BAR HILLEL, GENERATIVE SEMANTICS AND GENERATIVE PRAGMATICS

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CONTENTS

§ 1. *To which entities can we assign truth-values ?*

The rationality of a person is often characterized in terms relating to his "openness' to logical argumentation. Thus, a "rational" person is bound to believe the logical consequences of his beliefs — at least whenever he is *shown* that they are logical consequences of his beliefs (¹). Moreover, a rational person is consistent : he holds no inconsistent beliefs. Or, at least he adheres to consistency as a *norm* : whenever he is confronted with a revealed inconsistency in his beliefs, he attempts a revision in order to remove the inconsistency (²). Thus, no adequate theory of rationality can be given without a systematic theory of valid argumentation.

However, arguments can be construed only out of entities to which it makes sense to assign truth-values. After all, an argument pattern is *valid if*, and only if, it matches true conclusions with true premises. Hence, the notion of *validity* can be defined only by reference to the notion of *truth*. So if an argument would be constructed out of entities to which it would be absurd to assign truth values, the validity of the argument would be invaluable, hence its "rational" impact would be inestimable.

Now, argumentation occurs essentially in communication-situations of all sorts, and is couched in "natural language" (³). Hence, it seems urgent for any attempted theory of rationality to answer the question : To which entities can we assign truth values ? Then the entities in question should be identifiable with some kind of "units of communication" of some sort or other.

Hence, it should not be surprising that Bar-Hillel, who has always deeply interested both in problems of communication and in problems of rationality (⁴), dedicated considerable efforts to answer the question above, as well as the closely related question concerning the nature of the "logic" underlying reasoning in "natural language". The studies of these topics collected in his *Aspects of Language* (⁵) make it easier to survey the development of his thought, to criticize it, and to attempt an improvement of his suggestions which should also be of interest to theoretical linguists. This paper is intended,

therefore, to accomplish the following tasks :

a. to trace the development of Bar-Hillel's views concerning the problems mentioned ;

b. to examine some of the applications he has made of his views ;

c. to suggest a criticism of both Bar-Hillel's views and of his applications ;

d. to suggest certain corrections of Bar-Hillel's conceptions, which should overcome the difficulties revealed by the criticism.

These tasks will also determine the structure of the paper.

§ 2 *The development of Bar-Hillel's views*

The development of Bar-Hillel's views concerning the nature of the entities to which truth value can be ascribed can be described in terms of the theoretical context in which he locates this discussion, namely, that of philosophical semantics, or that of theoretical linguistics, or that of the theory of communication, or that of the theory of reasoning in natural languages, etc. It can als be described in terms of the conceptual apparatus which he suggests in order to encapsulate the insights he has achieved. Obviously, these two facets of the development cannot be separated easily.

As phases in the development, we will take Bar-Hillel's papers in the order in which they were published, which is also their order in *Aspects of Language*. Each paper will be treated in a separate subsection.

A. *"Indexical Expressions"*

The basic insight stressed by Bar-Hillel in this paper is that there are certain sentence-types, the reference of their tokens being determined by pragmatic characteristics of their occurrence, and not only by the sentence type to which they belong. Bar-Hillel dubs the reference of each sentence-token a proposition — without clarifying this usage any further. It seems, however, obvious from what he says that he considers the *truth value* of sentence tokens (and he allows them truth

values !) as part of their reference, since he takes the difference of truth values of various tokens of the same type as evidence that they have a different reference.

Bar-Hillel also points out, in this paper, that the dependence of the "reference" of a sentence — token on its context is sometimes revealed by the occurrence of "indexical expressions" in it. Thus expressions such as "I", "this", "now" etc., indicate as it seems the relevance of specifiable aspects of the context in which the sentence token occurs — namely the identity of the speaker, the object at which his attention and that of the listener is directed, the time of the discussion, etc. In order to ascertain the precise nature of those aspjects which are "pinned down" by the indexical expressions in question, one has, of course, to get information which is additional to that contained explicitly in the sentence token. One has to know *who is the speaker* and many other such things.

Bar-Hillel also provides a sketchy argument, in terms of a thought-experiment, to be quoted later, which shows why the utilization of context-dependent sentence-types (namely, sentences types whose various tokens have different references) is almost essential to the purpose of communication between humans. But he does not a he not to analyze in a theoretical and systyematic fashion the significance of both the thought-experiment and the conclusions he draws from it.

We may then quote Bar-Hillel [69]" "Even very superficial investigation into the linguistic habits of users of ordinary language will reveal that there are strong variations in the degree of dependence of the reference of linguistic expressions on the pragmatic context of their production. Whereas, for instance, the sentence

(1) Ice floats on water

will be understood by almost any grown up normal English speaking person to refer to the same state of affairs... what the sentence

(2) It's raining

is intended to refer to will be fully grasped only by those

people who know the place and the time of its production, and the identification of the intended reference of the sentence

(3) I am hungry

will require the knowledge of its producer and the time of its production... All the tokens of the sentence type (1) will be understood by almost every grown up English-speaking person te refer to the same state of affairs, whereas nothing of the kind can be said with respect to tokens of (2) and (3) ... (70). Though denying a reference to type (2), we might still say that it has a *meaning* in this sense that its various tokens fulfill the same pragmatic function (or the same pragmatic functions), say to draw attention to certain methodological conditions in the space time neighborhood of their producers (or in certain other specifiable neighborhoods) ... [77] Assume that Tom Brown is a logician interested in our problem who has decided to find out whether he could get along, for just one day, the first of January 1951, using the non-indexical part of ordinary English only. He told, of course, his wife about the experiment. At the morning of the mentioned day Tom awakes and since it is a holiday, he decides to take breakfast in his bed. His watch is under repair and he therefore, does not know the time. How shall he inform his wife about his wish? He is forbidden to say "I am hungry", but even "Tom Brown (is) hungry on January 1st, 1951" will not do, since nothing in this sentence (though, of course, many things outside this sentence) indicates that he is hungry then, rather than that he has been hungry before or will be hungry in the afternoon. And he has told his wife to react only to the sentences themselves and to nothing else. Shall he say, then,

Tom Brown is hungry at the moment Tom Brown utters this sentence token?

Certainly not. He is not allowed to use "this". Well, then perhaps

Tom Brown is hungry at the moment when Tom Brown utters "Tom Brown is hungry"

or, say,

Tom Brown is hungry at the moment when Tom Brown utters "tweedledum",

or, even,

Tom Brown is hungry at the moment when a fly is sitting on his head ?

will do ? No, still not. There is nothing in the "when" — clauses which ensures the uniqueness of the described situation, and Tom Brown, as a good logician, could not even use the definite article, "the", before "moment". Does there exist another uniqueness ensuring "when" clause ? Perhaps. I must admit that if I had been in his place, I would not have managed to make myself understood to my wife (or should I say "to his wife" ?) to the same degree as a simple "I am hungry" would have done under ordinary circumstances... We see that effective communication by means of indexical sentences requires that the recipient should know the pragmatic context of the production of the indexical sentence token... To communicate the same information by using non-indexical sentences only, knowledge of the context by the recipient is not required, but in its stead additional knowledge of some other kind may be necessary... Since our knowledge is limited, the use of indexical expressions seems therefore to be not only most convenient in very many situations — nobody would doubt this fact — but also indispensable for effective communication."

Bar-Hillel attempts to encapsulate his insights by appropriate terminological system : [p 70] : "To simplify the terminology, I shall call a sentence-token which is either true or false a *statement*-token and its reference a proposition. If and only if each sentence token of the same type has one and the same proposition as its reference, I shall call this type a statement (-type)...

(74) I propose not to assign reference and truth to sentence tokens of type (2), (3) and their like, but only to a sentence token in a certain context, i.e. to the ordered pair consisting of the sentence-token and its context. For the purpose of shorter expression, I shall call such a pair a *judgment*...

I shall use "sentence" (with respect to ordinary languages)

as it is customarily used by grammarians.

Ordered pairs of sentences and contexts, of which truth or falsity may be predicated, will be called *judgments*.

The first component of a judgment will be called a *declarative sentence*.

A declarative sentence which paired with any context whatsoever forms judgments which refer always to the same proposition will be called a *statement*, otherwise an *indexical declarative sentence...*". Bar-Hillel also notes that "With respect to most artificial interpreted language-systems, our terms "sentence", "declarative sentence", and "statement" coincide, whereas "indexical sentence" is empty and "judgment" unimportant. These systems have been constructed so that the pragmatic contexts of the production of their sentences is completely irrelevant." No systematic use is made, however, of this disanalogy between artificial and natural languages. Summing up, "Indexical Expressions" is a study within the traditional philosophical semantics ([6]), whose main insight is that the reference (and truth value) of "what is said" in speech events has to be identified by looking at pragmatic factors associated with these speech events. Neither the relevance to linguistic theory not the relevance of the theory of argumentation in natural languages are stressed, as yet, while the system of terminological distinctions includes "sentence type", "sentence token", "indexical sentence", "statement", "proposition", and "judgment", which is, as we shall see, quite redundant.

B. *"On Lalic Implication and the Cogito"*

This paper is, essentially, an application of the insights gained in the "indexical Expressions" in a polemical context, as against the treatment of Castaneda of the *Cogito*. However, as Bar-Hillel indicates [99] "I would now want to formulate my own treatment of the issue in a terminology different from the one I used before", while his actual argument (which will be dealt with more in detail in the next section) reveals this new terminology.

The type-token distinction with respect to sentences is re-

tained, but instead of "judgments" which are "ordered pairs of sentences and contexts" we have utterances, which are plain physical events. An utterance of a declarative sentence might be used to make a *statement* — which is not only not a non-indexical declarative sentence but not a sentence at all. It is an entity which is somehow associated with an utterance, and it can identified by utilizing both the information represented in the sentence which occurred in the utterance, and the information which can be gathered from the context of communication. Statements have truth values, and consequently they are the constituents of arguments. Propositions are not mentioned at all — either they are no more needed in general — or since Bar-Hillel does not need them for the purpose of the debate with Castaneda.

C. "Can Indexical Sentences Stand In Logical Relation ?"

This paper is, again, a polemical one. It treats the problem which is closely associated with that of the nature of entities to which truth values can be assigned. Since in B it was hinted that statements posses truth values (and statements are non-linguistic entities), it is not surprising that Bar-Hillel concludes [113] that "with repect to ordinary languages, logical relations hold primarily between statements, derivatively between the non-indexical (context-independent) sentences that can be used to make them, but not all, in any nontrivial sense, between indexical sentences (whereas, with respect to formalized language systems, logical relations hold, without any distinction of priority, between both the sentences among themselves as well as between the propositions expressed by them among themselves)."

