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PRAGMATICS AND THE LOGIC OF QUESTIONS AND ASSERTIONS*

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1. Introduction

The aim of this paper is to present and justify a logical system in which assertions are analyzed in terms of questions and their answers. The system satisfies R.G. Collingwood's conditions on logic, and its justification consists, roughly, in an attempt to interpret Collingwood's claims in terms of more modern views of logic.

One of the problems in justifying logical systems is the lack of a methodological theory which specifies the goals and the methods used in logical investigations and which defines criteria for the evaluation and comparison between competing logical systems. Hence, the first task we face is to find out some conditions which a "preferred" logical system should satisfy. This is done by considering different answers given to the question : "What is logic ?".

For example, the Port Royal definition of logic as "the science and art of reasoning", can be used to account for the inclusion of non-standard and deviant logical systems as "branches" of logic, since it is the job of logicians to isolate the principles which lie at the back of other facets of rational behavior, as well as of good arguments[1]. Moreover, this view of logic provides a basis for calling logicians to treat formally, not only "good arguments", but also "bad" ones, thus calling for a formal theory of fallacies[2].

The characterization of logic as having to do mainly with argumentation, to use another example, was used for the representation of classical logic in terms of certain deduction rules rather than axiomatically[3].

These two answers are, of course, compatible, for logic (in

the broad sense) consists of various different goals which may be achieved in various ways. Yet, the need to advocate the views of logic in terms of an answer to the question "What is logic ?", suggests that philosophers are not merely interested in characterizing the existing practices of logicians. Rather, they define the primary goals of logical theories, in order to extract from them criteria for evaluating such theories. It seems, indeed, that logical theories are not self-justifying, and what is needed is a general theory dealing with the methodological problems raised in doing logic.

In general, the requirements of logical theories in which I am interested relate the system and its underlying formal language to theories of meaning. A logical system is a formulation of certain meaning relations between linguistic entities. The presentation of these relations by the formal language is justified only in so far as the claim that they can be represented in this way is justified. For example, the claim that the meaning of a connective is specified by its truth-table is justified only if the claim that meanings of some linguistic expressions could be represented in terms of truth-tables, is justified.

In this case, I will say that a logical system is *based on* a certain meaning theory, when the relations between the syntax and semantics of the language (of the system) represent meaning relations according to that meaning theory. Thus, classical propositional logic is based on the truth-conditions meaning theory since the meaning of a wff in the language is specifiable in terms of the truth table.

Since the main considerations leading to the justification of the questions-answers system proposed here, are rather long and hairy, let me draw a rough outline of their form[4] :

Collingwood claims that the meaning (and truth value) of an assertion depends on the question it is supposed to answer. His suggestions lead to logical systems based (in the above sense) on a theory of "Meaning as Use".

In considering several answers to "What is logic ?" we can, following Hacking, view Gentzen system of classical logic as defining the meanings of the logical connnectives. Thus, the Gentzen system is also based on the theory of "Meaning as Use", but while Collingwood's suggestions are concerned with meaning of assertions (utterances made in contexts), the Gentzen system is concerned only with the meanings of the logical connectives. It seems, therefore, that one may combine Collingwood's suggestions with a Gentzen-like system and provide a system which models more completely the theory of "Meaning as Use."

However, it seems that any logical system which treats assertions as the basic and unanalyzable unit, is incompatible with Collingwood's claim that assertions should be considered as answers to questions.

The question-answer system offered here bridges this gap, by treating wh-qhestions as open formulas, and vice versa. Thus, in effect, the question-answer system is not suggested to refute the classical approach but to offer a new philosophical interpretation to this approach : the classical approach considers assertions as basic and unanalyzable units which are represented by closed formulas. Open formulas are used then, as a mere technical device. In the present approach, on the other hand, assertions are considered to be complexes consisting of a question, represented by an open formula, and its answer, represented by the closure of the open formula under consideration.

It appears that if we accept that the meaning of linguistic entities is associated with their use, then the logical systems which are based on a Tarskian distinction between semantics and pragmatics cannot model the natural-language relations between the syntactic entities (of natural languages) and their meanings, since it does not account for the role of the context of utterance in the determination of the meaning of the utterance. Possible world semantics is, in a sense, an attempt to overcome this problem by letting the specific meaning of an utterance depend upon possible worlds i.e., the world in which the utterance was made, the world in which the sentence is to be evaluated, or both. This approach is still ad hoc, I believe, for it does not illuminate the problem of how a context is to be characterized in terms of possible worlds, and how the specific elements of the context affect the meanings of sentences uttered in it. It leaves the concept of a possible world unanalyzed and uninterpreted, and thus it does not serve to clarify the concept of context.

What is needed, instead, is a framework in which the pragmatic properties of an utterance is a function of these contextual elements and the sentence uttered. Semantics can then be viewed as a theory of meanings when abstracted from contexts. The question-answer system provides such an analysis, where assertions are considered as pairs of questions and their answers. The "contextual elements" determining the meaning of an assertion are the questions "under discussion", and the sentence uttered determines both which of these questions are answered by the assertion and the answers given to them.

Thus, besides the logical considerations, we utilize considerations of the nature of the speech-acts involved and conversational principles in order to further justify the details of the questions-answers system. The wide range of considerations involved enables the theory to have a strong "explanatory power"; that is, it enables us to explicate various logical and linguistic concepts and describe their interrelations.

In section II, I discuss different definitions of the main goals of logic and their relations to meaning theories. In particular, the view of the deduction rules of Gentzen-like systems as defining the meaning of the logical connectives is presented as the view of logic as based on the theory of meaning as use. The system does provide a natural account for the meaning of terms, but fails to account for the meaning of sentences. To extend the theory, I consider, in section III, Collingwood's view of logic[5]. The system of questions and answers discussed here is very close, I believe, to his suggestions, and I will attempt to present it in his terms. In section IV, I discuss the speech-acts of asking and answering questions and of asserting. First, I consider apparently competing claims for the logical priority of asserting (to any other speech-act) and for the logical priority of questions to assertions. Then I consider the speech-acts by themselves and as speech-acts made in dialogues, which are therefore, subject to the Gricean principle of conversational cooperation. Section V is devoted to a short description of the structure of questions-answers dialogue, compatible with the previous characterizations of the speech-acts involved, while section VI is devoted to an outline of the formal language in which assertions are interpreted as question-answer pairs. One of the important features of the language is that it enables us to provide a natural definition of semantic relevance (of an utterance to a discussion). This concept is dealt with in section VII, where I relate the defined concept to the relevance requirement in cooperative dialogues as well as to the interpretation of the concept of relevance in the so-called relevant logics. In the final section I attempt to summarize the major considerations and to consider the extent in which the system satisfies the conditions for a "preferred" logical system.

II. Logic and Theories of Meaning

Let us consider first several characterizations of logic in its more restricted sense, namely, the subject which is dealt with in classical logic. My main interest is not really in defining the major goal of

logic or what the One True Logic should be like. Rather, these different approaches serve to raise problems which logic is supposed to solve, and thus, indirectly, they define criteria for the evaluation and comparison of different logical theories. In other words, if we accept that logic, as other fields of investigation, may have different goals and may be used to solve or explain different problems or phenomena, then in sketching the problems to be solved, we obtain criteria for evaluating logical systems utilizing the methodological principle that the better logical theory is the one with the maximal explanatory power.

Popular logic text books define logic in a more or less uniform way, as having to do with correct reasoning and the distinction between good and bad arguments. Copi[6], defines logic as "the study of the methods and principles used to distinguish good (correct) from bad (incorrect) reasoning", while Haack[7], is more cautious, saying :

> "A central concern of logic is to discriminate valid from invalid arguments : and formal logical systems, such as the familiar sentence and predicate calculi, are intended to supply precise canons, purely formal standards of validity".

Thus, according to these characterizations of logic, the job, or one of the central jobs, of logic is to explicate the notion of "good", "correct" or valid arguments. Note that it is not claimed that every correct argument is valid or that every valid argument is good — rather, that validity is a central determinant of the correctness and value of an argument. But how are we to characterize validity ? Haack[8] distinguishes "systematic validity" from "extra-systematic validity"; the former represents well-defined concepts within well-defined formal systems, while the latter is informal and only intuitively defined. When one judges an informal argument valid, says Haack, "one is claiming ... that its conclusion *follows from* its premises, that *its premises could not be true and its conclusion false.*" An acceptable logical system should be such that "if a given informal argument is represented in it by a certain formal argument, then that formal argument should be valid just in case the informal argument is valid in the extra-systematic sense". We thus have two concepts of informal validity : the first has to do with the relation of "following from" and the second is the property of truth preserving. Correspondingly, Haack defines two concepts of systematic validity : the syntactic concept defined as the derivability of the conclusion

of an argument from its premises using the axioms and derivation rules of the system in question, and a semantic concept, defined in terms of satisfaction in any standard interpretation[9].

Now, although most standard logic texts for philosophers represent the syntax of the system in terms of deduction rules, without any axiom, and these are normally given some intuitive justification in terms of the corresponding informal arguments, the list of these inference rules is justified only indirectly. The list contains enough rules necessary for the proof of the completeness of the syntax relative to the standard interpretation. Most texts contain even more rules : some I think, because of their informal counterpart appear often in proofs, and some for pedagogical reasons, e.g. to make the derivations of the exercises in the text easier and better suited to the level of the students. But the point is that the list of rules is not given a uniform justification in terms of the informal concept of "following from"[10].

Thus, in effect, we can say that this representation of classical logic in terms of deduction rules alone, is given only a semantic justification.

The formal logical system does have a further characteristic associated with the concept of interpretation. If validity of arguments is an important determinant of the correctness of arguments, and if the correctness of an argument depends on the meanings of its constituent sentences, then the theory of validity should say something about the meaning of sentences. It is often claimed that validity is concerned with the form of sentences and not with their content or meaning, as if the content and meaning of sentences could be independent of their form. This, of course, is absurd. What is normally meant by this claim is that the meaning of sentences depends on their form as well as on other elements, and the theory of validity is a theory which represents only those aspects of meaning which depend on the form of sentences. The logical form of a sentence is determined, in part, by the logical terms occurring in it, and hence, the theory of validity (namely, the logical system in question) provides a meaning theory for the logical connectives. The definition of semantic validity is associated with the "truth-conditions" meaning theory : the meanings of assertoric sentences is given by their truth conditions, and the meanings of the logical connectives is given by specifying how they affect the truth values of sentences in which they occur.

Let me remark that this presentation of classical logic as related to the truth conditions theory of meaning, explains the historical

development of nonstandard logics (for example, modal logics) as extensions of classical logic. By using possible worlds semantics to interpret non-extensional operators, we are able to extend the truth conditions meaning theory to apply to non-truth functional terms. Furthermore, it explains, in part, the attempts to reduce non-assertoric logics (e.g., epistemic, command, question logics) to assertoric logic[11], since the meaning of a sentence is given in terms of its truth conditions, the above reduction enables us to account for the meaning of non-assertoric sentences (uttered in normal conditions) in terms of the same meaning theory, even though properly speaking, these sentences may not have truth values.

Let me summarize the above considerations by setting goals for a "good" logical system :

1. It should provide a semantic account of the informal notion of validity as truth-preserving.

2. It should provide a syntactic account of the informal notion of validity described in terms of the relation of "following from".

3. It should account for the meaning of the logical terms in such a way that it could, at least in principle, provide a framework within which the meaning of sentences can be explicated, according to some general theory of meaning.

The representation of the classical logical systems in terms of inference rules is related to their axiomatic representation. It seems that once we note that these are different representations of the same system, then they are each justified in terms of the purposes of their use : it is much easier to prove deductions within the system by using inference rules rather than axioms, and it is easier to prove meta-theoretic properties of the system if it is represented axiomatically. But there is more to the representation than convenience. Quine suggests[12] that logic defines the set of logical truths :

> "We must distinguish two senses of logic, a broader and a narrower; logic in the narrower sense comprises those truths which contain only the so-called logical vocabulary essentially, while logic in the broader sense includes both logic in the narrower sense and discourse about it".

