a question phrase, is at some node just below the top-most node of the phrase markers
- (2) each of the category-intension pairs at nodes just below <> in the phrase markersare in the same relation to one another in which they were in the question
- (3) the question phrase is substituted with a category-intension pair such that if that category is concatenated with the categories at the other nodes, it makes a sentence.

Q

(S/N)/N

Inves

Frodo

3A

Q/(S/N)

who



Sam

(S/(S/N))/C

This

For example, where (3A) is the question in question, (3B) and (3C) are two answers.

Frodo

(S/N)/N

loves

(1-3) are not necessary conditions for answerhood to a what-question, since 'He entrusted him with the One Ring' ought to qualify as an answer to 'With what did Gandalf entrust Frodo' but the intension of 'He entrusted him...' differs from the intension of 'Gandalf entrusted Frodo'; the demand I presented above would preclude the 'he entrusted him...' response from being an answer. With a few caveats however, a statement that satisfies (1-3) (relative to some question) is sufficient for answerhood to that what-question. I define a set of paradigmatic answers to each question and claim that the (total) set of answers includes all the paradigmatic answers and all those sentences that have the same meaning (not intension) at a relevant index as some paradigmatic answer. The paradigmatic answers to a question are those sentences that satisfy (1-3) that have intensions that do not vary with the contextual coordinates of indices. Words such as 'I', 'you' and 'now' which have meanings-at-an-index that vary with the contextual coordinates of indices will rarely, if ever, be present in paradigm answers. In some cases a paradigmatic paraphrase of a question will be necessary to formulate the set of paradigmatic answers; for example, 'With what did he entrust Frodo?' may differ in meaning relative to different indices, so a paradigmatic paraphrase of the question,

(S/N)/N

loves

hobbit

Frodo

namely 'With what did Gandalf entrust Frodo' is needed in order to specify the set of paradigmatic answers. A paradigmatic paraphrase of a question at index *i* will be a question such that it has the meaning at every context coordinate that the paraphrased question has at indices with the context coordinates of the index *i*. Thus, each sentence of the form 'he entrusted him with...' is an answer at a restricted set of indices; if 'he entrusted him with...' refers to Sam and not Gandalf, sentences of that form will not be answers to 'with what did Gandalf entrust Frodo.'

Meanings for in-what-manner questions and yes-no questions such as 'how does Gandalf entrust Frodo with the One Ring' and 'does Gandalf entrust Frodo with the One Ring' may be treated similarly; each is answered by a sentence of the form 'Gandalf [adverb] entrusts Frodo with the One Ring'. Each is formed by the concatenation of a Q/S with an S. Answers to these kinds of questions are semantically interpreted sentences such that

- (4) If the name or noun-phrase of the question is at the node <n> in the question then
 it is at <n-1> in the answer
- (5) If the verb-phrase of the of the question is at node <n>, that verb phrase is at or below <n-1> in the answer and the only other nodes at or below <n-1> are adverbs (i.e. they are of the form <(S/N)/(S/N), intension>)

One will need to define the set of paradigmatic answers and define the set of answers relative to them. This may be done exactly as for what-questions above. In the case of yes-no questions, the paradigmatic answers are only two: such is the intension of the yesno question-phrase expressions; in-what-way questions will have a plethora of paradigmatic answers. So, (3D-F) are respectively trees for the question 'Does Sam love Frodo' and the paradigmatic affirmative and negative answers.



I hope that my reader will forgive me for not giving a formal treatment of answers each of the common kinds of questions. I think that the examples above suffice to show that such formal treatments are possible; at least the objector has the burden of providing a counter-example.

What about other non-declarative sentences? I haven't touched imperatives or the uncategorized 'Hurrah for Frodo'. I suggest that imperatives may be treated like questions; that is, one may introduce a new category, I, and devise an appropriate intension for the category. I admit that I am not certain what the appropriate I-intension should be. An initially attractive answer is functions from indices to sets sentences that describe actions that satisfy the command; another suggestion is functions from indices to possible actions. I won't here arbitrate the choice of I-intensions. It will be crucial to specify how the non-I-categories below the topmost node of an I-expression have a role in determining the meaning of an I-expression. I suggest that most I-expression will have at node <1> an I/S and the possible actions to which the I-intension is a function is described by the S-intension at <2> in the I-expression. That isn't a theory but it is a

program for one. Here I shall merely let the plausibility of completion of such a theory piggyback on what might have seemed implausible before, namely, an intensional account of question semantics.

I don't have a Lewisian proposal for dealing with 'Hurrah for Frodo' kinds of sentences. I propose to treat them pragmatically only; 'hurrah' is a word-like type of element in sentence-like types of speech acts; it is something with which one does something, not which itself does something. Some words certainly get used in ways that contribute nothing to the meaning of a sentence, e.g. 'the hell' in 'what the hell are you doing'; 'Hurrah' is a word-like thing that has this sort of use. One might say that 'hurrah' means in the sense that 'mean' has in 'those flashing lights mean that there is a police officer nearby'. 'Hurrah' used in the way that Lewis discusses does not seem rightly to belong to any category⁹ and, moreover, it does not seem to be able to play a productive role in the way that other words do.