In this paper, Bar-Hillel simplifies his terminological apparatus still further, by giving up the relevance of the type-token distinction (though, of course, he does not claim that no such distinction can be made in a clear manner) [115] : "It was indeed awkuard of me, and totally unnecessary for my, or anybody else's purposes, to pair sentence tokens with contexts. I should have paired sentence types, and this is what

shall be done hence. The tokenness is sufficiently taken care
of by the context. There is no problem in pairing one sentence
(-type) with many contexts." This simplification has a con-
siderable theoretical importance with respect to the nature of
the information required in order to describe the context of an
utterance of a given sentence (type) : it has to include the
"history" of the communication processes which took place in
that context prior to the utterance in question. That is, it has
to include the list of all sentences uttered in that context, be-
fore the utterance in question took place, in their order. Other-
wise, if the same sentence (type) had occurred twice in the
same communication situation, which is quite common, and
if one identifies "context" with "the situation of communica-
tion", as seems natural to do (^{7}), then it would not have been
possible to identify the token of the sentence in question
merely by characterizing the sentence type and context. But
if the description of the context of each utterance of the sen-
tence in question was different — and this could be made so
either by using an unrealistically precise timing system for
description (so that the two utterances would be distinguish-
able by reference to the time they were made) or by including
in the description the history of the communication process.

The later course is recommended for independent reasons :
the process of communication between two persons itself has
certain effects on their stock of shared knowledge, hence on
the possible background of presuppositions underlying their
discussion. This background might be relevant in the identi-
fication of statements made by utterances — though Bar-Hil-
lel, in contradistinction to many other philosophers of lan-
guage and linguists (^{8}), has so far not discussed presupposi-
tions.

D. *"Imperative Inference"*

Up till now, Bar-Hillel has mainly treated indicative sen-
tences and their usage (for statement-making). This is natural
as far as truth-value in the narrow sense is considered. But
since it makes sense to consider logical relationships (and

appropriate analogues of truth values) with respect to orders, questions, etc., Bar-Hillel provides in this paper an extension of his threeforld distinction : indicative sentences, statements, and utterances, to the domains of other types of language use — such as giving orders. This is done, again, in a polemical context, while the discussion concerns argument-patterns involving commands.

Bar-Hillel repeats in this case the moral of his "Do Indexical sentences stand in logical relations?" He claims : [148] : "There exists no logic that covers all English imperative sentences, just as there exists no logic that covers all English declarative sentences. But just as there exists a logic of statements made by uttering English declarative sentences (or by uttering French sentences, or in innumerable other ways) underdeveloped as it may be, so there exists a logic of commands (and of instructions, and of encouragements, etc) issued by uttering English imperative sentences (or other appropriate English sentences, or certain French sentences under appropriate circumstances or in innumerable other ways)." Thus, Bar-Hillel stresses that statements can be expressed in different languages, and that the identification of an utterance as giving of a command is not an automatic result of the grammatical type of sentence occuring in it (either imperative or not).

Moreover, in this paper Bar-Hillel utilizes the disanalogy between natural languages and constructed languages he has pointed out before, namely, that in constructed languages Pragmatics is irrelevant. He says [149] : "In order to develop such a logic formally — and there seems to exist no other way of doing so that deserves serious attention — the commands (and statements) have to be presented first in some normalized form, preferably in some formalized language" ... "This, of course, now poses the double problem of, firstly, specifying the exact nature of this normalization and, secondly, and still more formidably, establishing the 'rules of normalization' governing the transformation from ordinary speech into the normalized language. The second task can surely not be performed by logicians as such."

This is the first time in our survey of the development of Bar-Hillel's views concerning our problem that his insights and associated distinctions come to be associated with a program — a program for a logic of argumentation in ordinary languages. The program requires the construction of a system of rules of normalization, which will map utterances on representations within a "normalized language", and a system of logic for this language, which is such that for it the statement-sentence-utterance distinction (and the correlated distinction concerning commands) is irrelevant.

Thus, "Imperative Inference" relates, for the first time, the question concerning the nature of entities to which truth-values can be assigned to the program of the Logic of Argumentation in Natural Languages, with a hint that this program, involving as it does, elaboration of a component of a system of rules of normalization, cannot be the exclusive concern of Logicians.

E. *"Review of 'The Structure of Language' "*

This is the first paper in which Bar-Hillel explicitly claims the relevance of his threefold statement — utterance — sentence distinction to linguistic theory. Though, he limits his discussion to two terms of the trio. He claims [165]: "The relation between a string and an utterance 'of it' is, of course, by no means one-one or even one-many. Neither is it deterministic. The string which underlies a given utterance is never completely and uniquely determinable from the utterance as such, not even if we know the language to which the string is supposed to belong." The notion of 'string' occurring here is more general than that of a sentence. Each sentence is a string of "formatives". ([9]) But there are infinitely many strings of formatives which are not — sentences, since they do not satisfy the relevant grammatical constraints.

F. *"Universal Semantics and the Philosophy of Language :*

Quandaries and Prospects".
This paper continues its predecessor in that it stresses the

relevance of the threeforld distinction to linguistic theory.

Moreover, it sketches a *program* associated with the dis-stinction in question — that is, a program of finding certain systematic regularities governing the identification of state-ments from utterances and the identification of sentences in utterances.

Moreover, the paper reflects the interests of Bar-Hillel in another program — that of a logic for argumentation in natural languages. This program has been mentioned in "Imperative Inference" — as highly relevant to the threefold distinction of utterances, sentences and statements (or commands, etc). But what is curious about this paper is that Bar-Hillel does not at-tempt to relate the two programs mentioned — namely — the program of stating the rules which enable speakers to identify both sentences and statements from utterances, and the pro-gram of stating rules of inference for argumentation in natural languages. The second program is discussed by him only in the context of the requirements on a semantics for natural lan-guages. As we shall later see, in his stress that "Logic of natural languages" is relevant to the characterization of their semantics, Bar-Hillel has anticipated the influential school of neo-Chomskyan Linguistics, that of Generative Semantics. His isolation of the two programs in this stage reflects some deeper incoherence in his views, and this incoherence will be the main subject of our criticism of his views.

With respect to the first program discussed in this subsec-tion, Bar-Hillel says [196] : "Who does not know the distinc-tion between an act — in particular for our purposes, a lin-guistic act — and its product ? Who does not know that the English word "utterance" ... denotes both a certain speech act and the (perhaps only *a*) product of the act ? ... A statement can be quick, and it can be carefully formulated ; but it is, of course, the statement act, the particular act of stating, that is quick, and it is the statement — product that is carefully formulated..."

"Who does not know that one has to distinguish between a sentence, qua abstract linguistic entity, and the utterance of it, qua concrete physical product of some linguistic act, or even

between a sentence and the set of all its actual and possible utterances ?

... Most, though not al, of the people I know understand rather quickly the existence of a difference between a declarative sentence, an abstract linguistic entity, and the statement, if any, that is made by an utterance of this sentence on some occasion. Statements are abstract, non-linguistic entities that can be made by uttering declarative sentences but also in many other ways. The same statement can be made by uttering different tokens of the same sentence (-type), and also by uttering tokens of different sentences, in one language or in more, even by nodding one's head, and so on. It is statements that are the prime carriers of truth-values (i.e. that are true or false) and in natural languages truth or falsity should be assigned to sentences or utterances only derivately and with a number of precautions and provisos... many more refinements will need to be introduced and investigated. One will have to distinguish, for example, the statement intended, the statement understood by some listener to have been made, the statement that is usually made by uttering a certain sentence under standard conditions (and, sometimes, these three statements may turn out to be different and thereby, perhaps to be a major source of misunderstandings), and so on. More generally, for a given utterance the questions of how one determines which sentence was intended to be uttered, which was understood to have been uttered, what kind of linguistic act was performed on that occasion (whether asserting, requesting, demanding, declaring, promising, swearing, or whatever), what was the product of this particular act, how it was intended, how was it understood, and so on, have only began to be systematically investigated."

Thus, Bar-Hillel sketches a program of study of the processes involved in communication situations — those of intending to make specific speech act and of using a certain sentence for this purpose, those of attempting to carry out these intentions, by making an utterance, and those (on the side of the receiver) of attempting to reconstruct the intentions of the speaker from the utterance.

Thus by relating the threefold distinction to the act-product distinction, to the intention-result distinction, to the distinction between the process of producing an utterance and the process of interpreting it, and to the idea of speech-acts ([10]), Bar-Hillel makes it a cornerstone of a psycho-Linguistic program of study of the structure and processes of communication which is much more comprehensive than the program of study of this same area associated with early thinking in Chomskyan Linguistics. ([11])

However, this program is unrelated to the other one — that of Logic of natural languages as part of their Semantics. In the context of the proposal of that program, Bar-Hillel says [187] : "I claim that nobody had fully mastered the semantics of English who does not know that from *John is older than Paul and Paul is older than Dick* (with the occurrences of *Paul* referring to the same person) one can deduce *John is older than Dick.* A complete semantics of English must contain a rule to this effect, either as a primitive, explicit one, or at least as a derivative, implicit one. Such a rule might, for example, have the form : From X *is older than* Y *and* Y *is older than* Z deduce X *is older than* Z. We also need rules to the effect : From X *is older than* Y deduce Y *is not older than* X and X *is not as old as* Y and Y *is younger than* X and so on. None of these meaning rules can be derived from traditional dictionaries. Any stretching of the notion of dictionary (or lexicon, for that matter) in order to incorporate them would be at best merely pointless and, at worst, a misleading adherence to an outmoded terminology... Notice that logicians have a way of compressing this multiplicity of rules into very compact formulations. One such formulation would be *Is older than* denotes an irreflexive, asymmetrical and transitive relation. A more compact formulation is : *Is older than* denotes a strict partial order. Still more compact and comprehensive is : *Is older than* and is as old as together from a quasi order... Notice that these meaning rules can be separated into two parts : one that is specific for a given language such as English, and one that is universal, holding for all languages, or, rather, is language independent.