The relation of logic presented in this way, to the study of informal validity is a special application of the system :

> "Logic has its practical use in inference from premises which are not logical truths. Logic countenances such inference when

the conditional statement 'If ... then ...' connecting premises with conclusion is itself logically true ... and it is in this way that logical truth links up with extra-logical concerns. Precisely the analoguous account holds with regard to applications of mathematics generally : the tremendous utility of mathematical techniques in natural science turns simply on the importance of discerning mathematical truths of the form : "If ... then ..." whose component parts are statements of natural science." (p. 7).

Hacking[13] argued forcefully against this view of logic as "The science of truth" and for the view that it is the science of deduction, and at present I do not wish to get into it. But let us note that Quine in his book starts by describing the truth tables for the logical connectives, and thus provides their meaning along the lines discussed. However, since his major aim is to define logical truths and not validity, the objection raised against the arbitrariness of the list of deduction rules as is offered say, by Copi, does not apply here. If the syntax is given by axioms, then the choice of axioms is made in accordance with the principles of "mathematical elegance" : i.e., a set of axioms is preferred which is both minimal and independent, and, of course, which generates the right set of theorems or "logical truths" — namely, those which are so defined in terms of the semantics. We may therefore, add to the list of goals to be achieved by a logical theory, that it should generate the set of logical truths in the above sense.

Before doing this let us consider a different aspect, namely, the connection between the axiomatic representation of a logical system and meaning theory. We can consider the set of axioms as characterizing the meaning of the logical constants in much the same way as the set of axioms of an algebra defines the meaning of some algebraic operations, or as the set of laws of a physical theory defines the meaning of certain physical concepts.

If we follow this line of thought, we reach the view that the meaning of a sentence is theory-dependent and should be characterized in terms of the whole theory. This can be done by taking the meaning of a sentence to be represented by its logical closure, that is, the set of all the sentences which that sentence entails. If we consider a sentence which belongs to a non-logical theory (i.e., it contains non-logical constants), then its meaning is given by the logical closure of the conjunction of the sentence with the set of axioms of the theory in question.

Note that this view of meaning as defined in terms of logical closure does not depend on the axiomatic presentation of the system, but rather, only on the fact that the system defines some concept of derivability. The view of the meaning of sentences as represented by their logical closure is related to the theory which distinguishes the extension, reference or breadth of linguistic expressions from the intension, sense, or depth of these expressions[14]. While the former set of concepts belong naturally to the theory of reference, the latter set belongs naturally to the theory of meaning. Though these concepts are naturally related, it seems that they should also be carefully distinguished. A semantic interpretation of a system can be viewed as providing the references of the expressions in the language, while the senses of these expressions seem to be of different kind and may be described syntactically as related to the syntactic structure of the expressions in question. For example one may define the sense or meaning of an expression in terms of logical closure as described above.

So let us add to our list of goals for a "good" logical system the following :

4. A logical system should provide a basis which generates a set of "logical truths", namely those sentences of the language which are true by virtue of the fact that only the logical terms occur in them essentially[15].

5. A logical system should provide a notion of derivability, sufficient to define a concept of logical closure of sentences in the language considered, to allow for the definition of the intension or depth of expressions, as distinct from their extension or breadth.

In some cases, of course, these goals are related in such a way that if we achieve one of them some others can be achieved in a natural and, possibly, quite easy way. For example, the formal explicant of syntactic validity can serve to define a concept of derivability needed for the definition of logical closure.

The third view of logic I wish to consider here is the view that logic is concerned with the transitions between sentences, and that a logical system should provide rules for correct transitions. This view is best presented by Hacking, who argues that the rules of inference are not justifications of transitions — no more than the grammar rules of English are "justifications" for standard usage of the English language. The rules "are descriptions, or, perhaps codifications of what one knows when one knows how to make certain transitions that we call logical"[16]. According to Hacking, then, "deducibility comes first, not logical truth". The definition of logical

truth is a by-product of the theory of deducibility : the theory of deducibility defines what a logical constant is, and a logical truth is defined as one in which only logical constants occur essentially. The resulting concept of logical truth depends on the notion of truth of a language. Thus, Hacking's approach is based on the identification of the second goal I have listed (formalization of the concept of syntactic validity) and the third goal (the account of the meaning of logical terms). Hacking proceeds by defining a logical constant as one which can be introduced, characterized or defined by operational rules like those of Gentzen[17].

Now, this approach relies, I believe, on the general assumption that we can define the meaning of expressions in a language by specifying the rules of their use. The debate, then, over the question of how operational rules can serve to define constants, seems to be a special case of the problem of what is the nature of rules of usage which are sufficient to define the meaning of an expression (in the sense that meaning is use). Let me leave this question open and assume that, say, Gentzen's system is an appropriate system yielding a meaning theory for the logical constants, grounded in the general theory of meaning as use; it seems then, that it should also be capable of extensions in which the meaning of other expressions can be given. I believe that is the question which Hacking has in mind when he considers categorial grammar : he suggests that the addition of any constant to the language could be done by adding to the language syntactical rules for the grammar of the constants, as well as inferential rules for its use. I have no quarrel with this, but thus far the framework is limited to the characterization of constants or terms. How to proceed within the formal framework of a Gentzen-like system to characterize the meaning of other expressions by rules of use remains an open question. In other words, how can we define the meaning of a sentence within this framework (where we consider meaning as use) besides resorting to an indirect reference to use by the logical closure operator or by referring back to semantics ? Just as standard semantics can be viewed as a basis which can be extended so that any sentence in the language has meaning in the sense that its truth conditions are specifiable, we should enable our theory of use to provide a basis for the specification of the meaning of a sentence in terms of its use. Otherwise, either we should neglect the theory of meaning as use in its general form and accept the truth-conditions theory (in some restricted form at least); or reject the view that a logical system can provide a natural basis for the analysis of natural language.

Let us pause for a moment to see where the present discussion leads us. We have considered several views of what logic should be like, and associated the resulting presentations of classical logic with corresponding theories of meaning. If we combine these views we can say that the meaning of an expression in the sense of its reference (extension, breadth) is given by semantic theory, that is by the truth conditions theory of meaning. The meaning of an expression in the sense of its sense (intension, depth) is given by the logical closure of the expression, defined in terms of a syntactic concept of derivability. Finally, the meaning of an expression in the sense of its *use* is given (so far, for terms only) in terms of Gentzen like deduction rules. These theories of meaning are not incompatible. Indeed, if we could find a natural way to define the meaning of sentences (or utterances) by rules of usage which can consist of an extension of the deduction rules, then this system could, in principle, be based on all three meaning theories.

There is an additional difficulty here. The operational rules of a Gentzen-like system can be viewed as rules of use for the logical constants when these are used in the context of a proof. The question remains as to how their use in other contexts affects their meanings.

I suggest that the context of a proof is, in a sense, the broadest kind of context. If a natural language connective is used in the context of a proof, then its meaning is given by rules of usage corresponding to the operational rules defining the meaning of its formal counterpart. For example, the meaning of 'and', when used as a sentential connective in the context of a proof, should correspond to the meaning of the conjunction symbol '.'. Any other meaning of the connective, obtained by its utterance in a different context, could be described as a function of this "basic" meaning and the context of utterance.

This raises a further problem. It seems plausible enough to assume that if an utterance is made in the context of a proof (or a very rigorous proof), the components of the context can all be explicitly specified : namely, the theory and the basic assumptions and definitions which are presupposed in the proof. But once we consider less formal contexts (or better, the more normal contexts), these assumptions about the subject under discussion are hardly ever given in any sense. Speakers do not normally precede their discussion by a meta-discussion, checking that they do share certain assumptions which they are to presuppose in their discussion and which are relevant to the subjects of their following discussion.

One may attempt to characterize the context in terms of the participants' aims and intentions in the discussions. But again, they may not know what other participants' aims are before the discussion begins. It seems, therefore, that those components of the discussion which relate to information of the physical situation of the discussion is, to some extent, given in the sense that the participants of the discussion know them. Those elements of the context which relate to assumptions of the participants concerning the subjects of the discussion are not given in the above sense, but they are somehow revealed in the course of the discussion. The question we face now is how they are revealed and this problem is related to the question of how to characterize the contextual elements which can affect the meanings of expressions. In general, the idea is this : The contextual elements which affect the meaning of an utterance are conveyed by the previous discussion since they are part of the meanings of the previous utterances. This is where I turn to Collingwood's logic, which is based on the claim that any assertion is made in answer to a question[18]. If we characterize the context of an utterance in terms of the questions under discussion, then what is the context of an utterance depends, to some extent, on the sentence uttered and upon the questions raised by previous utterances in the discussion.

The speaker's intention in making an assertion is characterized in terms of the question he is attempting to answer by his utterance. That such a question exists follows from the fact that his speech-act is an intentional act : for otherwise, he would not have had any reason for making this particular assertion rather than any other. Yet, it may not be obvious to the participants, and even to the speaker himself, what this question is, and only by reflection and analysing his thoughts may he come to realise it. In this case, the point of making the assertion is not apparent, and its meaning is not uniquely determined. In other cases, however, the question which the speaker answers by his assertion is apparent; for example, where it was actually asked or raised by the preceding discussion or through the speaker's use of intonational stress.

III. R. G. Collongwood's Outline of Logic

According to Collingwood, logic should account for a body of knowledge, both in the sense of the activity of knowing and in the sense of that which is known. The activity of knowing is the scienfitic process, and logic has to describe this process which he calls

'analysis' or 'orderly thinking processes'. "That which is known" are the thoughts and logic has to describe their interconnections in a system of a series of thoughts. Both these tasks could be achieved if we consider the basic unit for logical analysis to be a question and its answer. Analysis consists in placing the questions and answers in their logical order and in studying the connections between questions and their presuppositions and between questions and their answers That which is known is known, understood and has a truth value only as part of a large complex of questions and answers.

Thus, Collingwood rejects the basic distinction between meanings of sentences (as part of semantics) and their use (as part of pragmatics), attacking, what he calls 'the central doctrine of propositional logic' :

> "... that there is, or ought to be, or in a well-constructed and well-used language would be, a one-one correspondence between propositions and indicative sentences, every indicative sentence expressing a proposition, and a proposition being defined as the unit of thought, or that which is true or false." (1939, pp. 35–36).

Any assertion a speaker ever makes is always in answer to a question, and hence the meaning of the sentence uttered, depending on the speaker's intention, depends upon the question he attempts to answer. Moreover, one cannot understand what the speaker means unless one knows "what the question was (a question in his own mind and presumed by him to be in yours), to which the thing he has said or written was meant as an answer". (1940, p. 23).

Answers to questions may be evaluated in two ways relative to the question concerned. They may be *right* or wrong answers to the question concerned, and they may be *true* or false answers. These concepts are related but are not equivalent. Truth bearers, according to Collingwood, are answers to questions, belonging to complexes of questions and answers. The meaning of sentences is thus not directly related to their truth values, not even to their truth value in relation to the question they are supposed to answer. Rather, both the meaning and the truth value of an assertion depends on the questions-answers complex they belong to.

> "Truth in the sense in which a philosophical theory or a historical narrative is called true, which seems to me the proper sense of the word — was something that belonged not to any

> single proposition, nor even, as the coherence-theorists maintained, to a complex of propositions taken together : but to a complex consisting of questions and answers". (1939, p. 27).

The structure of these complexes is such that they satisfy the following conditions :

1. "Each question and each answer in a given complex had to be relevant or appropriate, had to 'belong' both to the whole and to the place it occupied in the whole."

2. "Each question had to 'arise'; there must be that about it whose absence we condemn when we refuse to answer a question on the ground that 'it 'doesn't arise'."

3. "Each answer must be 'the right' answer to the question it professes to answer." (1939, p. 27).