4. Some Objections and Replies

A first objection is that phrases are often answers to questions; for example, 'ardently' answers 'in what way does Sam love Frodo' and 'yes' certainly answers yesno questions. However, as I have defined 'answer', an answer is a semantically interpreted sentence marker. Thus, so the objection goes, my theory fails to account for some answers to questions. However, rather than try to specify how non-sentence phrases can be answers to questions I prefer to say that a phrase may be an appropriate or inappropriate response to a question as determined by a theory of pragmatics. I claim that under certain circumstances, using 'ardently' to respond to 'In what way does Sam

love Frodo' implicitly commits the responder to the answer 'Sam loves Frodo ardently' and that a theory of pragmatics should tell us when this is the case.¹⁰

Some people may find it objectionable that some answers are incoherent and uninformative. As I have defined 'answer', 'Someone that doesn't love Frodo loves Frodo' and 'A fish of worm-like intelligence loves Frodo' are an answers to 'Who loves Frodo'. Surely, this objector insists, answers should be informative and coherent. My response: Coherency and informativeness are both relative matters and come in degrees. One is tempted to say that Hamlet thrice informed Polonius of nothing when he responded to the question 'what are you reading' with 'Words. Words.' However, this was uninformative because, among other things, Polonius knew that Hamlet wasn't reading Hieroglyphics. Coherency is similar; it may seem slightly incoherent to answer 'yes' to 'do characters talk about clocks in Shakespeare's plays which were in settings before the invention of clocks?' but the answer would be right.¹¹ One hundred years ago 'Particles' position and velocity are not measurable at the same moment' would have seemed incoherent. If one demands that we set a boundary for when a sentence is to coherent or not coherent enough, one runs a risk of setting the boundary too close or too far. Rather than run this risk, I would like to say that there are there is a subset of answers to questions that seem to be stupid or crazy answers. The answer of an ignoramus is still an answer. (I hope that a good theory of conversational implicature will illuminate the informativeness and coherency conditions that we often place on one another in speech.)

What if we have more general worries about Lewis's semantics? Burge¹² has raised an objection that may be held against Lewis; he points out that there is a distinction

between the meanings of 'Stephen Lenhart likes *The Lord of the Rings*' and 'I like *The Lord of the Rings*' that is not captured by the theory because when I say either of them they mean the same thing. David Kaplan has developed a theory of indexicals on which indexicals are treated as non-constant functions from context to content, where content is just a function from possible worlds to truth-values or a thing that contributes to the content of such a content.¹³ The function that describes how context determines the content of an expression is the character of that expression. This captures the distinction that Burge contends a semantics must. My theory of question semantics must be modified if Burge is correct. Very generally speaking, in order to do so one claims that answers are just statements that in a given context have the content of a paradigmatic answer; paradigmatic answers on this view are statements whose character is a constant function.

Earlier I gave reasons to suppose that the theory of question semantics in section 3 is a good one. I think, however, that an important argument for it is the coherence of the theory with Lewis's semantics for declaratives. The theory presented here introduced new categories and intensions for those categories but the functions, meanings and categories that the theory employed were already part of Lewis's ontology. What I have done here is specified different ways of relating the entities of Lewis's theory in order to account for the semantics of questions. I have independently motivated modifying Lewis's semantics to accommodate questions. However, whether this theory stands or falls rest, I think, on the strength of Lewis's semantics for declaratives; if we accept my suggestion earlier that any intensional semantics with a categorial grammar can *mutatis mutandis* incorporate the theory of questions here—as I have suggested we could do with

Kaplan-perhaps we will think that this theory comes with all of the recommendations

that intensional semantics has.

¹⁰ Roughly: whenever an adverb phrase quickly follows an in-what-way-question, that phrase is a response to the question and the responder is committed to the answer wherein that adverb modifies the adverb phrase in the question.

¹³ (1977) "Demonstratives" in *Themes from Kaplan*, eds. J. Almog et al.

¹ (1972) in Semantics of Natural Language, G. Harman and D. Davidson eds.

² Lewis goes into greater detail than this (175).

³ Though some amount to them, see Lewis (180-81).

⁴ Some may prefer to say that these phrase markers work just like meanings but are not the meanings themselves.

⁵ Perhaps we can do extreme metaphysics, sever ethics and drastic epistemology as well.

⁶ As if the metaphysical and epistemological problems with functions were not enough.

⁷ Lewis mentions that there may be some question regarding this since performative sentences are sometimes claimed to be importantly different from paradigmatic declaratives.

⁸ What is a kind of question? I identify question kinds with the semantically interpreted phrase marker at the node <1>.

⁹ Merriam-Webster's New Collegiate Dictionary says that 'hurrah' is a noun but I think that one will find the classification forced at best. And of course, 'hurrah' has been "verbed" before, as in "the crowd hurrahed", but here 'hurrah' is a verb and has a clear intension.

¹¹ See for example, *Hamlet* 1.4.5; there is a mention of clocks in *Julius Cesar* as well.

¹² (1974) "Demonstrative Constructions, Reference and Truth" in *The Journal of Philosophy*.