That *is as old os and is older than* form a quasi-order is, of course, peculiar to the English semantics ; but the fact that, if they do, then *is as old as* is symmetrical, *is older than* is transitive, and so on, has no longer anything to do with English specifically. This implication belongs with "universal semantics" or "logic" depending on the department you belong to. The first rule would best be published in a volume called *The Semantics of English* the others in a volume entitled *Semantica Universalia Sive Logica* ... I do not believe that there exists a rigid borderline between special and universal semantics ... [191] let us press hard upon the logicians to spend part of their time ... in developing logic so that it will be able to answer the needs of linguists and of everybody else for a theory of deducibility in natural languages that should be as complete as possible and would then turn out to be a full theory of valid argumentation in natural languages."

Thus, Bar-Hillel proposes to develop the logic of natural languages in terms of rules of deducibility applying to *semantic representations* "underlying" sentences. ([12]) Otherwise, the relevance of logic to semantic theory would become unstatable. This suggestion has many implications with respect to the form semantic representations should be cast in — and these implications are not discussed by Bar-Hillel.

But as we have argued in the beginning, rules of deducibility apply to those entities to which it makes sense to assign truth values. Hence, semantic representations, in Bar-Hillel's sense, should be the entities to which truth values can be assigned. But in the same paper Bar-Hillel has eexplicitly claimed that statements are those entities to which one can assign truth values. So, if Bar-Hillel is consistent it follows that semantic representations are the same type of entities as statements. This result, as we shall see in the critical section, is at least problc matic. As we have already hinted, the difficulty inherent in will be the main point of our criticism, and also the starting point for our constructive suggestions to follow.

G. *"Argumentation in Natural Languages"*.

As is expressed in its title, this paper is concerned with the

problem of developing a logic for argumentation in natural languages. It repeats, in a systematic fashion, the ideas developed in previous stages ; the relevance of the threefold distinction to the elaboration of logic for natural languages, and the need to represent statements "directly" within some "canonical notation" ([13]). Thus, he says [202 - 204] : "It seems that, consciously or subconsciously, the almost general attitude of all formal logicians was to regard such an evaluation process as a two stage affair. In the first stage, the original language formulation had to be rephrased, without loss, in a normalized idiom, while, in the second stage, these normalized formulations would be put through the grindstone of the formal logic evaluator ... One major prejudice, which the experience of Amsterdam ([14]), among others, has shown to be very difficult indeed to overcome, is the tendency to assign truth-values to indicative sentences in natural languages and to look at those cases where such a procedure seems to be somehow wrong, e.g. in the case of sentences containing indexical expressions as being exceptional and in need of special treatment. The "justifications" for this tendency is, of course, that formal logic is, by definition, able to deal only with entities which have a "form", .e. with linguistic entities. This is perfectly valid for the output of the first stage operations, the "normalized" sentences, (as well as, of course, for sentences of constructed, interpreted calculi), but is perfectly misleading for the original sentences. Which true or false statement, if any, has been made on a given occasion (or referred to, since not on each occasion when a statement is referred to it is necessarily being "made by the speaker. As Frege, among many others, was fully aware of, though with a different terminology), which statement, if any, has been understood by a given addressee 'to have been made on that occasion, which statement is "normally" made by similar utterances on such occasions (and these three kinds of statements need not at all be identical) these are questions the answers to which may, on occasion, be very difficult to obtain and will hardly ever be determinable by just looking at the uttered sentence (if the statement was made by uttering a sentence and not, say, by a nod).

Indexicality or context-dependency is only one of the many features of pragmatic languages that have to be taken into account. Another one, often neglected, is the background knowledge which the speaker presupposes to be available to the addressee..."

"In order to evaluate an argument presented in some natural language — and let us deal, for the sake of simplicity, with deductive argument only... it is first necessary to determine which statements, if any, have been referred to on this occasion... Next, it is necessary to formulate these statements in a "normal" (philosophical, universal) language in some canonical form..."

· Thus, Bar-Hillel separates in his suggestion the stage of the identification of the statement "referred to" and the stage of "normalization". He also stresses that whatever information is needed in order to identify statements referred to by utterances should include also shared information of the speaker and hearer, in addition to the "indices" of the context — such as place, time and identity of speaker and hearer.

H. *"Argumentation in Pragmatic Languages"*

This paper repeats, essentially, the ideas expressed in the preceding papers discussed above. Thus, the threefold distinction is restated, in addition to the suggestion to represent statements by means of sentences of some "normalized" language in order to evaluate the validity of arguments expressed in a natural language. Again, the transition from utterances in a natural language to sentences of a "normalized" one is envisioned as a two-stage affair: transition from utterances to statements, and transition from statements to their normalized representations. The infeasibility of a logic which directly applies to (indicative) sentences of a natural language is repeatedly stressed. The main innovation of the paper is its communication-theoretical perspective. Thus, the *pragmatic* nature of natural languages is represented as an essential characteristic, which follows from their being designed in order to meet the constraints on communication processes taking place

between human beings. The major characteristic of "nor-
malized" (rather, formalized) languages, their being non-prag-
matic, is thus hinted to be explainable by their subjection to
different constraints from those which dictate the structure of
natural languages. Their major purpose is to represent in-
formation in as explicit as fashion as possible — since only
when information is fully and explicitly represented can one
find out what other information follows from it by paying
regard to the *formal* (i.e. structural) characteristics of the sym-
bolic units of representation. Bar-Hillel does not, however,
apply his communication-theoretical perspective to the nature
of the rules of normalization, rules which map utterances in
which statements are referred to (or by which they are made)
onto sentences of a normalized, non-pragmatic language.

Let us, then, quote Bar-Hillel himself [207-8] : "I believe I
have succeeded, in the meantime, in isolating the decisive
factor whose insufficient understanding is responsible, more
than anything else, for the measure of irrationality in our ap-
proach to argumentation in natural languages and that disturb-
ing wavering between despair and frivolity, namely, the es-
sentially pragmatic character of these languages. This may be
expressed, in other words, as the essential dependence of com-
munication in such languages on *linguistic co-text* (viz. the
utterances, if any, that preceded the communicative act under
scrutiny), and *extra-linguistic context* (the general background
in which this communicative act was performed, the motives
that brought it about, the cognitive and emotional background
of the participants in it, etc) — in short, to use for a moment
the terminology of Communication Theory, on the fact that,
in general, human communication proceeds in more than one
channel at a time, that each channel has its own specific pro-
perties, and that their interaction creates possibilities whose
number is greater than the sum of the possibilities of each
channel taken separately... [212-3]. According to this approach,
we always have to clarify to ourselves, as the first step in
testing the validity of an argument presented in a natural
language, what were the statements, if any, that were referred
to on that occasion and intended to serve as premises in the

argument. Since the English word 'statement' is ambiguous...
let me stress that I am using it here to denote a non-linguistic,
abstract, theoretical entity, whose nature, like any other antity
of its kind, can be clarified in principle only by presenting the
whole theory to which it belongs; but I have no intention to
present here such a completed theory... But one cannot apply
formal logic to statements. Since they are non-linguistic en-
tities, it is difficult, perhaps even impossible, to talk about the
'form' of statements. And if there is no form, there can be no
formal logic. It is, therefore, necessary to take one further
step, viz. to formulate these statements in some *normalized
sterilized, regimented, systematized* language to the sentences
of which it is then possible to apply the rules of formal logic...''

"Three formidable questions immediately arise : (a) What is
the exact nature of that language system in whose sentences
all statements one can make in any natural language can be
formulated, and to which formal logic can be applied ? (b) What
is the exact nature of that formal logic that will be applied
to the sentences of that language system ? (c) What is the
theory that guides us in performing this fateful transition from
utterances of sentences of natural languages to statements ?...

[214-5] "I do not know whether there is a single linguist, or
a single scientist in any other field, who believes in all se-
riousness that there could be a language that would be 'ideal'
for all the purposes of linguistic communication, whose syn-
tax would preclude syntactic ambiguity, whose semantics
would provide a unique interpretation for every well-formed
sentence, that would allow for convenient communication un-
der all conditions, and — what interests us most at the mo-
ment — that would permit a mechanical test procedure for
the validity of the arguments advanced in it. But it seems to
me that it has not yet been sufficiently clarified that these
tasks cannot be atteined with a single tool, and that our natural
languages embody a compromise solution to all this, perhaps
even a close to optimum solution, but that just because of this
feature of theirs they cannot be the ideal tool for accomplishing
any of these tasks. As for our present needs, one should not
really demand — and the absurdity of such a demand be-

comes obvious after a little thought — that arguments in natural languages should allow for a mechanical test of their validity. Since arguments are meant not only to *convince* supermen with unlimited capacities for thinking, concentrating and remembering, but also to *persuade* all too human beings who suffer from rigid restrictions on what they can store in their short term memory, and full of irrational emotions and prejudices, and possess so many other 'pleasant' traits of this kind, it is but natural that man should use in his argumentation, as in his other communicative acts, additional channels to the one of pure reason. Without the use of these additional channels, there can hardly be any doubt that communication between humans, in a form similar to the one known to us, would be impossible."

Summary of Bar-Hillel views

In his dealings with the question : To which entities, in the situation of communication, can one assign truth values ? and with the related question : To which entities, in the situation of communication, can one apply logical rules in order to evaluate the validity of proposed arguments ? Bar-Hillel developed a sketch of the process of communication and suggested interdisciplinary research programs required in order to expand this programmatic sketch into a full-fledged theory of the process.

The story of a communication process, when told within this programmatic framework, is essentially as follows : The speaeker intends to perform some speech act, to give a command, to make a promise, to transmit information (i.e. to make a statement) etc. In order to carry out his intention he decides on some sentence or other in the language he uses on the occasion at hand, and utters it. The decision on the sentence is determined not only by the specific nature of the message he wants to transmit — whether this be a statement, a question, or a command, but also by the knowledge he has (or he believes he has) concerning the context of communication. This knowledge may include knowledge of his own identity, of the

identity of his addressee, of the spacetime condition of the communication, of the utterances already made within that context prior to the speech act he intends to make — and his interpretation of these utterances, of the background of information presumably common to him and to his addressee, etc. The attempt is then made to realize the sentence decided on, within an utterance, which is a physical process, whose termination produces a realization of some linguistic string which may be (but must not be) a realization of the sentence the speaker intended to utter. Moreover, the utterance is a speech act, which can be interpreted by reference to certain standard rules of interpretation, which when applied to it, yield both the sentence it contains and its "message" (statement, command, question, etc.). The hearer applies rules of interpretation of this sort, so as to reconstrumt both the message and the sentence from the utterance, as he has represented it, and from his knowledge of the relevant contextual features (or, rather, those contextual features which the hearer assumes to be relevant). This background of knowledge of his can be described in terms similar to those in which the background of knowledge of the speaker was described.