The idea is that questions and their answers are "correlates" : a highly detailed and particularized propositon must be an answer to a question as detailed and as particularized as itself. The questions in the complex are ordered, "because one of them may be contingent upon a certain answer being given to another. The question whether you ever beat your wife does not arise unless an affirmative answer has been given to the question whether you ever had one." (1940, p. 39). A question arises only if its immediate presupposition is in fact made, otherwise the question could not be logically asked.

> "... The 'right' answer to a question is the answer which enables us to get ahead with the process of questioning and answering ... it is 'right' because it constitutes a link, and a sound one, in the chain of questions and answers by which the falseness or truth of the presupposition is made manifest." (1939, p. 38).

I believe that the concept of 'right' answer is related to the concept of 'logical efficacy' applicable to assumptions : the logical efficacy of an assumption does not depend on its truth nor on its being thought to be true, but only in its capability of causing questions to arise. Similarly,

> "The process of thought from question to question does not depend on each question's being answered truly, but only on its being answered; and not upon the questioner's thinking the answer true, but only on his accepting the answers given him, or 'assuming them for the sake of the argument." (1940, pp. 28—29).

Hence, when a proposition is ordinarily called 'true', says Collingwood, what is meant is that the following conditions obtain :

1. The proposition belongs to a questions-answers complex which as a whole is 'true' in the proper sense of the word.

2. It is an answer to a question within the complex.

3. The question is sensible, i.e. it arises (its presupposition is accepted within the complex).

4. The proposition is the 'right' answer to that question (1939, p. 38).

I have claimed previously that Collingwood's theory may be viewed as a suggestion for a logic based on the theory identifying meaning and use : this claim must be clarified. First, note that the meaning is not a property of isolated sentences or of utterances abstracted from the contexts of their use. Rather, it is the property of utterances in their contexts of use. In particular, the meaning of an assertion is given by a question-answer pair : the utterance of the sentence involved in the assertion provides the answer, while the context of the utterance provides the question to be answered. One may, of course, ask what the meaning of a question is, or more generally, what a question is. Collingwood does not discuss the nature of questions, and I shall leave the discussion of questions to a later section. The main point is that the meaning and truth value are not properties of single and isolated sentences or utterances, but of whole complexes governed by certain structural rules. These complexes, I believe, represent scientific or philosophical theories, and thus our description of these complexes amounts to the description of 'the activity of knowing" or the ("correct") transitions between sentences, as well as a description of 'that which is known' or a theory of truth. To understand the meaning of an utterance is to know the whole structure and the function (or 'logical efficacy') of the utterance within the structure. Collingwood plays down the importance of the concept of truth. Truth of a proposition is defined in terms of the concepts of 'right' answer and of truth of a whole questions and answers complex. The latter is undefined and Collingwood does not elaborate on it. However, he does suggest (in his *Metaphysics*) that the truth of a theory, resting on certain absolute presuppositions, is a matter of assumption, which is an act of free choice, and thus may change in the course of history as our absolute presuppositions may change.

Nevertheless, and in spite of the fact that Collingwood plays down the importance of the concept of truth of a proposition and the dependence of a meaning theory on this concept, we can make

use of an argument given by Dummett to show that this view of meaning can yield that the meaning of assertions is given by its truth condition[19]. Dummett claims, roughly, that the meaning of a sentence is given by what justifies us in asserting the sentence, and that a sentence is true if an assertion made by means of it would be justified. Hence, in providing the truth conditions of a sentence we specify the conditions under which we are justified in using it to make an assertion, and thus we have thereby specified its meaning. Now, in this paper, Dummett does not say what could serve as a justification of an assertion, and we shall not concern ourselves at present with his view of justification. It is of interest to us that we can interpret Collingwood's views to fit the above argument : in his terminology, an assertion is justified (i.e. true) if and only if it is a 'right' answer to a question which arises within a question-answer complex, the absolute presuppositions of which are assumed; and the meaning of an assertion is given by a description of the complex. Thus, in specifying the truth conditions of an assertion we have to describe the complexes within which the assertion is true and thereby we have specified its meaning (or possible meanings).

Before continuing let me note that Dummett argues that his point of view yields that certain sentences for which we have no justification and have no truth value. This is in complete agreement with Collingwood's view that certain elements in a complex have no truth values : namely, the absolute presuppositions which are never answers. Since the assertion of the absolute presuppositions is never justified, they are not assertible : to assert them is a logical error; they can only be assumed. And the meaning of assumptions is not given in the same way as the meaning of an assertion. The justification of an assumption is its 'logical efficacy', i.e., the questions it causes to arise.

Before going on I would like to sketch roughly the main assumptions I wish to adopt from Collingwood and how they are to be incorporated within the general discussion.

In considering Gentzen's system as a logical system based on the theory of meaning as use, I have noted that the system provides rules of use for the logical constants, and using Hacking's suggestions, can be used to similarly describe the meanings of non-logical constants by similar rules, but it does not seem to provide a natural account of the meanings of sentences. I turned to Collingwood's suggestions, which seem to provide a basis for the specification of the meanings of sentences (assertions) but not for terms. It seems possible and interesting to combine the two views and to provide a

system according to Collingwood's general suggestions where the logical constants are defined in terms of Gentzen rules. Such a system of a 'Gentzen-like questions and answers' logic has not been developed yet and the problem of its formulation remains an open question.

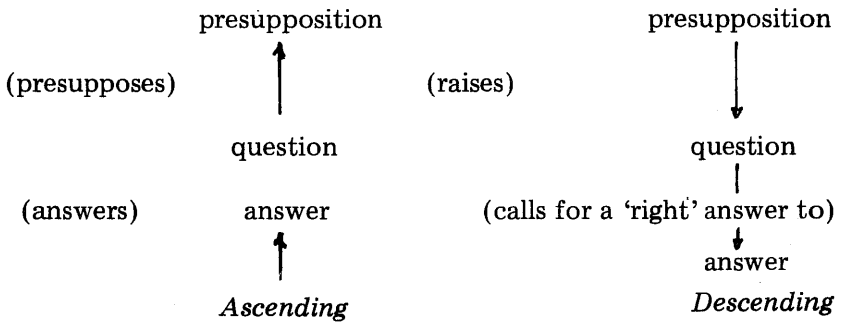
This system should be part of a theory satisfying the following conditions :

1. The system is based on representing assertions in terms of question-answer pairs. Hence, the theory has to clarify the concept of assertion as well as that of assumption, question and answer,

2. The theory should provide a means for representing the meanings of linguistic expressions within the meta-language of the theory. In particular, we will adopt the concept of a question-answer complex, used to represent the meanings of assertions.

3. The theory, being a logical theory, should account for 'logically correct' transitions between sentences. The question-answer complexes are ordered so that every element in it is "relevant" (in Collingwood's terms) to the complex as a whole and to its immediate neighbours. This ordering reflects 'the process of knowing', and reflects the basic transitions in orderly thinking.

These transitions are best described as the 'ascending' and 'descending' transitions along a complex, represented graphically as follows :



If we provide the rules allowing for the ascending and descending transitions, we provide a logic which yields the meaning of assertions in terms of rules of use very similar to the way the Gentzen operational rules define the meaning of logical connectives. Moreover, these rules do represent the thought processes of analysis (ascending) and of explanation or justification (descending), and thus they provide a model for derivations and proofs[20], as well as for a

more general way of systematic and orderly thinking. Finally, derivability can be described in terms of the above transitions in a complex : A proposition entails another if in every complex in which both occur, the second can be reached from the first by an ascending transition. Thus, we can add a further requirement :

4. The theory should explain the concepts of 'raising' of a question and 'right' answer, as well as those of 'presupposition', 'answer' (to a question) and 'relevance'.

Note that the transitions described differ with respect to the determinacy of the transition : given a question, its presupposition (ascent) is determined and its right answer is determined (descent). However, the other two transitions are not determined : given an answer, the problem of which question it purports to answer is undetermined, and so is the transition from a presupposition : given that it is a presupposition, it is not determined to what questions it gives rise. Admittedly, this last comment is very vague, and will hopefully be clarified later on.

IV. The Speech-Acts of Asserting and Asking

Collingwood, as we have seen, bases his view of how logic should be on the claim of the logical priority of questions to assertions. This claim is, to say the least, unorthodox. Traditional logic appears to be based on the presupposition that assertions are logically prior to any other form of speech. The claim of logical priority is important for our purposes for it seems that if, say, assertions are logically prior to questions then analysis of questions is possible only in terms of assertions; and hence the logic of questions should also be based on or even reduced to the logic of assertions. These considerations are very vague, and they need to be clarified if we are to answer the question of what is logic, using any claims of logical priority.

I will sketch here roughly two arguments for the priority of assertions, which seem relevant to the present purposes. The first goes like this : Any speech-act can be described in a language in which one can only make assertions (and one cannot ask questions, issue commands etc.) By this I do not mean that one can ask a a question or issue a command using assertions (though I do believe that my claim may yield this result) but that we can describe in assertoric language the conditions under which a speech-act is correctly characterized as an act of asking a question or of issuing a command or etc., and thus we can describe indirectly the speech-act

in question. Now, we note that if we restrict our language so that we can use it merely to ask questions (or any other speech-act different from assertions) then our language will not have the same expressive power as the assertoric language described above. Hence, assertions are logically prior to any other speech-act.

A stronger argument for the logical priority of assertions is given by Kasher, using the following considerations[21] : Any kind of speech-act involves a speaker who entertains beliefs. Since beliefs require justification in which evidence may play a significant role, beliefs are results of acts of judgment. Judgment is the interiorization of the external act of assertion, using Dummett's argument, since "there is no 'natural' behaviour which, taken by itself, is enough to express those judgments"[22]. Hence, as Kasher puts it : "Assertion is prior to judgment, judgment is prior to belief, belief is prior to any thought, which, in turn, is involved in any kind of speech-act. Assertion is, therefore, prior to any other kind of speech-act."

Kasher continues and argues that asking questions is a necessary speech-act belonging to any language as follows[23] : asking a question is an attempt to elicit assertion or judgment from other speakers (or oneself). Any speaker capable of making assertions would recognize that the same capability exists in other speakers. "Since there could not be natural, non-linguistic ways of conveying the difference between assertions, there could not be natural, non-linguistic ways of trying to elicit all different assertions". Thus, Kasher argues that a 'minimal speaker', who is capable of performing only those speech-acts which are of a pure linguistic nature, will have in his language questions as well as assertions.

I tend to agree both with Kasher's claims to the 'logical priority' of assertions and the necessity of asking, as well as with Collingwood's claim that questions are 'logically prior' to assertions. To make my last claim sensible, I have to show that I have used the expression 'logically prior' in two different senses, and I have to show which of these senses is "logically prior" to the other so that it could be used as a guideline for constructing logical theories.

Collingwood, it seems, does not claim that the *speech-act* of asking a question is logically prior to the speech-act of asserting, since he admits that one may assert something (namely, answer a question) without being aware that one is answering a question. In particular, in asserting a speaker is answering a question even if he was not asked that question by someone else and even if he is not aware that he asked that question himself[24]. Now, if any speech-act

is an intentional act, then when Collingwood speaks of a person "realizing that he asked himself a question" he does not speak of a speech-*act*, but rather, I believe, he is speaking of a mental act. This mental act can be expressed by the speech-act of asking a question, but it is also expressed by the speech-act of asserting. In asserting something one expresses the fact that the question to be answered has been *raised*, and "By being answered a question does not cease to be a question. It only ceases to be an unanswered question[25].

The main point is this : the speech-act of asserting is logically prior to any other speech-act, including that of asking a question. But the speech-act of asserting consists of answering a question — whether it was asked or not (in the sense that asking is an intentional act). Hence, that which is asserted, a proposition (that which is true or false), is an answer to a question. This means that the question as a semantic entity, is logically prior to the proposition which is asserted, but the speech-act of asserting is logically prior to any other speech-act, including that of asking a question. How then should logic proceed ? It should be assertoric, that is, it should be based on a language within which we can make assertions, but the meanings of assertions should be given in terms of questions and answers[26]. Moreover, since we accept Kasher's argument for the necessity of the speech-act of asking, the language should be one which can be used to ask questions. Finally, since asserting involves answering a question, the language should be one which can be used to answer questions which are asked by use of the language. Thus, it seems that what we need is a language for conducting questions-answers dialogues. If thinking processes are described as "dialogues of the soul", then this language can be viewed as a 'minimal' language for the description of thinking processes, and thus appropriate for both the analysis of (the use of) language and for the formulation of our logical theory.

We come now to the problems associated with the specific description of the formal language of questions and answers, which will proceed from the analysis of the speech-acts in the dialogue. So far, I have presented general considerations of what logic should be, and tried to justify Collingwood's general suggestions. Now, I will use two additional kinds of considerations to support the details of the formal framework. First, in the analysis of the speech-acts I rely heavily on linguistic evidence. The idea is that the formal language should enable us to analyse and describe phenomena of natural language. A logical system which corresponds more closely to our intuitions concerning the syntactic features of natural languages

and their use, has greater explanatory power. Secondly, since the speech-acts are not performed in vacuum, but in the contexts of dialogues and since these acts are governed by conversational rules, I will use consideration about the interplay between the speech-acts performed in a dialogue and the conversational rules governing the dialogues.

Here the idea is this : certain features of a speech-act performed in a conversation, for example, asserting, may be attributed by some people to that speech-act, in arguing that any assertion made in any context will have this feature. Other people may attribute the feature not to the speech-act itself but to the dialogue within which the act was performed, and claim that it is a feature of the conversational rules and not the speech-act. The difference may be that different dialogues may, at least in principle, be governed by slightly different conversational rules, and hence in these different contexts the assertions may have slightly different features. I am not interested here in the problem of the demarcation between features essential to speech-acts and features which are derived from considerations of use stemming from conversational rules, and hence I will draw on considerations of both kinds. This is justified if we keep in mind that we are characterizing speech-acts which are performed in the context of a dialogue.

In an earlier paper I have attempted to analyse the speech acts of asserting, asking, assuming and presupposing in terms of two "functions" of language[27]. In general, I considered the speech-acts by asking two questions concerning them :

1. Did the speaker express his commitment to the truth of a proposition by performing his speech-act ?

2. Did the speaker raise a question, or 'put a proposition in question' by his speech-act ? I argued there that to assert a proposition and to ask a question both involve the expressing of a commitment to the truth of a proposition (possibly in varying degrees), and the raising of a question, thus allowing the hearer to react relevantly by answering the question asked or by affirming or denying the proposition asserted. Typically, a speaker asserts a proposition when he utters, in normal conditions, an indicative sentence which expresses that proposition in the given context. Thus he both expresses his commitment to the truth of the proposition and raises the question of its truth.

A speaker asks a question, typically, by uttering an interrogative sentence in normal conditions. By asking the question the speaker raises that question, inviting the hearers to answer it. Moreover,

the speaker expresses his commitment to the truth of the presupposition of the question, viz. that it has a true answer.

The meaning or content of both an assertion made and a question asked can be represented in terms of question-answer pairs : the question raised or asked by the speech-act and the answer to it which is claimed to be a true answer by the assertion, or the 'zero-eliminative' answer which is the presupposition of the question asked. (This will be explained further below).

When a speaker assumes a proposition he explicitly avoids expressing a commitment to its truth and he does not put it in question (he does not cause the question of its truth to rise). Typically, the speaker indicates that he is assuming rather than asserting a proposition by uttering :

Let us assume that ...
Suppose that ...
If ...

and the like. An assumption is always made for some purpose. It may appear as a part of another speech-act, for instance, it may be part of the assertion that the assumption entails something. It may also be used as a separate speech-act in order to condition or guard another speech-act. For example, a speaker may ask a question under some assumption and his asking of the question is in effect only if the assumption holds. Note that this account of assumptions is, in general, in accordance with Collingwood's claim that assuming is "an act of free will" which does not involve the speaker's expressing his belief in its truth. I depart, however, from Collingwood's terminology by speaking of assumptions, namely, that which is assumed (and that which is presupposed) as being a proposition.

When a speaker asserts a proposition he expresses his commitment to its truth and he thus expresses that he can (in principle), provide a justification for it (in the sense in which we have defined the concept of truth as a justified assertion, in the previous section) and that he is willing to bet his reputation on its being true. When a speaker assumes a proposition, on the other hand, he expresses the fact that he accepts the proposition as true (possibly, only on a temporary basis), without having to satisfy the requirement that he can justify it. We should therefore distinguish between the justification of a proposition, which is the justification of its assertion, and which is required for its being true, and the justification of its assumption or its acceptance, which is the purpose for which the

assumption was made, i.e., its "logical efficacy".

A speaker presupposes a proposition while performing some other speech-act (say, asserting another proposition or asking a question) and he thereby expresses his own commitment to the truth of the proposition presupposed and indicates also that the hearers accept, or should accept the truth of that proposition. He does not put the proposition in question, namely, he does not raise the question of its truth[28]. Thus, for example, by uttering the following sentences in normal conditions :

1. The present king of France is bald.

2. Is the present king of France bald ?

the speaker presupposes the proposition that there is presently a king of France. He expresses his commitment to the truth of the presupposition, but does not raise the question of its truth. Thus, his presupposing is pragmatically justified, if it is justified by his previous acts in the dialogue (namely, if he asserted it or assumed it or it is entailed from his previous assertions and assumptions) or if the other participants similarly accept the presupposition and do not challenge it[29].

In short, as I have argued, asserting and asking can be represented in terms of question-answer pairs. Now, since presupposing is an act which is always involved in performing another speech-act, say, asserting or asking, we have to be able to account for presupposition in terms of these speech-acts, and hence, also in terms of pairs of question-answer. This is done, as we shall see, by defining the different kinds of presuppositions in terms of the presupposition of a question that it has a true answer, which is identical to the 'zero-eliminative' answer to that question (and thus represented as a question-answer pair).

Finally, assuming is always a part of a complex speech-act, and it can be represented as the conditional part of a conditional-asking or a conditional asserting. Hence, it could be represented as a certain relation between question-answer pairs.

Hence, the different speech-acts of asserting, asking, answering, assuming and of presupposing may all be represented in terms of question-answer pairs.

Let me summarize some further considerations leading to the representation of both asking a question and asserting a proposition in terms of question-answer pairs[30].

First, the *point* of asserting is to answer a question under discussion. An assertion answers the questions it itself raises. For example, the sentence :

3. John ate the cake

raises the following questions :

4. Who ate the cake ?

5, What did John eat ?

6. What did John do to the cake ?

as well as the so-called "difficult questions" (multiple questions) :

7. Who ate what ?

8. Who did what to the cake ?

9. What did John do to what ?

10. Who did what to what ?[31].

If any of the questions raised by (3) is raised by the discussion prior to its utterance, then the point of the assertion by the utterance of (3) is to answer this question. Otherwise, the assertion seems pointless : it is ambiguous with respect to its point, and its semantic relevance to the previous discussion is questionable[32].

Now, consider the three assertions corresponding to the answers to questions (4) – (6) respectively :

12. *John* ate the cake.

13. John ate *the cake.*

14. John *ate* the cake.

(The underlines denote intonational stress).

These sentences differ from each other not in their truth conditions but in their focus information (underlined) and their topic information. The discussion of this problem is beyond the scope of the present paper. It is important to note that the treatment of assertions in terms of question-answer pairs provides a natural way for dealing with this problem[33].

As a further consideration for the representation of both asking and asserting by question-answer pairs, consider the request for a reaction. Typically, this request is associated with interrogative sentences. One may claim that when someone participates in a dialogue, he is, thereby, permitted (by the conversational rules governing the dialogue) to react to others' speech-acts. Yet, the difference between asserting and asking is that asking is an act by which the speaker tries *to cause* the hearer to react in a certain way, while in asserting he does not. This difference between the speech-acts is not always due to the use of interrogative sentences. It is clear that one may assert propositions by uttering interrogative sentences, (e.g., rhetoric questions) and that one can ask questions by uttering indicative sentences. Hence, it seems that the request for an answer is not completely dependent upon the mode of the sentence used. I suggest an even stronger claim : The use of an inter-

rogative is associated with bringing up a topic, a problem or a question for consideration or for discussion. The use of an indicative sentence is associated with the discussion of such topics. These functions are distinct from that of causing others to react — which is a function not of sentences, but rather, of a speech-act of its own : the act of pausing and waiting expectantly for a reaction. This speech-act, which as far as I know was not dealt with by anyone, is distinct from the acts of uttering interrogative or indicative sentences. The use of these sentences serves to indicate what would be a relevant reaction, and interrogative sentences have, in general, a more restricted range of semantically relevant reactions than indicative sentences : but, the request for a reaction is not a function of sentences but only the function of the "pausing expectantly" speech-act.

Finally, let us note that one can react relevantly to (answering a question raised by) both assertions and questions in similar ways. For example, one can affirm or deny an assertion and answer a "yes-no" question affirmatively or negatively by uttering the corresponding full indicative sentence, or by uttering simply "Yes" or "No", or by uttering some other categorial expression affirming or denying part of the information of the proposition under consideration. For example,

15. John ate the cake.

16. Did John eat the cake ?

admit reactions which provide the same kind of answers which consist of uttering any of the following :

17. No, Mary ate it.

18. No, he ate the soup.

19. Yes, and the soup too.

20. John didn't.

21. Yes, Mary helped him.

22. No, he and Mary finished it together.

23. There was no cake.

Even wh-questions admit some of these expressions as providing answers, e.g.,

24. Who ate the cake ?

can be answered appropriately by uttering (20) and (23) as well as

25. One of the kids

26. The present king of Belgium.

27. John, and possibly someone else.

28. All the king's horses,

and the like.

This brings us to the problem of characterizing relevant reactions, the act of answering a question asked or raised in a dialogue, and the kinds of answers that are possible to a given question. Clearly, reacting and answering are binary relations between an act and a reaction to it. These acts are elements in a dialogue and thus governed by the Gricean Principle of Conversational Cooperation[34].

To characterize reactions and answers, let us consider, of the four Gricean maxims, those of informativeness and relevance, which complement one another, as they concern reactions more than the other two maxims[35]. The maxim of informativeness requires a participant to make his contribution to the dialogue "as informative as is required (for the current purposes of the exchange)". The maxim of relevance requires a participant to "be relevant", which, I guess, could also be formulated as the requirement to be as relevant as is required "for the current purposes of the exchange".

In order to use these principles in characterizing reactions, we need to know what the "purposes of the exchange" are, and how they are to be characterized, and what relevance and informativeness are, and how they are characterized. But let us try to do the converse : let us accept these concepts on an intuitive basis, and see what conditions these concepts force upon the characterization of a reaction and answer. This would enable us to give a formal representation of answers. We can then use these concepts of kinds of answers to obtain a formal account for the above concepts used previously on an intuitive besis only. More specifically, after defining the various kinds of answers semantically, we can define the concepts of semantic relevance (consisting, roughly, of answering a question raised), (semantic) purpose of the exchange (consisting, roughly, of the questions raised or the questions under discussion) and of informativeness (consisting, roughly, of the new information or "focus information" of an utterance).

A dialogue, in general, is a game of asserting and causing others to do the same. The speakers say and ask whatever they wish according to their own interests which may or may not be apparent. The maxim of informativeness restricts the acts of the participants of the dialogue in two ways : A speaker should not be over-informative to the point of boring his audience to death. He can, in general, pursue his own interests and volunteer information which is not directly relevant to the information-requests of the other participants, but he cannot do so unlimitedly. This means that the maxim of informativeness is essentially vague or fuzzy, and that the

purposes of the exchange depend on the purposes of the speaker as well as on the interests of the other participants. Secondly, to be as informative as is required, the speaker should react to acts of "pausing expectantly" and provide answers to questions raised, whenever such a reaction is called for.