Misunderstanding can occur. This might be due either to a misrepresentation of background information within the speaker, leading him to choose a sentence which does not suit the purpose of the message he intends to transmit, under the correct characterization of the context, or to a failure on his side to utter the sentence he intended to utter (a slip), or to a failure on the side of the hearer to decode the sentence, or, again, the message — due to misrepresentation of the relevant background information or to simple misidentification of the sentence occurring in the utterance, etc. An important type of communication process is argumentation. Since a relevant property of arguments is their *validity* — validity contributes to their fundamental aim, their power to convince — it is important to develop a logic of argumentation in natural languages. The development of this logic depends, however, on the development of a theory which will explain how messages (statements, commands, etc) are reconstructed from

utterances. This is so, since any attempt to apply logical rules directly to *sentences* will be unsuccessful, for the same reasons which make the ascription of truth value to sentences unsuccessful, that is, because sentences do not determine their messages directly in natural languages, but only relative to some characterization of the context. Thus, it seems necessary to provide a logic of *messages*, and not of sentences, and to provide it relative to some system of non-pragmatic, though linguistic, representation of statements. Thus, the evaluation of arguments made by utterances of sentences in a natural language depends on a stage in which statements (commands, questions, etc) are identified, a stage in which these statements are reformulated in a formalized, nonpragmatic language, and a final stage of applying the formal logic rules of the formalized language question to the "formalized" (normalized) argument in order to test its validity.

Curiously enough, Bar-Hillel elaborates a different program for the logic of argumentation in natural languages. This program is more closely associated with the M.I.T. conception of linguistic communication, and it consists in formulating the deductive rules of argumentation in natural languages on the level of semantic representations underlying the sentences of these languages. This program is defended also in a paper which we have not discussed ("Dictionaries and Meaning Rules"), and though it seems close to the program discussed before, it is not identical, and, moreover, seems even te be inconsistent with it.

§ 3. *Application of Bar-Hillel's views to philosophical problems*

The previous section is an attempt to extract the systematic aspect of the stages of the development of Bar-Hillel's views from their context, a context of problem solving and of polemics. In this section, we will dwell somewhat longer on this context, especially on the *problems* to which Bar-Hillel applies his ideas and his terminological apparatus.

The discussion of these problems is important both in order

to realize the fruitfulness of Bar-Hillel's ideas and their in-
herent limitations. They will help us, in the critical section, to
illustrate the problematic aspects of Bar-Hillel's views. Each
problem will be dealt with separately, in a subsection.

A. *Pragmatic Paradoxes*

Bar-Hillel says [85-87] :
"Sentences like
(6) I believe that he has gone out, but he has not
or like
(5) ("I am dead") have given headaches to some philosophers
and the discussion of the so called "pragmatic paradoxes" con-
nected with them is still going on. On the other hand, there
is nothing mysterious in sentences like
(7) Dick believes Bill has gone out, but Bill has not.
or
(8) G. B. Shaw is dead in 1949.
... I shall now show only how the new terminology will
allow us to dissolve the puzzling situation simply and effective-
ly.
    Let us note that though the sentences (7) and (8) look com-
pletely innocent, certain assertions of tokens of them would
be puzzling, e.g. an assertion of a token of (7) by Dick himself
of or a token of (8) by G. B. Shaw himself. In the second case
we could have explained Shaw's *prima facie* strange assertion
as one of his jokes and would perhaps have investigated the
situation a bit more to find out what exactly might have
provoked such a joke. In the first case, however, knowing
nothing specially about Dick, we would be seriously puzzled
and if not able to find a rational explanation for Dick's beha-
vior might be entitled to call it *absurd*. And that is all that is
to be said in this situation. Many people behave absurdly
sometimes. But it is the psychiatrist's business to deal with
their behavior and not the logician's. But is it not different with
respect to (5) and (6) ? Only very few exceptional assertions
of (8) are absurd, but *every* assertion of (5) (which cannot be

explained away as 'apparent' assertion) is absurd. Is therefore
(5) not paradoxical to a degree that (8) is not ? Our answer is,
of course : No, not all. That *all* assertions of (5) are absurd is
due to the peculiar character of 'I' in this case... but there
are also non-indexical sentences *all* assertions of which are
absurd, e.g. :

(9) Nobody has ever uttered a sentence-token.

Let us summarize the discussion of this section : There are
false statements (like (9)) all assertions of which are absurd ;
there are fale statements (like (3)) which as such are neither
true nor false but such that some judgments containing them
as first components are (possibly) false ; there are indexical
sentences (like (5)) which as such are neither true nor false
but such that all judgments containing them as first compo-
nents are false and all assertions of them absurd. (In our
terminology, an assertion is a kind of behavior and a judgment
a pair of a sentence and a context.) That such linguistic situa-
tions arise is interesting enough and deserves careful study,
but there is nothing in them which should disturb the logician's
mind and make him start worrying about "pragmatic para-
doxes". It is easy to see the point of Bar-Hillel's argument in
terms of his terminological apparatus. By blaming the "odd-
ness" of the *sentences* in question on the *absurdity* of the
behavior in which they occur, that is, on the absurdity of
asserting them Bar-Hillel transforms a prima facie difficulty
involved in the interpretation of *sentences* — something about
which logicians should worry-into a difficulty of understand-
ing *behavior* — which is utterly in the psychological-psychia-
tric domain of concern, or so at least it seems.

In this way, Bar-Hillel's elaborate distinctions (in the con-
text of the paper in question, the type-token distinction, the
statement — indexical sentence distinction, and the judgment,
assertion and proposition distinction !) enable him to uncover
the dependence of the "oddness" of sentences on the contexts
of their use.

B. *The Cogito*

Bar Hillel says [p 99] : *"Cartesius cogitat, ergo Carterisus*

est is a valid argument whatever Descartes himself might have thought (under certain natural assumptions about the meaning of sentences of the form 'X est' where 'X' is replaced by a proper name). But this statement is so utterly trivial that it is hard to believe that it could have made the impression that was made by *Cogito ergo Sum.* This sentence is indeed not a valid argument, or an argument at all but only for the simple reason that the partial sentences of which it is composed, *Cogito* and *sum* are indexical. Three features, each of which only of a mild interest by itself, combined to impart to the *Cogito ergo sum* that almost magical fascination it has exerted since on the minds of so many good people : (1) Every argument of the form 'X *cogitat, ergo* X *est'* is valid. (2) Each time someone utters (a token of the type) *Cogito* in what Castaneda calls a *normal* context, the statement he thereby makes is true. (3) The truth of these statements is establishable on nothing more than an understanding of the sentence by means of which it was made — *ex vi terminorum* — (and by the knowledge that it was uttered in a normal context). It is easy to see how disregarding the distinction between declarative sentence and statement, on the one hand, and misunderstanding the functionning of indexical expressions (quite natural in 1637, though somewhat less excusable in 1957) would yield together the illusion that *Cogito* is a (logically) necessary statement, which combined with the illusion that *Cogito ergo sum* is a valid argument yields that Sum is a logically necessary statement."

Thus, using the distinction between sentences and statements, Bar-Hillel disclaims the right of '*Cogito*' to be called a "logical truth". It is a sentence which, whenever uttered in a normal context, yields a true statement. But the statements it can be used to make in different utterances are different, while a sentence can be claimed to express a logical truth only if it is context independent, and hence it follows that the statement made by using it is true only due to the 'logical structure' of the sentence. Moreover, by pointing out the distinction between context-dependent sentences, no string of which is an argument, and context-independent sentences, strings of which can sometimes constitute valid arguments

(even if indexical sentences can be *used* in order to express arguments) Bar-Hillel severs the seemingly intimate connection between 'X cogitat, ergo X est' (where 'X' can be replaced only by proper-names, which have a fixed reference, hence are context independent — 'I' is not a proper name in this Russellian sense) and 'Cogito ergo Sum'. The first is a string of context-independent sentences, hence can represent an argument (which is, accidentally, valid) the second is a string of indexical sentences — hence cannot represent directly any argument, valid or not. Hence 'Sum' is not the consequence of applying Modus ponens to the two logical truths 'Cogito Ergo Sum' and 'Cogito'. Hence, is not a logical truth itself.

C. *The 'liar' Paradox*

As is presumably wel a known, the liar paradox cannot be formulated within any language system the concept of truth for which can be defined only in its meta-language ([15]). In none of these languages can one properly formulate a sentence which predicates falsity on itself. This is, though, not the case for natural languages, hence it was concluded by certain authors ([15]) that natural languages are not "consistent" language systems. Obviously, if one accepts Bar-Hillel's suggestion to limit the application of the concept of truth to statements, no sentence which predicates truth values on sentences can have any truth-value, being a "category mistake". Hence, a sentence which ascribes falisty to itself has no truth value, being a category mistake of the type explained, hence fails to create the paradox. [p 255] : "But could not the version of the Liar paradox chosen by Kemeny be reformulated in statement terminology ? Let us try. Assume that John is uttering in an appropriate voice the following two sentences one after the other : 'The statement I am going to make by uttering the next sentence is true. The statement I made just now by uttering the previous sentence is false.' It should be clear that on the assumption that John, by uttering these two sentences, made two statements, a paradox immediately arises, if we grant that *a statement might be either true or false*. But we are perfectly

free to conclude that, despite appearances, no statements were made by uttering these sentences. Indeed, this conclusion is reasonable on reflection quite independently of the argument through paradox. I for one would have judged so, after some consideration, even if John has said 'true' in the second sentence, instead of 'false' ... Whether a given sequence of English words constitutes a sentence or not, is a question that after certain qualifications and refinements — should be answerable on the basis of the list of formation rules which English grammarians should in principle be able to produce. There are even good reasons for thinking that the answer could be given by a mechanical procedure... But there is no reasoon to expect that the same should hold for 'statement'. It is, on the contrary, quite obvious that no general procedure could exist for determining whether a statement has been made. Examining the sentence used is certainly never quite enough, though occasionally not much more might be required ... in the case of ordinary languages, the semantic truth conception loses its point, once we decide to regard truth as a property of statements rather than of sentences."