The maxim of relevance is clearly associated with reactions. The maxim does not apply for instance, to the first stages of certain dialogues in which the topics to be discussed are not specified so that there is nothing to which the speaker's acts can be relevant.

Even in the middle of a dialogue, if the topic under discussion is exhausted, a speaker may legitmately and "cooperatively" utter a sentence which is completely irrelevant to the previous discussion. Moreover, a speaker may introduce a new topic into a discussion, without thereby violating the principle of conversational cooperation, by utilizing a "by the way..." or an "a propos ..." clause. In general, while the principle of informativeness is associated with the request for a reaction (involved in the "pausing expectantly" speech-act), the principle of relevance is associated with the form or content of the reaction sought. In general, a reaction is relevant to a discussion if it answers a question raised by the discussion, or if it asks a question raised by the discussion. Moreover, these two maxims interact with one another in a way that might tell us something about the problem of what answers are sought to questions asked.

For the moment, let us assume that the syntactic structure of an interrogative sentence determines the set of possible direct answers to the questions it raises (this assumption will be further clarified below). The maxims of informativeness and relevance together require that a reaction be the strongest possible claim which the speaker can make which is relevant to the question under discussion. This means that if by a speech-act a speaker expresses his commitment to the truth of a proposition which the hearer believes to be incorrect or incomplete, then in his reaction the hearer should correct and complete the information. In other words, I think that if the hearer is requested to react, and in his reaction he does not complete or correct the information as supplied by the speaker, then one can be justified in concluding that the hearer is not ready to commit himself to the truth of any stronger proposition. For example, suppose that you believe that John and Mary ate the cake while I assert that John ate the cake. Then your reacting to my assertion simply by uttering "Yes" is insufficiently informative, and by the maxim of informativeness you are required to complete

the information, say, by asserting that both John and Mary ate it. On the other hand, if you believe that there was no cake, your reaction to my assertion by uttering "No" is again insufficiently informative, for you should have corrected my presupposition. Your failure to complete or correct my information is a violation of the maxims of informativeness, and thus is subject to the interpretation that you are intentionally witholding that information.

Moreover, suppose a speaker asks a question which the hearer is unable to answer : then the maxim of informativeness requires of him to supply the "maximal" information which is relevant and which he is able to give. I do not consider here information which may be pragmatically relevant, for example, information which may explain why the hearer is unable or unwilling to answer; but this principle also applies to semantically relevant information. Thus, a hearer may not know who ate the cake, but he may know that John didn't eat it or that one of the kids did. He then has to supply, by the maxim of informativeness, the appropriate *eliminative answer*,(20) or (25).

To summarize the above consideration, we reach the following conclusions : The maxim of informativeness, as a principle of conversational cooperation, requires a hearer to provide the information requested (i.e., to react), whenever it is requested. The maxim of relevance requires the reaction to be semantically relevant, by answering *directly* a question raised or by asking a question raised. Both principles together (shall we call it the principle of "Relevant-informativeness" ?) require that when the hearer is unable to provide a direct answer, he should provide an eliminative or corrective answer, and that this answer is the strongest claim he is willing to make.

Note that if the speaker knows the direct answer but provides an eliminative answer, then he is violating this principle. For example, if he knows that Mary ate the cake, but reacts by providing the eliminative answer (20) ("John didn't") to the assertion that John ate the cake or to the question of who ate the cake, then he is violating the above principle. Of course, if he cannot give any information which is semantically relevant, then he should resort to providing pragmatically relevant information, for example, by uttering:

29. I don't know

30. Go and ask Mommy

or the like. In the present paper I will not concern myself with pragmatically relevant reactions.

The discussion so far has led us to consider three kinds of

answers : direct, eliminative and corrective. They will be dealt with below. Roughly, a *direct answer* is a categorial answer satisfying certain semantic features. The question specifies a certain set of elements of a certain category — the range of the possible direct answers to it — and a direct answer is any expression of this category. An *eliminative answer* is an expression which denotes a subset of this range : the range represents the set of possible direct answers, while an eliminative answer helps to eliminate some of the possibilities. A question's presupposition is representable in terms of the "zero-eliminative" answer to the question, stating that it has a true answer. For instance, the answer

31. Someone did.

to the question :

32. Who ate the cake ?

A corrective answer to a question is, intuitively, an answer contradicting the question's presupposition, and hence it is an expression which negates the "zero-eliminative" answer. Thus, (33) is a corrective answer to (32).

33. Nobody ate it.

If we recall the principle of "relevant informativeness", then the following answers are also corrective answers :

34. Nobody ate it; Mary threw it away.

35. There was no cake; Mary didn't have time to bake it.

V. A short outline of the structure of dialogues

In the previous section I have used consideration, involving speech-acts and conversational rules of cooperation in order to establish that we can represent the elements of a dialogue in terms of question-answer pairs and to argue for the general properties of questions and of answers. These considerations are quite intricate, and their relation to the previous discussion of logical systems based on a theory of use may not be apparent. Hence, before we proceed to the description of the language representing the dialogues, let me clarify the distinctions made and describe, in general, how the formal framework for question-answer pairs accounts for dialogues.

We consider a questions-answers dialogue in which the participants utter indicative and interrogative sentences and cateogrial expressions in order to assert and to ask. I assume that they do not interrupt each other, though they sometimes pause, allowing the hearers to react, and they sometimes pause and wait expectantly, thus requesting the hearers to react. By their speech-acts, the

speakers express their commitment to the truth of propositions and they raise questions for the other participants to relevantly react to.

Context

The speech-acts of the participants consist of the utterance of a sentence (or of a categorial expression) in a *context*. Following Kasher, let us distinguish two components of the context[36]. The context-index contains information about the speaker, his audience and the physical properties related to the time and place and the form of the utterance. It seems reasonable to assume that the participants in a dialogue are aware of and agree upon the main facts included in the context-index. The context exponent contains certain assumptions which are shared by the participants and which are about the subject under discussion. I will not consider here any aspects related to the context-index and its possible effects on a dialogue[37]. Now, in some dialogues, the speakers know beforehand the subject of their talk and that they share certain information. In others, they may not know what they are to talk about and they may not be aware that they share certain assumptions or that they differ in their opinions concerning other assumptions. In these cases, the context-exponent may be empty in the beginning of the dialogue, and as the dialogue continues the assumptions, which turn out to be shared, are added to it.

How is the information of the context (-exponent) represented ? It is my view that the "topic under discussion" is representable by a question or sets of questions, and the shared assumptions related to the topic are these questions' presuppositions[38].

Hence, in any stage of the dialogue, an utterance is made in the context (-exponent) C which is a set of questions (which may be empty). The utterance of the speaker is relevant to the discussion in so far as it answers or raises a question in C. Roughly, a question is represented as an open formula. While in the beginning of the dialogue, the questions in the set may not be ordered, during the dialogue they are partially ordered according to the order in which the questions were raised by the speech-acts. (This is to facilitate answering categorially a question raised in the immediately preceding stage).

To see how this works, we have to see how an utterance is to be interpreted when there is information in the context.

Speech-acts

A speech-act consists of uttering a sentence or a categorial expression in the context of C.

The speaker asserts a proposition p by uttering, typically, an indicative sentence S or by uttering a categorial expression a, which answers a question F previously raised in C. The speaker asks a question p, typically by uttering an interrogative sentence S or by uttering an indicative sentence raising F and pausing expectantly.

Assertion.

1. The sentence S expresses the proposition p, $p = \{<F_1,q_1,a_1> \ldots <F_n,q_n,a_n>\}$ such that F_i is a question, namely, an open formula with one free variable q_i, and F_i is obtained from S by replacing a non-logical constant in S by this variable. (The idea is that from a sentence like (3) we obtain a set of wh-questions (4) - (6)). q_i, the variable which represents the wh-expression, is called a *querriable*, and it is of a certain type. a_i is a term which represents the categorial expression answering F_i, and it is of the same type as q_i. We say that S *raises the questions* $F_1, \ldots, F_n$ (as well as other questions. See below).

2. A categorial expression a expresses in C the proposition p, if immediately prior to its utterance, another speech-act was performed in which the question F was raised, where a and the querriable q of F are of the same type, and $p = \{<F,q,a>\}$.

The *meaning* or *the point* of an assertion in C, we claimed, is to answer a question under discussion, and hence it is that subset of the proposition which contains all the triplets $<F_i,q_i,a_i>$ such that F_i is in C (i.e. such that F_i is a question under discussion or raised by the previous discussion).

Asking a question.

1. If S is an indicative sentence used to ask, then S expresses the question $(p,-,\vee\{Yes,No\})$, where p is the proposition expressed by S, '—' denotes that there is no querriable, and '$\vee\{Yes,No\}$' represents the disjunction of the range of the yes-no question of whether p is true.

The *meaning* or *the point* of the question asked in C is the question $(r, \vee\{Yes,No\})$, r is the subset of p of the utterance of S in C.

2. If S is an interrogative sentence, then S expresses the question $(F,q,\vee C)$, where F is obtained from S by replacing the

wh-expression by the querriable q of the appropriate type, and C is the set of possible direct answers to F, namely the range of F : the set of all terms of the same type as q.

Raising of a question.

a. *An assertion* $A = \langle F,q,a\rangle$ *raises* the following questions :

1. $(F,q,\vee C)$, where C is the range of the querriable q[39].

2. The second-corder yes-no question of whether a is a true answer to F, $(\langle F,q,a\rangle,-,\vee\{Yes,No\})$.

3. The corresponding higher-order yes-no questions.

4. The multiple-questions $((F_1,q_1,\vee C_1),q,\vee C)$, such that F_1 is obtained from F by replacing one of its non-logical constants by the queriiable q_1, and C_1 is the range of the querriable q_1. (This accounts for the fact that sentences like (3) raise the multiple questions (7) — (10)).

5. If a is a complex term which involves a presupposition that some other question $(F_1, q_1,\vee C_1)$ has a true answer, then this question is also raised by A (This case will be discussed below).

b. *A sentence S* expressing $p = \{\langle F_1,q_1,a_1\rangle,\ldots, \langle F_n,q_n,a_n\rangle\}$ or expressing $(F,q,\vee C)$ raises any question raised by any of $\langle F_i,q_i a_i\rangle$ or by $\langle F,q,\vee C\rangle$ correspondingly.

Presupposition

1. A question $(F,q,\vee C)$ presupposes that it has a true answer, namely, it presupposes $\langle F,q,\vee C\rangle$.

2. A complex expression of the form $(\wedge x)\ \langle F,q,x\rangle$. (the x which answers F truly), $(\vee x)\ \langle F,q,x\rangle$, (all the x which answer F truly) or $(\vee x)\ \langle F,q,x\rangle$ (some x which answer F truly) all presuppose $\langle F,q,\vee C\rangle$.

3. An assertion $\langle F,q,a\rangle$ presupposes all the presuppositions of $(F,q,\vee C)$ and of a.

4. A proposition p containing assertions $\{A_1, \ldots, A_n\}$ presupposes all the presuppositions of any of the A_i.

Answers.

Let $(F,q,\vee C)$ be a question, then initially, we distinguish three kinds of categorial answers to it :

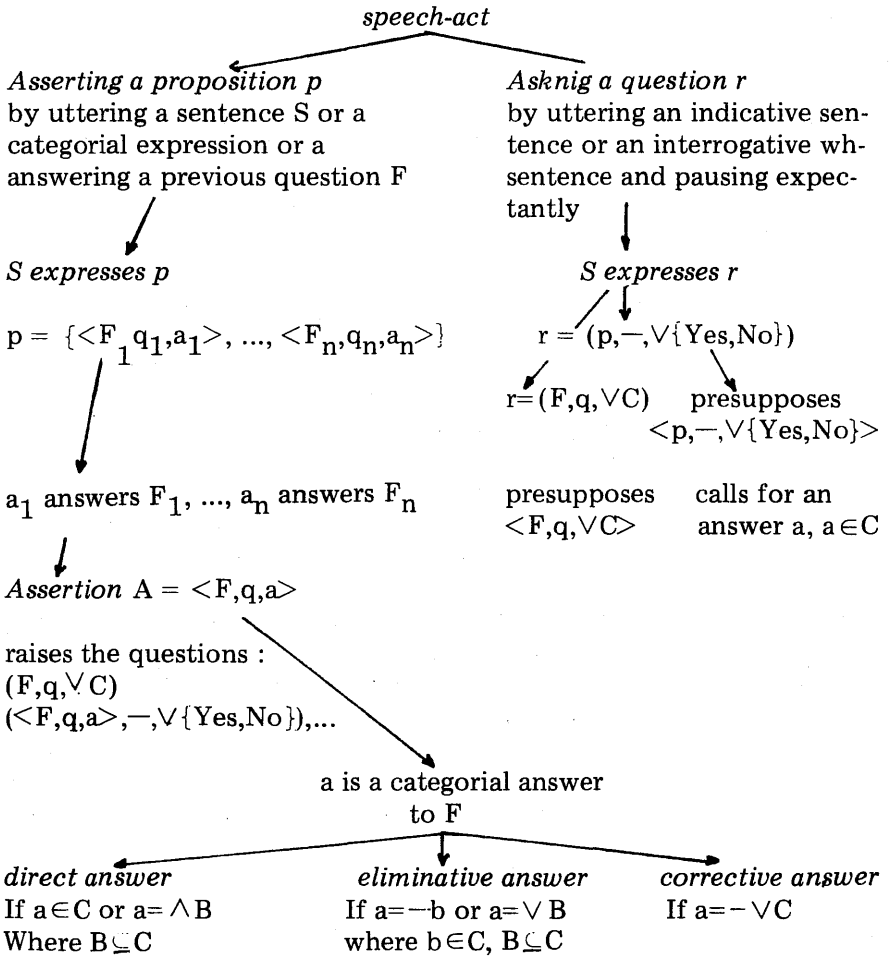
1. If $a \in C$ or $a = \wedge B$, where $B \subseteq C$ then a is a direct answer to the question (Intuitively, a is an individual term or a relational term and B is a conjunction of such individual terms or relational terms).

2. If $a = \neg b$ or $a = \vee B$, where $B \subseteq C$ and $b \in C$ then a is an eliminative answer to the question (Intuitively, a is a negation of a term

or a relation, or a is a disjunction of such individual terms or relational terms).

3. If $a = -\vee C$, then a is a corrective answer to the question. (Intuitively, a is the negation of the presupposition, namely, it is the term-negation of the disjunction of all the elements in the range of the questions)[40].

The main relations among the concepts defined may be best represented by the following table :



VI. Outline of the formal language for questions and answers.

Without getting into the technicalities of the language, let me describe it briefly.

We assume a fully typed theory, with term types which enable us to define recursively relational types and functional types of any level. 0 is the sentence type. The idea is that the speech-acts of both asserting and asking are adequately represented by the triplets $\langle F,q,a\rangle$ (in corners). Strictly speaking, the cornered triplet represents an assertion, i.e., that which has a truth value, but since in asking a question one is asserting (expressing one's commitment to the truth of) its presupposition, the question itself can be represented as the asserton of the presupposition $\langle F,q,\vee C\rangle$. The triplet (F,q,a) (in regular parentheses) represents a question which is asked (i.e., preceding a "pausing and waiting expectantly" speech-act). Finally, the open formula F in the triplets $\langle F,q,a\rangle$ or (F,q,a) is a question

Thus, although the language is basically assertoric, for it defines a semantics for assertions, the assertions are defined in terms of questions (open formulas).

Now, let us keep in mind that the wffs of the language are fully typed. We define as usual atomic formulas and complex formulas containing the usual sentential connectives (negation, conjunction, disjunction) for the leftmost element on the triplet, F. We then define, for each type a set of categorial answers (direct, eliminative and corrective answers) of this type, by regarding the term-negation of a categorial answer, the term-conjunction and the term-disjunction of categorial answer. After thus taking care of both components of the triplet, the open formula F and its categorial answer a, we add assertions to the list of wffs. Triplets in which F is closed, representing yes-no questions which allow for "yes" or "no" direct answers, and triplets in which F is open admitting categorial answers as sugeested above. To allow for quantifiers and definite descriptions, we also allow categorial answers of the form : "All those x which answer F_1", "Some of the x which answer F_1" and "The x which answers F_1" to be given as categorial answers to the question F (provided, of course, that the types fit). In this way we have used the fact that questions are open formulas in order to quantify over them. This results in a basically Aristotelian form of quantification. For example, the expressions

36. All of John's kids

37. Some of John's kids

38. The child of John

are all construed as answers to the question

39. Who is a kid of John ?

and thus all presuppose that John has children.

Semantics.

I use the regular two valued interpretation for the basic formulas F of a triplet. Assuming a domain for every term type, we let categorial answers denote elements of the power set of the power set of this domain. This yields that the term-connectives defined on this set constitute a Boolean Algebra.

The interpretation of the triplets naturally follows except for the following : I take a negative assertion $<F,q,\neg a>$ to be true if the positive assertion $<F,q,a>$ is false and the presupposition of the question $<F,q,\vee C>$ is true. This yields that, for example, the negative assertion

40. It's not John who ate the cake

represented by the pair

41. <Who ate the cake ? Not John>

is true only if someone else, different from John, at the cake[41]. This leads to the definition of an *implicature* of an assertion : F_1 is an implicature of an assertion $<F,q,a>$, where F_1 is a closed wff, if under any valuation which verifies $<F,q,a\vee\neg a>$, F_1 is also verified. Now, if we consider sentences involving negation, we can normally interpret the negation as term-negation operating on different terms, or as a sentential negation. For example,

42. John didn't eat the cake

may express a proposition which contains the following assertions:

43. It is not John who ate the cake (implicature : Someone else ate it)

44. John did not *eat* the cake (implicature : He did something else with it)

45. John ate not the cake (implicature : He ate something different from the cake.)

46. It is not the case that John ate the cake (no implicature).

Hence, it seems the different assertions of the same proposition may involve different implicatures. Note, however, that the above definition resembles the Strawsonian definition of presupposition (the presupposition has to be true in order that the propositon will have a truth value). Indeed, the implicature of an assertion is defined as the closed wff which has to be true whenever the question which the assertion answers has a true answer. If we now check the propo-

sition, it turns out that if F is a closed wff and F is a presupposition of a proposition p as defined in the previous section, then F is an implicature of all the assertions in p. Hence we define the presupposition of a proposition to be an implicature of all its assertions. This, in effect, yields the definition of presuppositions of questions and assertions in terms of the presupposition of a question that it has a true answer within its range.

VII. Semantic relevance

One of the most important features of the present theory is that it yields a natural account of relevance. The importance of this concept should be clear and does not need elaboration. For our present purposes let me just cite two cases where the need of clarification of the concept of relevance is stressed. One of the main objections against classical logic rests on the claim that material and strict implications are not kinds of implication, since these relations countenance fallacies of relevance. To quote Anderson and Belnap,

> "To fancy that relevance is irrelevant to validity strikes us as ludicrous, and we therefore make an attempt to explicate the notion of relevance of A to B[42]."

This claim led to the development of several systems of Relevant Logic, whose main task is to explicate a notion of relevance, which we may dub here "logical relevance" : This notion should account, at least, for the relevance of the proposition A to the proposition B, when the claim that A logically (and relevantly) implies B is true. The other case I have in mind which requires the clarification of the concept of relevance, is the use made of this concept within the Gricean theory of conversational cooperation rules, and in particular, his theory of implicatures. Indeed, in section IV above, I have made use of the Gricean maxim of relevance in order to argue for the characterization of kinds of answers to questions. Grice does not explicate the notion of relevance he has in mind, and indicates the difficulties involved in its explication.

Following Dascal, let us distinguish semantic from pragmatic relevance[43]. According to him, pragmatic relevance has to do with the relevance of speech-acts to certain goals, and it should be explicated as part of a theory of a goal-directed behavior. Semantic relevance, on the other hand, is a relation between propositions or sets of propositions, and its characterization, "which involves

concepts such as reference, aboutness, meaning relations, entailment, etc., is ... a fundamental task of semantic theory."[44] When we attempt to be clear on this distinction while holding that meaning is use, in the sense of the present approach, the distinction is not very clear. For our purposes, relevance is a relation between utterances and the context of their utterance. *Semantic relevance* is a relation between the meanings or the content of utterances (in the context of their utterance), so that in some sense we can say that the utterances are about the same (or, about semantically relevant) subjects. *Pragmatic relevance* is a relation between the meaning of an utterance (in the context of its utterance) and the conditions under which it is uttered. I guess that both concepts as used here relate to Dascal's concept of pragmatic relevance, for both are relations between a speech-act and the context of its performance : semantic relevance is a relation between the speech-act and the context-exponent, while pragmatic relevance is a relation between the speech-act and the context-index. Thus, in a dialogue in which we are discussing Mary, for example, any comment about Mary would be semantically relevant to the discussion, while my comment to the effect that I do not like to gossip, and hence do not wish to discuss Mary, is semantically irrelevant but pragmatically relevant to the discussion.

As indicated before, I will not concern myself here with pragmatic relevance. One should note, however, that the present account can be used for the explication of this concept. For in a discussion where the context-index is included in the context-exponent (namely, when the discussion is about the conditions under which the discussion is taking place), whatever is pragmatically relevant to the discussion, would also be semantically relevant to it. In all cases, I believe, an utterance which is semantically relevant to a discussion, is also pragmatically relevant to the discussion[45].

In general, an utterance is semantically relevant to a discussion if it answers or asks a question under discussion. But this characterization is too broad and too vague, so let us consider it in relative detail. Since we have characterized a question's being under discussion in terms of its being raised by previous pseech-acts, we can now talk of the semantic relevance of a reaction to a previous speech-act. But this involves a complication. In general, relevance is an intransitive relation : B may be a relevant reaction to A, and C may be a relevant reaction to B without C's being a relevant reaction to A. This is apparent if we consider pragmatic elements of the reactions, but it holds true also for semantic relevance : for A and B may be about the same thing (in the sense that they share a topic),

and the same may hold for B and C, while A and C do not share any topic. This accounts for the fact that in everyday dialogues, we may have a dialogue where every reaction is semantically relevant to the preceding speech-act, while the discussion as a whole changes its subject so that from a discussion of, say, the political situation in Israel it moves to be a discussion of the price of gasoline in the States. However, there is a sense in which relevance is transitive. For example, if in the proof of a long theorem we have used a lemma, then we would want to say that some utterance made in the proof of the lemma is relevant to the theorem since it is relevant to the lemma, and the lemma is relevant to the theorem. Different kinds of dialogues are governed by different relevance requirements. In a less formal gossipy chatter, there is no need that every utterance be relevant to the topic under discussion — simply because there is no such well defined topic. In these discussions, the requirement for relevance is only localized : every utterance should be relevant to the other utterances in its immediate vicinity. In other discussions (for example, in proofs), the requirement is that segments of the discussion should be locally relevant, but these segments should be also globally relevant (i.e. in the sense in which we have required relevance to be a transitive relation) to each other. Hence, what is needed is an explication of the concept of relevance that would explain both the transitivity of relevance (when it is) and its intransitivity (when it isn't). Moreover, we often talk in terms of relative relevance, that is, of one utterance being more relevant to something than another utterance is. Thus, our explication of the concept of relevance shoujld yield some partial ordering according to the "degree of relevance" of an utterance to another.