Thus, the 'elusiveness' of statements, their being neither concrete physical entities nor structured abstract ones, is utilized by Bar-Hillel in order to explain away the *Liar*. The *Liar* arises only if one assume that certain sentences, when uttered, bring about statement-making. So let this assumption be dropped and the paradox is done with ! Since not very much is known about statements — or, to put that point in a more sophisticated manner — there is no serious *theory* of statement identification, the suggestion that a sentence of the type uttered by John cannot be used to make a statement, is not in conflict with any theoretical claim concerning statements. Rather, this claim can be reinterpreted as a *suggestion*, which, if accepted, will turn out to be a *desideratum* any adequate theory of statements should satisfy — namely, that all sentences which, if successfully usable in order to make statements will bring about the production of paradoxes will be classified as sentences which can never be used in order to make statements.

"(1) The question of whether natural languages contain se-
      mantic paradoxes (or any paradoxes, for that matter)
      should not be treated as a question of empirical fact. It
      can be decided in the negative a-priori, though only at
      a considerable price.

(2)   Since such a decision can be made, it should be made.

(3)   The price, though high, is tolerable, and more important-
      ly, one that has to be paid in any case, for independent
      reasons..." [279]

Now, when someone enters a room with only one blackboard
and sees there written "The sentence written on this black-
board is false" and nothing else, he will in all likelihood as-
sume that some other sentence, previously visible on this
blackboard, has been erased in the meantime. If assured that
this is not what has happened but that somebody else, a few
minutes ago, entered the room and wrote that sentence on the
otherwise utterly blank blackboard, he will — outside of a
logic class — wait for some explanation and not worry, un-
less forced to do so. He may, of course, somehow come to be-
lieve that a statement was intended to be made by the utter-
ance on the blackboard, and, if asked which statement, might
perhaps answer : "The statement that the statement made by
the utterance written on the blackboard is false" (if he is suf-
ficiently sophisticated to use this mode of speech) or something
to this effect. When further pressed for some more specifica-
tion, he might resent the pressure and insist that there is no
need to comply with the request just as there is no need to
comply with the request to be more specific when one utters
"The first statement made by Julius Caesar on his 45th birth-
day was false". But just as one is entitled to doubt whether
Caesar, on his 45the birthday, made any statement at all, ...
so it is of course perfectly legitimate to doubt whether the man
who wrote the utterance on the blackboard really intended to
make a stratement or — if one has outside information about
the reality of this intention — whether he succeeded in doing
so... Not only is it impossible, in principle under the given

circumstances, to become more specific about the statement made by the utterance on the blackboard, but the assumption that a statement was made at all leads to a contradiction, with the result that we can tell a-priori that if a statement was in- ended to be made, this intention ended in a failure... Hence, I would insist that recognizing the essentially non-recursive character of the notion of statement in natural languages, i.e. the non-existence of a mechanical procedure for deciding whether, given an utterance, a statement was made by it, is just another part of the price that has to be paid for keeping our natural languages consistent..." It can be seen that some of the motivation underlying Bar-Hillel's distinction between sen- tences, statements and utterances is that this distinction can be used in order to rationalize the claim that natural languages contain no "paradoxes" — either semantical or pragmatical. Therefore, according to this, there are no built in barriers within natural languages against rational communication. (⁴)

§ 4. *Criticism of Bar-Hillel's views*

The criticism of Bar-Hillel's conception suggested below is not intended to suggest that we discard the distinctions he has painfully elaborated. On the contrary, it is part of an argu- ment for a more daring utilization of these same ideas, for turning them into an explicit program for a theory of state- ments and their relationships to utterances, sentences and contexts. In short, the argument is directed against Bar-Hillel's tendency to limit the use of his own ideas to contexts of "se- mantic hygiene", either polemical or of a similar nature to that of the applications sketched above.

The argument will be both internal-attempting to expose certain inconsistencies and incoherence in Bar-Hillel's writ- ings — and external — it will utilize certain studies of other logicians who when treating problems with which Bar-Hillel himself has dealt here reached certain deeper insights by using ideas which were in substance a pushing of Bar-Hillel's own thought one step forward. Again, each point of the criticism will be provided with a subsection of this section.

A. *Statements and Semantic Representations*

As we have seen in § 2,F Bar-Hillel has suggested, in the same paper, both the relevance of the three-fold distinction to linguistics and a program of dealing with the logic of natural languages within the semantic component of a generative grammar. The second suggestion implies that logical rules operate on semantic representations, while the first involves the idea that they are formulated for statements. Since the units of representations for which logical rules are formulated are the same units to which truth-values can be assigned, we end with an identification of semantic representations with statements, and this result is unacceptable. It is unacceptable since semantic interpretations should represent only information which is explicitly conveyed by the sentence with which they are associated, while Bar-Hillel has stressed over and over again that statements are determined also by the pragmatic structure of the context in which the sentence is uttered. Thus, semantic representations are both identical with statements and different from them which is a contradiction.

B. *The formlessness of statements*

One of the major emphases of Bar-Hillel is that statements are both "abstract" and "formless". Hence, he concludes that the logic of natural languages should be formulated so as to allow for a three-stage process of evaluation of arguments : identification of the statements involved in a sequence of utterances constituting an argument, representation of the statements within some artificial "normalized" language, and applying the logical rules to the artificial language representations. But what does "identification" of statement mean if it is a stage different from that of formalizing ? What does this process consist in ? How can entities which are both immaterial (abstract) and formless be distinguished from each other ? Identificatioon can be only of discernibles. Moreover, how can one make the transition from indiscernible statements to distinct representations of an artificial language ? The situation becomes more hopelessly complex if one considers Bar-Hillel's

notion of "rules of normalization". This notion relates to rules which convert representations of *utterances* into representations within the "normalized" artificial language. But sine an adequate system of rules of normalization, conjoined with an adequate constructed language system which serves as the "target-language" for the process of normalization constitute a full-fledged realization of Bar-Hillel's program concerning "the logic of argumentation in natural languages", the notion of "statement" seems to be superfluous. There is no place for the stage of statement-identification in the realized program. Hence, it seems to have no warranted place in the proposed program either.

C. *Bar-Hillel's treatment of pragmatic paradoxes compared with Hintikka's*

In contradistinction with the preceding subsections, which dealth with the incoherence of Bar-Hillel's views this subsection and the following ones are intended to shown that Bar-Hillel's treatment of statements and contexts, as having no describable *structure* blocked his treatment of both pragmatic paradoxes and of the *cogito*. That is, his analysis stopped short of certain insights, which were later revealed by Hintikka, and which could have come by had he not insisted that statements are "formless" and had he attempted to suggest a more explicit theory concerning the relevance of contextual information to statement-identification. Bar-Hillel's treatment of pragmatic paradoxes, such as Moore's and "I am dead" terminated in pointing out that what was "paradoxical" about them was not the sentences they involved but the acts of uttering (or "asserting") these sentences. Once this step was taken, Bar-Hillel claimed that the whole business should now concern psychologists, since "absurdity of utterances" is a special case of "absurdity of behaviors", and psychologists should deal with behavior and with its absurdities.

But this second step involves a confusion. There are two distinct questions which can be asked about absurd behaviors,

and only one of them is of proper concern for psychologists, at least as long as their profession is conceived of in traditional 'terms. ([16])

One can ask :

a. Why do certain persons at certain times produce absurd behaviors ? and the answer to this question might involve both theories of personality and the relationships of personality traits to behavior, as in the extreme cases in which absurd behavior reflects some deeep mental disturbance. This question is "strictly psychological".

But one can also ask :

b. What characteristics of a behavior make it absurd ? How can absurd and non-absurd behavior be distinguished ? This question is not strictly psychological, though it has considerable relevance for psychologists. An adequate answer to it has to be, at least partially, stated in *meta-logical terms* ! Thus, a person who moves his hands as if they were wings, in an attempt to fly produces an absurd behavior. He might behave so because he is psychotic. But his behavior is absurd since it presupposes certain beliefs about the world ; for instance, the beliefs that birds fly because they perform certain patterns of movements, and that their anatomy and psysiology is irrelevant to flying, beliefs which are refuted by commonly known facts. Thus, the contradiction between the person in question's beliefs and all other persons' beliefs (or, rather, culturally shared 'knowledge') makes it possible to explain why his behavior is considered absurd by other persons. It should be pointed out that in certain easily imaginable tribes, his behavior would not be considered absurd since its information-background, namely, the presuppositions for its success, might be believed in by all of his community. The fact that he never succeeds in flying would then be explained away by ad-hoc maneouvres. ([17])

Even the absurdity of non-verbal behaviors should therefore be described by a conceptual framework which takes into account logical relationships (between beliefs). So, the

absurdity of speech acts ([17]) should not be left out of logicians'
legitimate domain of concern.

Hintikka has in this vein effected an explanation of what is
absurd in uttering" (8) p but I do not believe that p" ([18]) [p 64]
in terms of a partial theory of *contexts* which can be formul-
ated only by using a meta-logical terminology. He thus
says : ([18]) [67] "The explanation I shall offer turns on the fact
that, although (8) [p.: but do not believe that p] is defensible,
the closely related form of words (30) "I believe that the case
is as follows : p but I do not believe that p" is indefensible.
The explanation is as follows : What is violated by uttering
(8) is not logical consistency (defensibility) but rather the
general presumption that the speaker believes or at least can
conceivably believe what he says. This presumption amounts
to requiring that (30) is either indefensible or, if indefensible,
so complicated that its indefensibility is not felt (however in-
articulately) by the speaker. Now, the latter alternative is ruled
out by the simplicity of (8) and by the consequent intuitiveness
of what (30) expresses. The former alternative is ruled out by
the indefensibility of (30). In short, the gist of Moore's para-
dox may said (somewhat elliptically) to lie in the fact that (8)
is necessarily unbelievable by the speaker. From this point of
view, it is understood at once why the result of changing the
person in (8) is not absurd. For what is expected when some-
body utters

(8) (a) "p but a does not believe that p"
(where a is neither the pronoun "I" nor the speaker's own
name) is similarly that is possible for him to believe what he
says, that is, it would be defensible for him to say :

(30) (a) "I believe that the case is as follows : p but a does
        not believe that p"
This sentence is of the form

(30) (a)· $B_b(p \& - B_ap)$"
while (30) is of the form

(30)· $B_a(p \& - B_ap)$".
As we shall see (30) (a)· is defensible — unless a is identical
with b — but (30) indefensible.

In a sense, therefore, the paradoxical character of (8) does

not turn on the peculiarities of the first person singular pro-
noun, namely in the sense that (30)· is indefensible no matter
what a is (whether a name on a personal pronoun). In another
sense, of course, the absurdity of (8) is due to the fact that is
in the first person, namely, that (8) kindles the presumption that
(30) is defensible (8) (a) only gives rise to the presumption
that (30) (a) is defensible. And statements of the general form
(30) (a)* are indefensible only if a ≠ b.