We do this in steps : first, we define the strong relevance, a relation between assertions and/or questions which consist of the sharing of the question (i.e., the leftmost argument in the triplets, which corresponds to the sharing of the open formula). This relation is an equivalence relation. Secondly we define a relation of weak relevance between propositions and/or questions, which consists of having some triplets which are strongly relevant to each other. This relation is symmetric, but, in general, intransitive. Thus, for example, a conjunction of two propositions is weakly relevant (only) to any of its conjuncts. This relation accounts for the possibility of a series of speech-acts in which each speech-act is locally relevant to the preceding speech-act, while not to a speech-act performed earlier. Finally, to account for the transitivity of relevance, we define concepts of weakly and strongly conditional relevance : If A and B

are propositions or questions or assertions, and if A is strongly relevant (weakly relevant) to the question Q' and B is strongly relevant (weakly relevant) to the question Q", and if C is an assertion of the form :

$$<Q', q, \begin{cases} \text{(all} \\ \text{(some} \\ \text{(The} \end{cases} \text{ x) which answers Q" truly}>$$

(Namely, C asserts that all or some or the true answers to Q" are answers to Q'). then A and B are strongly (weakly) conditionally relevant to each other, on condition C.

These definitions of semantic relevance, provide a natural account for the difference between "natural" complex sentences in which the connectives connect sentences which are somehow relevant to each other (in the context of their utterance), and those complex sentences in which the components are clearly irrelevant to each other and appear only in logical texts. For example, both conjunctions (47) and (48) are natural conjuncts :

47. John and Mary ate the cake

48. John ate the cake and Mary ate the cake.

As a matter of fact, the conjoined assertions in (48) (when the intonational stress is on "John" and on "Mary"), are strongly relevant to each other. These conjunctions are acceptable because it is apparent what question the two conjuncts answer (49), on the other hand, is intuitively unacceptable.

49. John ate the cake and snow is white.

The two conjuncts seem completely irrelevant to each other since there is no question which the two conjuncts answer. Of course, we can always find a story, that is, describe a context in which the two conjuncts will be relevant to each other. But the present account takes care of this case as well : we can find some assertion which will make these conjuncts conditionally relevant to each other.

Now, it follows clearly from our account that strong relevance is stronger than weak relevance and thus we define some kind of ordering on relevant utterances. Moreover, we can define such an ordering among weakly relevant propositions (or questions) if we consider the "quantity" of whatever is shared. Thus consider

50 John ate the cake.

51 John ate the peanuts

52 John slept late.

Clearly (51) is more relevant to (50) than (52), ... since both (50) and (51) are about John's eating, while (52), though it is about John, is not about John's eating. On the other hand, if we compare (50) and (51), it seems that (50) is as relevant to (52) as (51) is.

As a final note concerning relevance let us consider what I previously called "logical relevance" : it seems that within the present approach we can account for logical relevance in terms of semantic relevance.

The present definition of semantic relevance, which is sufficiently general to account for the oddities of relevance in dialogues, can be used as a guideline for the construction of relevant logical systems.

Following the customary practice in logical investigations the study of relevant logics starts with propositional logics. But there is something unnatural in starting with the analysis of the concept of relevance on the propositional level. One should note that relevant logics are not designed to provide an explication of the concept of relevance in general, but only as it applies to the concept of implication. When we consider propositions as our atoms, it seems that the relevance requirement of an implicational statement amounts to demanding that the antecedent and the consequent share at least one variable. Practically, this means that the relevance needed for an implication to be relevant is rather strong : on the atomic level it is such that the only relevant connection between atoms is that existing between an atom and itself.

A more general view of relevance should allow for different atoms to be relevant to each other, even in a way that applies for relevant implication. Thus, presumably, we want a relevant logic containing an identity symbol, to allow that, say, that a = b relevantly implies that b = a. Hence, it seems more natural to start from an analysis of relevant implication directly from the study of such a predicate calculus. The present approach allows for two possibilities of interpreting relevance of implication : First, we extend the idea of 'variable sharing' in the propositional level to the 'sharing of a question' (an open formula), as is exemplified in the concept of strong relevance or 'sharing of any constant' as is exemplified in the concept of weak relevance[46].

Secondly, to allow for relevant implication to be transitive, we need to utilize something like the concept of conditional relevance. This concept of conditional relevance enables us also to account for relevant implication between atoms on the condition that some axiom holds in the system[47].

VIII. Conclusion - The logic of questions and answers as a logic based on a theory of meaning as use.

Whatever the major goals of logic are, we claimed in the first section of this paper, its theories are theories describing relations between the meaning of some linguistic entities, and thus, how they represent the meanings of these entities depends on a theory of meaning. In studying the relation between various approaches to logic and theories of meanings. I have, at various points, described conditions which should be satisfied by logic. It is time now to summarize the main argument which is scattered along the paper and to see to what extent the theory of questions and answers offered here satisfies these conditions and to what extent it does not.

In section II, I have compared several views concerning the aim of logic, discussing the answer given within the framework of classical logic. The presentations of the classical system by a set of deduction rules and the customary semantic interpretation, by a set of axioms, or by a natural-deduction set of rules, are justified by different views concerning the major goals of logic and are also related to different answers of how to describe the meanings of linguistic entities.

The representation of logic in terms of deduction rules and semantic rules, as is done by the common logic books for philosophers, is related to the explication of the concept of informal validity, formally described by two concepts : semantic validity and syntactic validity. Semantic validity is defined in terms of truth values of formulas, and it utilizes the theory of meaning as it is related to truth-conditions. Accordingly, the meaning of sentences is given by their truth conditions, and the meaning of the logical constants is given by showing how they affect the meaning of sentences in which they occur. Syntactic validity, as interpreted in these texts, is justified only in terms of the semantics and pedagogical considerations : the list of rules seems arbitrary and subject to the sole condition that it is a list sufficient for the proof of the completeness theorem.

The axiomatic presentation of logic is associated with the goal of providing a theory of logical or analytic truth. The syntax defines a concept of derivability needed to define the logical closure of sentences, in terms of which the meaning of a sentence can be defined as its logical closure or its intention. Clearly, the customary interpretation is associated with this presentation as well, using an undefined concept of truth, and as before, it yields a

truth-conditions meaning theory.

Already at this stage we are able to compare the two presentations of classical logic : in a sense, the axiomatic presentation is better since its syntax and semantics are given separate and independent justification in terms of the goals of logic, and the completeness theorem establishing the connection between the two enabmles us to consider the syntax as supporting the plausibility of the semantics and vice versa. This does not exist in the first representation of logic, and hence we can say that the axiomatic representation has greater explanatory power.

The natural deduction representation of classical logic is an attempt to remedy the flaw found in the common texts : the goal of logic is to describe deductions or valid arguments, and the syntactic rules given are justified as rules defining the meaning of the logical terms. The rules of deduction are rules for the use of the logical constants, and thus this presentation is associated with the theory of meaning as use. However, the rules and the system do not offer a natural candidate for the interpretation of the meaning of sentences. Moreover, a general theory of meaning as use has to account for the ways by which different contexts of utterance affect the meaning of the sentences uttered. This cannot be done within classical logic, and, I believe, it cannot be done by using the standard semantics (i.e., by possible-world semantics), since there the concept of context (and possible world) is not explicated but taken as primitive. Hence, at this point, we parted from classical logic and turned to Collingwood's suggestions, interpreting them to offer a logic based on a theory of meaning as use. However, the discussion of the above representations of classical logic enabled us to state some general conditions which a preferred system should satisfy (see section II). If the system of questions and answers logic offered here is to compete at all with classical logic, it should be able to do all that the latter achieves, namely, it should satisfy the following conditions :

1. It should provide a semantic account for the informal notion of validity as truth preserving, and account for the notion of logical truth as true under any interpretation, and for the meaning of linguistic expressions in terms of truth-conditions.

2. It should provide a syntactic account for the informal notion of validity as "following from", this notion should be sufficient for the definition of logical closure of sentences, thus accounting for the meaning of sentences in terms of their intensions.

The syntax for question-answer pairs is given a semantics which satisfies the first condition above. Concerning the second condition,

the present theory is lacking. What is needed is the development of the appropriate Gentzen-like rules for the connectives. This is left here as an open question.

Note, however, that to some extent, the difference between the present system and the more common assertoric systems, is notational : the first argument F in a triplet <F,q,a>, a question is actually an open formula. Sentential connectives are functions from these formulas or triplets. Still, the present system offers an added complication, since the last argument in the triplet admits term-connectives, and the relations between the two kinds of connectives, and the appropriate syntactic rules are still to be explored.

Note, in addition, that the implication relation developed should presumably yield a concept of relevant implication (in the sense of the previous section), which in its turn will yield a concept of intension (or depth) of terms and of sentences, satisfying the traditional properties assigned to intension[48].

Utilizing Collingwood's suggestions concerning logic and interpreting them as an offer to base logic on a theory of meaning as use, I considered assertions as acts of providing answers to questions. Assertions are indeed logically prior to questions as claimed (in section IV), in the sense that the speech-act of asserting is logically prior to any other speech-act. Yet, questions are logically prior to assertions in the sense that the meaning of an assertion depends upon the question it answers. Hence, our logical theory should be basically assertoric, but the assertions are further analyzed in terms of questions and their answers. Moreover, since the theory is basically a theory of use, where the meaning of sentences is interpreted in terms of question-answer pairs within an ordered complex of such pairs, the theory has to explicate the concepts related both to the pairs and to the complexes. Namely, it should account for (1) the speech-acts of asserting and asking and show how their meaning is related to their presentation in terms of pairs (in a complex); and (2) the components of the pairs : what a question is, and the kinds of answers to it : and, finally, (3) the relations between the elements in the complex and the possible transitions from one to another. Two kinds of transitions were discussed. The first, are transitions which we may call "logical" : derivations and analysis. The theory has to explicate concepts like : presupposing, answering, requesting an answer, raising of a question and implication. Secondly, the theory should account for how different contexts of utterances may affect their meaning, and hence it should account for concepts related to transitions between speech-acts performed in a dialogue.

The theory does offer an explication of the concepts of context (-exponent), semantic purpose of an exchange (the questions under discussion, i.e. within the context-exponent), informativeness of a speech-act (related to the focus-information of an utterance) and semantic relevance.

The formal system which results from our treatment is not completely new, I believe, mainly since the central concept of a question turns out to be an open formula, with which we are familiar. The main difference between the present approach to assertoric logic and the customary one is in its attempt to account for pragmatic aspects within its syntax, for we do not consider sentences alone but sentences and the contexts of their utterance. Formally, the new idea here is to view that which is true or false — an assertion in the present terminology — as a structured entity, namely, a question-answer pair, and a proposition then turns out to be an equivalence class of such assertions (equivalence under truth conditions)[49]. This enables us to account for categorial answers to questions, for term-connectives and for the linguistic concepts of sentence-topic and sentence-focus. In addition, we have defined a concept of presupposition which reduces all presuppositions to the (pragmatic) presupposition of a question — that it has a true answer. This enables us to have both a Strawsonian-like approach to presuppositions, and show the connection between the pragmatic presuppositions of the participants of a dialogue (the contextual presumptions of the dialogue) and the presupposition of an assertion or a question. Finally, we are able to characterize contexts (context-exponent) and semantic relevance, which seems to be fruitful both for the discussion of dialogues and conversational rules and for logic and the requirement that implication be relevant.

Admittedly, although not all the problems discussed are given a complete answer and possibly, the answers to some are vague and unsatisfying, the present approach seems promising, even if we consider just the list of problems which it helps clarify.. If we accept Collingwood's claim that assumptions have no truth value but are to be judged according to their "logical efficacy" — the questions they cause to arise – then the amount of problems mentioned here, I believe, makes the present approach "logically efficacious", and worth pursuing.

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NOTES

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[1] Grover (1975).

[2] Hamblin (1970).

[3] Hacking (1979). Further points of this paper will be discussed in section II.