The fact that (30) [b] is indefensible no matter what a is
seems to be consonant without intuitions. For what is ex-
pressed by (31) "a believes that the case is as follows : p but a
does not believe that p"
is something which can be changed by pointing out to the
person referred to by a that his beliefs are contradictory.
Hence (31) is indefensible in the sense we have given to the
term..." [71] "It is instructive to try to generalize the explana-
tion we gave of the peculiarity of (8). One way of doing so is
as follows : Let us assume that the person referred to by a
makes a finite number of statements, that is, utters a finite
number of declarative sentences $p_1, p_2, p_3, ..., p_k$, on one and
the same occasion. Let us assume, furthermore, that every
time he refers to himself in these statements he does so by
using a certain terms, say a. Then we shall call the set
$p_1, p_2, ..., p_k$ *doxastically indefensible for the person referred to
by this term to utter* if and only if the sentence

"$B_a(p_1 \& p_2 \& ... p_k)$"

is indefensible *simpliciter*. The intended generalization may
now be expressed by saying that the absurdity of (8) is due to
the fact that it is doxastically indefensible for the speaker to
utter (although it is not itself indefensible) and this doxastic
indefensibility is demonstrable in so simple a way it is felt
by the speakers of the English language... Doxastically in-
defensible statements are nevertheless impossible for the
speaker to believe consistently. And this unbelievability of
theirs is of a logical character : it can be seen from the very
form of words the speaker is using (provided that we know
how he is referring to himself.)"

Thus, Hintikka's analysis of Moore's paradox involves a partial theory of the *structure of contexts*. It suggests the general requirement that speakers could believe what they say. Otherwise, their behavior is absurd — in Bar-Hillel's terms. The "absurdity" of behaviors is therefore analyzed by logical means, and at least in that case, it involves violation of a constraint the behavior in question should satisfy.

Another point in Hintikka's presentation deserves our attention : The beliefs of speakers are represented by logical formulas, and their consistency or inconsistency can be evaluated by a formal apparatus of the standard sort. Now, these beliefs are not "statements" in Bar-Hillel's sense. They may remain latent, or be recoverable by some kind of inference process from what speakers do. But they are not necessarily directly expressed.

However, they possess logical relationships with statements : what one says can (though should not) contradict what one believes. Hence, if one would state a logic for beliefs separately from a logic of statements, it would be impossible to express the logical relationships between statements and beliefs. Moreover, it seems that these two separate logics would have many rules in common, so that stating them separately involves a huge loss of generalizations which could have been stated had we not separated statements from beliefs. In any case, Bar-Hillel's suggestion to construct a logic of "natural languages" for statements turns out to be inadequate. Bar-Hillel could of course reply that beliefs and their "logic" are of concern mainly for psychologists, not for logicians. Moreover, he might reply that Hintikka's analysis of Moore's paradox is "non-logical" since it involves an "emperical conjecture", namely, that persons are expected to be able to believe what they say, and this conjecture, though highly plausible, and even seeming to be a "universal constraint" on communication, belongs to psycholinguistics. But such a reply is against the interdisciplinary spirit of Bar-Hillel's suggestions. After all, why should logicians not deal with psychological matters ?

D. *Bar-Hillel's treatment of the Cogito as compared with Hintikka's.*

The major points emerging from a comparison of Bar-Hillel's treatment of the *Cogito ergo Sum* to that of Hintikka are quite similar to those emerging in the prior discussion of the treatment of pragmatic paradoxes by these two authors.

While Bar-Hillel claims without any further argument that uttering "Cogito" in any "normal" context is bound to succeed in making a true statement, Hintikka provides a close analysis of what a "normal context" amounts to, as far as the Cogito is concerned. Thus, Hintikka says ([19]) [10 - 16] : "Descartes's formulations in the *Meditationes* and elsewhere suggest that his result may be expressed by saying that it was impossible for him to deny his existence. One way in which Descartes could have tried to (but did not) deny this would have been to say "Descartes does not exist." As a preliminary to our study of Descartes's first person sentence '*Cogito Ergo Sum*' we shall inquire into the character of this third person sentence...

What general characteristic of the sentence "De-Gaulle does not exist" makes it awkward for De-Gaulle to assert it ? I shall try to formulate this general characteristic by saying that it is existentially inconsistent for De-Gaulle to assert (to utter) this sentence. The notion of existential inconsistency may be defined as follows : Let *p* be a sentence and *a* a singular term (e.g. a name, a pronoun, or a definite description). We shall say that *p* is existentially *inconsistent for the person referred to by a to utter* if and only if the longer sentence

(2) "p ; and *a* exists"

is inconsistent (in the ordinary sense of the word) ...

A trivial reformulation of the definition shows that the notion of existential inconsistency really formulates a general reason why certain statements are impossible to defend although the sentences by means of which they are made may be consistent and intelligible. Instead of saying that (2) is inconsistent, we could have said that *p* entails "*a* does not

exist" ... Uttering such a sentence, p, will be very awkward for
the bearer of a : it means making a statement which, if true,
entails that its maker does not exist.

It is important to realize that the ills of such *statements* can-
not be blamed on the sentences by means of which they are
made. In fact, the notion of existential inconsistency cannot be
applied at all to sentences. As we defined the notion, it is a
relation between a sentence and a singular term rather than
a property of sentences. The notion of existential inconsisten-
cy, however, can often be applied to statements in a fairly
natural sense. In order to specify a statement we have to speci-
fy (*inter alia*) the sentence uttered (say, q) and its utterer. If
the later refers to himself by means of the singular term b
when he makes his statement, we may say that the notion
applies to the statement if and only if it applies to q in relation
to b ... The pointlessness of existentially inconsistent state-
ments is therefore due to the fact that they automatically des-
troy one of the major purposes which the act of uttering a
declarative sentence normally has. ... Normally, a speaker
wants his hearer to believe what he says ... But nobody can
make his hearer believe that he does not exist by telling his
so ; such an attempt is likely to have the opposite results ...
In a special case, a self-defeating attempt of this kind can be
made without saying or writing anything or doing anything
comparable. In trying to make others believe something I must
normally do something which can be heard or seen or felt. But
in trying to make myself believe somehting there is no need
to say anything aloud ... The performance through which
existential inconsistency arises can in this case be merely an
attempt to think ... that one does not exist ..."

"We have found that the notion of existential inconsistency
is primarily applicable to statements ... In a sense, it may of
course be defined for sentences, too, namely by making it
relative to a term ... Sometimes it may even be possible to
omit the specification "for ... to utter", namely, when the in-
tended speaker can be gathered from the context."

"In a frequently occurring special case such an omission is
not only natural but almbost inevitable. It is the case in which

the speaker refers to himself by means of the first person singular pronoun "I". This pronoun inevitably refers to whoever happens to be speaking. The specification "inconsistent for ... to utter" therefore reduces to the tautology "inconsistent for whoever happens to be speaking to utter", and may therefore be omitted almost always. In a special case, the notion of existential inconsistency may therefore be defined for sentences *simpliciter-* ... There are sentences which contain a first person singular pronoun. The existential inconsistency of such a sentence will mean that its utterer cannot add "and I exist" without contradicting himself implicitly or explicitly ... In the same way as existentially inconsistent sentences defeat themselves when they are uttered or thought of, their negations verify themselves when they are expressly uttered or otherwise professed. Such sentences may therefore be called existentially self-verifying. The simple example of a sentence of this kind is "I am", in Descartes's Latin *ego sum, ego existo* ... Descartes realized, however dimly, the existential inconsistency of the sentence "I don't exist", and therefore the existential self-verifiability of "I exist". *Cogito, ergo sum* is only one possible way of expressing this insight".

Thus Hintikka illustrates in the context of the discussion of the Cogito, as in the context of discussion of pragmatic paradoxes, how the notion of "context" can be used in a theoretically illuminating fashion. This time, he analyzes Descartes *Cogito* as the revelation and the explicit formulation of one of the *presuppositions of any possible communication* — namely, that the speaker exists. In a very similar fashion, it can be said that the analysis of pragmatic paradoxes depends on a very similar type of insight concerning the structure of contexts of communication, namely, that it is presupposed that a speaker can believe the statements he makes — while both analyses depend on another assumption — namely, that when one communicates information, that is, makes statements, his purpose is to make his hearer acquire certain beliefs. So that if the statements he makes are unbelievable for his hearer, this purpose cannot be realized. If the hearer cannot believe him for either logical reasons (because he makes contradictory

statements) or for very-general pragmatical reasons (because the statements he makes *contradict* the presuppositions underlying the process of communication) his behavior is *absurd*.

Thus, it can be seen that the notion of absurdity of statement-making can be analyzed by logicians, not by psychologists.

Moreover, it is clear that the analysis presupposes that it would be possible to talk about the logical relationships between *statements* and *presuppositions*. But this cannot be done within Bar-Hillel's program of defining the task of the logician of natural languages as confined to discovering the logical relationships between statements — since presuppositions are not likely to become statements. This is so much so that an explicit formulation of a presupposition, to determine if it is, for instance, common to all situations of communication — is a rare insight like Descartes *cogito* for instance.

E. *Bar-Hillel's treatment of the Liar*

Bar-Hillel's treatment of the 'Liar'-paradox as representable within natural languages provides us with the genuine insight that a paradox can be produced only if it is assumed that when someone utters, say, the two sentences : "The next sentence uttered expresses a true statement. The sentence just uttered expresses a false statement", he succeeds in making statements. He exploits this insight to argue that this is a good enough reason for claiming that no one can ever succeed in making statements if he attempts making them using this pair of sentences. He further argues that in any case there is no decision-procedure for the identification of statements from sentences uttered in order to make them (or, rather, in an attempt to make them). Hence, his suggestion to bar all utterances of sentences, which if could have succeeded in making statemaking, would have produced a paradox, from statement making seems to make sense.

The deeper motivation for Bar-Hillel's suggestion seems to be, as we have already hinted in § 1, the threat to the possibility of rationality lurking in the assumption that natural languages are inconsistent. If they are, argumentation in natural languages

seems to be pointless, while even the consistency of formalized languages is in danger, since they are ultimately dealt with in some natural language or other as a meta-language — if they are to be consistent. Hence, Bar-Hillel's demand to preserve the assumption that natural languages are consistent language-systems in any conceivable price seems to be well taken.

However, it seems that Bar-Hillel's "solution' for the paradoxes is more of the nature of a program for a solution than a fullfledged solution.