[4] The formal system is presented in details in Manor (1981b).

[5] Collingwood (1933), (1939) and (1940).

[6] Copi (1978), p. 4.

[7] Haack (1978), p. 1.

[8] In some texts, for example, Copi (1978), truth preserving relation is taken to be the explication of the relation of "following from". In this case, there is no obligation to explicate the latter in terms of the syntax since the semantics is doing both the job of representing semantic and syntactic validity.

[9] Haack (1978), pp. 14–15.

[10] The claim of the arbitrariness of the deduction rules is not new, of course. I believe that this is one of the motivations to consider the deduction rules of natural deduction systems as definitions of the logical constants, thus yielding definite conditions that the set of rules should satisfy.

[11] Another reason for the attempted reduction (which goes beyond technical conveniency), is the claim of the logical priority of assertions (See section IV).

[12] Quine (1962), pp. 1–8.

[13] Hacking (1979).

[14] For further details see Kasher and Manor (1979). There, the depth (intension) of sentence as well as of individual terms and predicate terms is defined in terms of relevant implication, (and, of course, in terms of the logical closure concept resulting from this implication). As we shall see in section VII, this fits well with the present appraoch.

[15] This formulation is due to Quine (1962). See Hacking's criticism

in the discussion of the "analyticity program" in his 1979 paper.

[16] Hacking (1979), pp. 290–291.

[17] Hacking puts two conditions on what he calls a "Gentzen-like" system. The subformula property, yielding that the problem of the derivability of a formula of a higher degree of complexity can be reduced to the problem of the derivability of formulas of lesser degrees of complexity. The property of conservativeness is, in effect, the requirement that an addition of a new constant to the system does ot change the stock of theorems in the original system. For further discussion, see also Bendall (1978).

[18] I discuss Collingwood in relative detail, first since I find his views interesting and refreshing and secondly since it seems that his views of logic were ignored and did not receive the attention they deserve.

[19] Dummett (1976). See also the comments to this paper in Ullmann-Margalit (1976).

[20] I believe that these transitions can be used to describe the methods by which we attempt to find proofs of theorems, for example, in mathematics, we attempt, at each point, to reduce the conclusion to a statement which seems easier to prove, and we try to "play with the assumptions" to see what we can derive from them which will get us closer to the proof of the conclusion. At each stage, we keep both questions in mind and compare them, trying to attack the easier of the two. Thus, in a sense, we use both ascending and descending : from the beginning and the end we attempt to find the middle.

[21] Kasher (1980).

[22] Dummett (1973), pp. 362–363.

[23] I do not go into the details of the argument. For the present purposes, this rough outline should suffice.

[24] Collingwood (1940), pp. 23–24.

[25] Ibid., p. 25.

[26] In the following I actually identify assertions (the meaning of assertoric utterances) with question-answer pairs. von Stechow (1980b), calls the question-answer pair "the semantic value" of a sentence, which, he claims, determines the assertion but is not identical to it, since it also provides additional information e.g., topic-information and focus-information. Since I do not get into these problems here, there seems to be no reason not to identify

assertions with these pairs.

[27] Manor (1981a).

[28] Note that I distinguish here the raising of a question by a proposition from the speech-act of raising a question or putting a proposition in question. A proposition is defined as a set of question-answer pairs and in this sense we say that it raises these questions. The speaker's speech-act of raising a question is a different thing for it meant that he by his act, brought the question to the hearer's attention. A presupposition, being a proposition, raises questions in the former sense. But by the act of presupposing, the speaker does not raise the question (in the latter sense).

[29] Namely, the presupposition is pragmatically justified if it is a "contextual presumption" in the sense of Manor (1981a). This is conveyed to the participants if no one challenges or rejects the presupposition in question.

[30] These considerations, as well as considerations of intonational stress, are discussed in detail in Manor (1981b), and hence I just summarize them here.

[31] This is not the complete list of questions raised by (3), for it also raises "second order questions" such as "Did John eat the cake ?" or higher-order questions, e.g., "Is it true that John ate the cake ? and the like. The characterization of the questions raised by an utterance will be discussed in section V.

[32] Its semantic relevance to the discussion is "questionable", since it is either irrelevant to it or the relevance connection is indirect and will become apparent only later on as the dialogue proceeds. This case is related to the problem of the transitivity of relevance, discussed in section VII.

[33] The work related to this problem is still in progress, but see von Stechow (1980a) and (1980b) as well as Manor (1980).

[34] Grice (1975).

[35] The other two maxims, of sincerity and perspicuity are also relevant to the particular nature of reactions. In particular, the requirement for the perspicuity indicates that one should phrase the answers to questions in such a way that the hearer could understand it. This aspect of answers was stressed by Hintikka, for example, in his 1976 book. The maxim of sincerity ("Be truthful"), is related to the concept of commitment to a proposition discussed before : when a speaker asserts a proposition he expresses his commitment to its

truth thereby staking his reputation on the truth of the proposition. This is so because there is a rule of sincerity governing the acts in the dialogue.

[36] Kasher (1974).

[37] It should be clear that the context index may also affect the meanings of utterances : For example, it should be used in order to find the meanings of indexical expressions. But, moreover, it should be considered in any account of pragmatically-relevant reactions.

[38] The context-exponent is related to Stalnaker's concept of 'pragmatic presuppositions". The treatment here of the contextual change as the dialogue proceeds is similar to Manor (1975) and Stalnaker (1978); but the difference is that here we refer to the context information as a set of questions and their presuppositions, and not in terms of propositions. Note that by representing the context in terms of questions and their presuppositions, we somehow justify the use of the term "presuppositions" to refer to the shared assumptions of the participants of the dialogue (i.e., the "pragmatic presuppositions" in Stalnaker's sense) : these are indeed the presuppositions (in the so-called semantic sense) of the questions which are under discussion. Finally, let me remark that questions are viewed as open propositions, and hence the present account is in accordance with Heim (1980).

[39] The range of the querriable, C, is the set of terms of the appropriate category, or some subset thereof. The following questions, for instance, have a restricted range :

Who ate the cake, John or Mary ?
Which one of the kids at the cake ?

[40] Those answers to which I have referred as "complex" answers may fall under any of these categories. For instance, "the present king of France" is a direct answer, but in a context where it is accepted by all that He does not exist, this may be used to yield a corrective answer, that is, like the answer "No one".

[41] A. von Stechow has just pointed out to me that the formal clause in the semantic of term-negation which creates the implicatures is *ad-hoc* and that by considering focus and topic information as in his (1980b), he gets the same effects in a non *ad hoc-ish* way. It seems to me that he is basically right about the matter. However, since I tried to avoid any discussion of topic, focus etc., in this paper, it seems that for the present purposes we can still use the above semantic characterizations. These definitions were formed

so that we can account for the difference between positive and negative sentences, discussed in Manor (1980), and von Stechow's suggestions concerning term-negation yields, I believe, the same results.

[42] Anderson and Belnap (1975).

[43] Dascal (1976), see also comments on this paper in Manor (1976).

[44] Dascal (1976), p. 153.

[45] Note that a semantically relevant reactions is not always appropriate or cooperative. For example, an appropriate reaction to a joke should consist of a laugh or a similar reaction but not of any sentence relevant to its content, thus "killing" the joke.

[46] Note that strong relevance amounts to the sharing of both the structure of a proposition and a term, while weak relevance amounts to the sharing of a term only. Both concepts could be interpreted a yielding a concept of "relevance of expressions" in addition to that of the relevance of sentences.

[47] Batens (1975) argues that the concepts of inference and valid inference are relative to the context in which the inference takes place. Hence, any inference rule must satisfy, besides the truth preserving condition, also the following: both the premises and the conclusion of the inference must be informative relative to the context, and the premises must be relevant to the conclusion. It seems that, in this way, Batens is also attempting, in a sense, to apply the conversational rules in order to define the use of logical systems and hence, to put restrictions on the nature of these systems, rather than the customary approach which starts from the system (syntax plus semantics) and hopes that the pragmatic aspects can be obtained by extending these systems.

[48] See Kasher and Manor (1979), and f.n. (14).

[49] This was pointed out to me by A. von Stechow.

REFERENCES

ANDERSON, A.R., BELNAP, N.D. (1975), *Entailment: the logic of relevance and necessity*, vol. 1, Princeton.

BATENS, D. (1975), "Deduction and contextual information", *Communication and Cognition*, vol. 8, pp. 253—275.

BELNAP, N.D., STEEL, T.B. (1976), *The logic of questions and answers*, Yale.

BENDALL, K. (1978), "Natural deduction, separation and the meaning of logical operators", *Journal of Philosophical Logic*, vol. 8, pp. 245—276.
COLLINGWOOD, R.G., (1933), *An essay on philosophical method*, Oxford.
COLLINGWOOD, R.G., (1939), *An autobiography*, Oxford.
COLLINGWOOD, R.G., (1940), *An essay on metaphysics*, Oxford.
COPI, I.M., (1978), *Introduction to logic*, (5th ed.), Collier Mc-Millan.
DASCAL, M. (1976), "Conversational relevance", *Meaning and Use*, A. Margalit (ed.), Reidel/Magnes, pp. 153—174.
DUMMETT, M., (1973), *Frege, Philosophy of language*, Duckworth.
DUMMETT, M. (1976), "What does the appeal to use do for the theory of meaning ?. A. Margalit (ed.), Reidel/Magnes, pp. 123—135.
GRICE, H.P. (1975), "Logic and conversation", *Syntax and Semantics*, vol. 3, Cole, Morgan (eds.), Academic Press.
GROVER, D.L. (1975), "Problems in evaluating logical theories, some exploratory remarks", *Communication and Cognition*, vol. 8, pp. 131—150.
HAACK, S., (1978), *Philosophy of logics*, Cambridge.
HACKING, I., (1979), "What is logic ?", *The Journal of Philosophy*, vol. LXXVI, pp. 285—319.
HAMBLIN, C.L., (1970), *Fallacies*, Methuen.
HEIM, I., (1980), "Reference and open propositions" (Mimeo).
HINTIKKA, J., (1976), *The semantics of questions and questions of semantics*, Acta Philosophica Fennica, vol. 28.
KASHER, A., (1974), "Mood implicatures : a logical way of doing generative pragmatics", *Theoretical Linguistics*, vol. 1, pp. 6--38.
KASHER, A., (1981), "Minimal speakers, necessary speech-acts", *Natural Speaker Festschrift*, F. Coulmas (ed.), Mouton, pp. 93—101.
KASHER, A., MANOR, R., (1979), "A note on the breadth and depth of terms", *Theory and Decision*, vol. 11, pp. 71—79.
MANOR, R., (1975), "On propositional commitment and presupposition", *American Philosophical Quarterly*, vol. 12, pp. 141—149.
MANOR, R., (1976), "Comments" (on Dascal (1976)), *Meaning and Use*, A. Margalit (ed.), Reidel/Magnes, pp. 175—180.
MANOR, R., (1980), "Positive and negative sentences" (Mimeo).
MANOR, R., (1981a), "Dialogues and the logics of questions and

of answers", (Forthcoming) *Linguistische Berichte.*
MANOR, R. (1981b), "Answers and other reactions", (Forthcoming), *Theoretical Linguistics.*
QUINE, W.V.O., (1940), *Mathematical Logic*, Harvard University. (The references here are to the Harper Torchbook edition, 1962).
STALNAKER, R.C., "Assertion", *Syntax and Semantics*, Vol. 9, Cole (ed.), Academic Press.
STECHOW, A. v. (1980a), "Notes on topic and focus of interrogatives and indicatives", Working papers of the SFB99, Konstanz.
STECHOW, A. v., (1980b), "Topic, focus and local relevance", (Mimeo).
ULLMAN—MARGALIT, E., (1976), "Comments" (on Dummett (1976)), *Meaning and Use*, A. Margalit (ed.), Reidel/Magnes, pp. 136—140.