First, it is trivially true that statements cannot be recovered by any decision procedure from the sentences used to make them — since they cannot be recovered from these sentences by any conceivable procedure — the identification of a statement depends on pragmatic information not explicitly represented in the sentence. However, it does not follow that statements cannot be recovered by any decision procedure from a more comprehensive type of input, which includes both the sentence used and the characterization of the relevant contextual features. Rather, it seems that the best explanation for the facility of hearers to "understand what is said to them" is that they utilize some such decision procedure. This applies to all the relevant information available to them in the situation of communication, in order to identify statements.

Hence, Bar-Hillel's suggestion can, at most, be interpreted as a suggestion for a *desideratum* that any detailed theory dealing with the process of identifying statements from utterances should satisfy, if it is to be adequate for its declared purpose. That is, any such theory should assign any description of an utterance of the two sentences quoted above, no statements — as output to the process of extracting statements from utterances. If Bar-Hillel's suggestion is taken in the manner he presents it, namely, as s *solution* to the problem, he is, it seems, in an extremely awkward position. His position is quite similar to that of a logician who suggests that the notion of well-formed formula of a language he is dealing with will be defined not only by a system of formation rules, but also by means of a "filter" condition, which rules that if both

the formula and its negation are derived as theorems, both have to be declared ill-formed. It is easy to see that such a convention ensures the consistency of the language system in question. No effort has to be taken in proving consistency. But the language-system in question is saved from being possibly inconsistent due to a very high price — namely, that the notion of well-formedness of formulas loses its effectivity.

F. *Summary of the Criticism*

Summing up our criticism of Bar-Hillel's views, we claim that Bar-Hillel has not reconciled his suggestion to incorporate the logic of natural languages within the semantic component of the grammar of natural languages with his suggestion to define the rules of this logic for statements. We claim further that he has left the utterance-statement — sentence distinction in a pre-theoretical stage, as a purely terminological distinction. His application of this distinction could therefore not achieve the insights of Hintikka, for Hintikka has attempted a partial theory of the interaction between contexts and sentences uttered which is highly relevant to a theory of the identification of statements. Bar-Hillel's insistence that statements are "formless" has the devastating result that they can have no place at all in a theory of argumentation in natural languages, though Bar-Hillel demands for them a major place in any possible theory of this sort. His treatment of "paradoxes in natural languages" does not constitute a serious, systematic, argument against the possibility of such paradoxes. It is rather a recognition that if natural languages would have been found inconsistent, the idea of rationality would have no chance of survival which was subject to a (unconscious ?) transformation, into a seemingly dogmatical rejection of the possibility that natural languages can be inconsistent. This transformation seems to be more of the kind of wishful thinking than that of a rational argument. The constructive suggestions in the next section are mainly designed in order to save the important insights Bar-Hillel has reached from the handicaps pointed out in this criticism.

§ 5. *A proposal to modify Bar-Hillel's suggestions*

The program which will be sketched here relates to Bar-Hillel's views concerning sentences, statements and utterances essentially in the same way as the views of Generative Semanticists ([21]) relate to those of Bar-Hillel concerning the relationships between Logic and the Semantic Component.

Thus, while Bar-Hillel has declared that the semantic componont should deal with the logical properties of sentences in natural languages, Generative Semanticists have attempted to find out what were the serious consequences of such a view. It turns out that if logical rules are to be defined for semantic representations then semantic representations should be, essentially of the same form as formulas of standard logical language-systems. McCawley says ([22]) (231) : "It should be evident by now that I am proposing a system of semantic representation that is along the lines of the notational systems used in symbolic logic".

Moreover, if semantic representations are conceived of not as "readings" assigned to deep structures in the way Katz conceives of them, ([23]) but as structured entities which represent the *meanings of sentences,* it is possible to describe their semantic representations, while the ambiguity of a sentence can be defined in terms of a multiplicity of semantic representations. The notion of *deep structure* then becomes superfluous. In nontechnical terms, the insight which was provided by the Chomskyan notion ([24]) of "*deep* structure" — (that many properties and relations of sentences which could not be systematically explained by reference to their *surface structure* could be systematically dealt with if a level of "underlying structure" was assumed to exist), does not depend at all on the specific concept of a (syntactic) deep structure. When a well-defined level of semantic representations comes to be available, the level of deep structures comes to be both intermediate and to have no clear theoretical justification. The identification of semantic representations with logical formulas provides a clear enough conception of their nature for such a turn to take place. Thus, Lakoff and Ross write ([25]) :

"So the theory of language provides (somehow) the universal set of rules and well-formedness restrictions which generate the correct set of concepts (i.e. well formed predicate calculus formulas) and every grammar consists of a set of transformations which map each concept (somehow) into the large set of surface structures which can be used to express each concept. Just as no intermediate level of taxonomic phonemics is necessary or possible, no intermediate level of deep structure is necessary (or, we will claim, even possible)."

The third step from Bar-Hillel's views to Generative Semantics is the search for some systematic interrelationships between logical relations and syntactic phenomena. That is, if one assumes that semantic representations are both the "basis for the operation of transformations" and the representations of the "logical form" of sentences, it makes sense to look for linguistic phenomena which illustrate the relationships between logical properties or sentences and their linguistic properties.

Lakoff ([26]) declares: "For better or for worse, most of the reasoning that is done in the world is done in natural languages. And correspondingly, most uses of natural language involve reasoning of some sort. Thus it should not be too surprising to find that the logical structure that is necessary for natural language to be used as a tool for reasoning should correspond in some deep way to the grammatical structure of natural language. Take the following example..." Bar-Hillel's views lack such examples. Moreover, Bar-Hillel did not accept the obvious implications of his own program to deal with the "logic of natural languages". Perhaps he did not want to commit himself against the Chomskyan conception of the organization of grammar, since this conception is inconsistent with his porgram. In any case, Bar-Hillel's suggestion to treat logical properties of formulations in terms of their semantics is inconsistent, as we have showon, with his suggestion to deal with that logic as defined for statements. Statements can be determined not only from the sentences used to make them but also from the context in which they were made. They are *pragmatical representations*, as we shall presently argue. The

program which we will suggest here as both an elaboration and a revision of Bar-Hillel's can be termed GENERATIVE PRAG-MATICS.

We will represent this program in a sequence of steps.

1. Bar-Hillel has drawn a distinction between indicative sentences and statements, imperative sentences and commands, question sentences and questions, etc. We suggest, for the purpose of terminological convenience, to conceive of statements, commands, questions etc. as so many varieties of *thoughts* — in the same manner as indicative, imperative and interrogative sentences are varieties of sentences.

   The term "thought" is suggested here since it seems that making a statement, or giving a command, are acts of communicating *thoughts*. Moreover, this way of using the terms seems to accord well with Frege's. ([27])

2. The second step of the revision is quite more radical. We have pointed out that Bar-Hillel's suggestion to conceive of statements as formless entities has absurd consequences : statements come to be indiscernible ; the transition from them to sentences of a (or, rather, *the*) normalized language seems to be impossible ; and it lseems hopeless to attempt to define the notion of truth for them in a manner analogous to that in which Tarski has defined it for formulas of constructed languages. ([28]) Moreover, we have pointed out that in the more technical exposition of Bar-Hillel's program for a logic of natural languages, there is a component of rules of normalization, and another component of specifying the syntax and the logic of the "normalized language" but there is no systematic place for thoughts. Both difficulties can be removed if we assume some constructed system of representations to be a Representation System for thoughts, and identify statements with representations within this system, commands with another kind of representations, etc.

   Thus, if this system was assumed to be a constructed lan-

guage system, such as standard predicate calculus, or modal predicate calculus of some sort, thoughts could be conceived of as formulas of this language. Since, as we will argue later, it is advisable to think of the Representation System as a hierarchy of such languages (i.e. a hierarchy in which L_n is the meta-language for L_{n-1}), thoughts could be identified with formulas of any of these languages.

3. Suppose now we have a Representation System and a system of rules of normalization. The rules of normalization match sentences, uttered in a specified context, with the thoughts they express. Thus, the relationships between sentences uttered in a specific context, rules of normalizations, and thoughts, seems to be quite analogous to that of surface structures, rules of transformation, and deep structures in Chamsky's "standard theory" ([29]) or to that of surface structures, grammatical rules and semantic representations in Lakoff's "basic theory." ([30]) Moreover, it should be pointed out that on any conception of rules of normalization, they have to include known grammatical rules. Thus, since either of "John hit the ball" and "The ball was hit by John" can be uttered in some context in order to express the same statement, the rules of normalization should map either of them (conjoined with an appropriate description of the context) onto the same formula of the Representation System. That is, these rules have to "undo" the Passive transformation which distinguishes the two surface structures.

    The last formulation presupposes that the rules of normalization "have a direction" : they operate "from" utterances to "thoughts". This formulation is misleading, however. The rules of normalization are abstract, and any notion of "direction" or "order" as applied to their operation can mean, at most, an abstract ordering of rules, precisely as is the case with rules of grammar. ([31]) Hence, we see that the rules of normalization include rules of grammar — any rule of grammar which produces differences in surface form which do not reflect a difference in the "thought"

have to be included among them. Moreover, sentences which are synonymous in the syntactic sense (having the same Chomskyan "deep structure") or in the semantic sense (having the same McCawlian "semantic representation") have to yield the same thoughts under the rules of normalization. But sentences can be "pragmatically equivalent" in some context. That is they can serve to express the same thought in that context without being either semantically or syntactically synonymous. Thus, the notion of "pragmatic equivalence to broader than that of semantic or syntactic synonymes. The first can be defined in terms of "pragmatic equivalence" by a universal quantification over contexts, while the second is a special case of the first. Why then not suggest that the rules of normalization are those rules which relate thoughts to their linguistic formulations, with sensitivity to the context in which these formulations occur, and that the rules of grammar are just a subset of the rules of normalization? And if the rules of normalization provides the association of thoughts and sounds which is traditionally thought to define the field of linguistics, why assume that in addition to the representation system for thoughts, there is an intermediate level of semantic representations? Such a level is superfluous, in the way that from the point of view of Generative Semantics, deep structures are superfluous. Moreover, it can be shown that any suggestion to the effect that "pragmatic rules" precede "syntactic rules" is bound to block the formulations of otherwise statable generalizations e.g. those govern pronominalizations. Cf 5.

4. A a next step in constructing the program of Generative Pragmatics out of Bar-Hillel's ideas, we suggest that "contexts" be conceived of only in terms of the assumption about the context which speakers and hearers represent. These assumptions are "thoughts", that is, they have to be assumed to be represented within the same representation system as *expressed thoughts* do. Thus, we can take into account the logical relationships between statements

and presuppositions, since both are representations of the same system ; and we can also subsume Hintikka's analyses of pragmatic paradoxes and of the Cogito within our framework. That is, since his analyses of the interaction between uttered sentences and their contexts relied, essentially, on certain *constraints* which any communication event should satisfy, and which speakers and hearers represent — such as the requirement that one could believe what he says, etc. In any case, the "objective parameters" of contexts (time, place, identities of speaker and hearer, etc) are relevant to the interpretation of utterances by partners of discussions only in so far as they represent them correctly. So it in the representation that counts.

5. As an argument for our suggestion it can be pointed out that if it is not assumed that the pragmatic factors relevant at any moment of communication to the interpretation of utterances can be exhausted by a set of statements represented by the speaker (and a corresponding set for the hearer), we have to deal separately with *deictic* and *anaphoric* pronouns. Thus, a separate analysis is given to "How pompous he is !" when it is uttered after "Look at John" and when it is uttered after both partners of the discussion actually looked at John (without mentioning him explicitly before). But if one conceives of prior utterances in the communication event merely as operations on the set of statements represented by either speaker or hearer as "background knowledge" — operations which either increases this set or changes its elements, there is no need to provide a syntactic distinction between the case in which both partners were concentrating their attention in John due to some implicit consensus, and were taeking about him using only the third person personal pronoun, and between the case in which either one of them mentioned him explicitly in some prior speech act. There is no need to state separately the generalizations governing deictic and anaphoric occurrences of pronouns.

The Representation System (Thoughts)	Rules of Normalization	Surface structures (and) presuppositions)

6. If these suggestions are accepted, the following model of organization of grammars emerges :

The diagram means, essentially, that rules of normalization apply to a thought, which has to be expressed, relative to certain other thoughts, which in turn represent the context in which it has to be expressed. They transform it into a sentence which is designed to express it, relative to the representation of the context which turn out to be "pressupositions".

It should be stressed that the notion of "presupposition" has not missed the attention of recent linguistics. It has been conjoined, howover, with semantic representations ([31]), in the same manner as certain prefixes representing "speech acts" (performatives) have been assumed to attach to semantic representations ([31]). This practice is confused. It only testifies to the need to make a systematic replacement of "semantic representations" by "thoughts", which are "pragmatic representations".

Thus, Bar-Hillel's ideas trun out to inspire us with a new model for the organization of grammars. A model in which linguistic rules serve to map the representations of thoughts into the sentences suitable for their expression in a given context. This model is a close reconstruction of the classical idea that sentences serve to express thoughts. It also provides an answer to the question : What is the relationships between thoughts and language ? Since it points out that thoughts are related to sentences by means of a formal system — that of the rules of grammar (which turn out to be at the same kind as Bar-Hillel's rules of normalization).

This model provides us also with an answer to another question : Why should we assume that transformations occur in the grammar of any conceivable human language ? Why

can't we use languages in which thoughts are expressed "directly", i.e. languages in which the distinction between underlying structure and surface structure is not vacuous ?

The answer is, in broad outlines (which serve, essentially, only to delimit a research-program) as follows : the Representatic System mentioned above, the system in which thoughts are represented, is designed primarily for the representation of information in as explicit a form as possible. But a system of representation designed for communication purposes has to satisfy a host of constraints which cannot be reduced to the demand that language should represent thoughts in an adequate fashion. As Bar-Hillel has stressed, these languages are designed for the purpose of communication between beings which have a host of limitations. Their Short Term Memory is severely limited, to take just one example. Hence, there is a pressume to make linguistic messages as short as possible. Thus, we attempt to avoid the repetition of phrases (either VPs or NPs) by using transformations of equi-phrase deletion, which replace repeated phrases by some abbreviated indexes which can help us in recovering them. Thus, we are saved from the need to analyze the same phrase more than one time. On the other hand, a fully explicit representation of informamation would require repetition of the phrase, regardless of its internal complexity, since the usage of some indexes to represent repeated phrases might produce ambiguities.

Thus, *John told George that he was going to kill his brother* is multiply ambiguous precisely because of the pronouns which it contains, and which are "indexes" for deleted phrases.

Thus, transformations are needed in order to suit the representation of information used in the communication context to the constraints of the process of communicating. Hence, they have to be assumed to constitute a universal component of grammars.

It is interesting to note in passing that those linguists who did not distinguish between underlying structures and surface structures ([32]) were also methodologically close to those psychologists who assumed that cognitive processes, i.e. "thinking" are nothing but internalized speech. ([33]) The implications

of this closeness which in terms of our model reflects the assumption that there are no rules of normalization, should though, be left to some other discussion. What is the nature of the Representation System, in any case ?

Bar-Hillel's suggestion to represent "normalized formulations" within a constructed language which has a formal-logic of the standard type seems to suggest that the Representation System is a constructed language system.

This assumption, though, is refuted by the fact that whenever S is a well formed English sentence, *It is true that S* is also a well-formed English sentence. Now, under the assumption that S is the output of a formal process whose input is some thought — i.e. some formula of the Representation System, say p, *It is true that S* is also the output of a process of the same nature whose input is a formula, q. Now q should express the idea that p is true. Hence, it is either identical with p, in which case the occurrence of the phrase "It is true that" in the surface structure has no underlying source, or q belongs not to the same language as p does but to its meta-language : no consistent language system can contain a predicate which expresses the idea of truth for its own formulas. ([34])

Consider, now, the first possibility. If it were accepted, than *Whatever John claims is true* could have no underlying source. But for any context, any grammatical and "nonproblematic" ([35]) sentence which can be uttered in it has some underlying source. So we are left with the second possibility.

Hence, the Representation System has to be a hierarchy of constructed languages, each of which serving a meta-language for the language "underneath". Such a hierarchy of languages, though infinite, can be exhaustively described by finite, recursive, means.

Thus, Tarski's definition of Truth is adequate for *thoughts*, hence, indirectly, for their formulations in a natural language.

Moreover, this assumption about the nature of the Representation System also helps us to eliminate the ad-hoc nature of Bar-Hillel's solution of the *Liar*.

Thus, consider the sentences : "The next sentence expresses a true statement. The previous sentence expressed a false

statement." Let us assume that they are uttered, and statements are made thereby. Let the statement made by the first sentence by p, and the statement made by the second by q. Now, by our assumption that whenever one formulation expresses a claim concerning the truth value of another formulation, the under- lying "thoughts" are related as a formula in a meta-language to that of the object language.

Hence, p belongs to the meta-language of q, while q belongs to the meta-language of p. But since the relationship "belongs to the meta-language of" when predicate on pairs of thoughts is anti-symmetric, p and q have an impossible relationship be- tween them. Hence, there are no such p and q. Hence, no state- ments can be made by the pair of sentences above, which is precisely Bar-Hillel's suggestion.

Thus, our elaboration of Bar-Hillel's ideas brought us to a reduction of Bar-Hillel's solution of the *Liar* to Tarski's solu- tion, since we have suggested a definite relationship between constructed and natural languages. It can be shown that this suggestion yields many additional advantages — but this has to be left to some other discussion.

NOTES AND REFERENCES

(¹) Cf. Hintikka, J. *Knowledge and Belief*, Cornell University Press 1962 [p 31]: "..., suppose that a man says to you, "I know that *p* but I don't know whether *q*" and suppose that *p* can be shown to entail *q* logically by means of an argument which he would be willing to accept. Then you can point out to him that what he says he does not know is already implicit in what he claims he knows. If your argument is valid, it is irrational for our man to persist in saying that he does not know whether *q* is the case. If he is reasonable, you can thus persuade him to retract one of his statements without imparting to him any fresh information beyond certain logical relationships (the rules of which he is assumed to master right from the beginning.)"

(²) The point of the distinction is that adoption of a norm does not consist in never violating it. It consists, rather, in attempts to correct any revealed instances of its violation.

(³) Cf. Lakoff, G. "Linguistics and Natural Logic", STIGS no 1, 1970 p. 1.

(⁴) Cf. Bar-Hillel T. "A Prerequisite for Rational Philosophical Discussion", *Aspects of Language*, The Magness Press 1970, ch. 22 for an illustration of Bar-Hillel's interest in rationality of communication.

(⁵) Cf. note 4 for the reference.

(⁶) That is, it belongs to the intellectual tradition of Analytic Philosophy, and illustrates thinking about semantical problems which is not expressly committed to any explicit theoretical conception of the structure of language. For that matter, it belongs with papers such as "Meaning" by Grice (reprinted in Steinberg D. & Jakabovits L. (eds) *Semantics: An Interdisciplinary Reader*. Cambridge at the University Press 1971).

(⁷) The notion of "situation of communication" is not much more clear than that of "context", however, it seems obvious that the location of a communication event requires spatio temporal coordinates as well as identification of partners to the communication process. But it seems that "mentalistic" characteristics, such as the beliefs of both speaker and hearer are highly relevant.

(⁸) The philosophers of language referred to include, first and foremost, Strawson, P. F. "On Referring", *Mind*, lix (1950), pp 320-344. An illustrative linguist interested in presupposition is Lakoff Cf his "Presuppositions and relative well-formedness", in Steinberg and Jakobovits, ibid.

(⁹) This is Chomsky's term for, roughly, *words*. Cf. Chomsky, N. *Aspects of the Theory of Syntax*, M.I.T. Press 1965, ch. 1 [p. 3]"... that is, with the rules that specify the well-formed strings of minimal syntactically functioning units (formatives)..."

(¹⁰) This Austinian idea has been extensively dealt with by Searle, J. "That is a Speech Act?" in Searle J. (ed.): *The Philosophy of Language*, Oxford University Press 1971, ch III.

(¹¹) For Chomsky (*Aspects*, ibid) the process of interpretation involved in communication is, essentially, the process of assigning a syntactical analysis of the sentences which occur in it. [p 4-5]: "A fully adequate grammar must assign to each of an infinite range of sentences a structural description indicating how this sentence is understood by the ideal speaker hearer." Thus 'understanding' has nothing to do with the recovery of *thoughts*.

(¹²) Saying that a semantic representation underlies a sentence is nothing more than saying that it represents the sense of his senence. No commitment is thereby expressed to the precise type of relationship which has to be postulated between semantic representations and sentences.

(¹³) The term "canonical notation" and the stress on the process of paraphrasing a natural language formulation within an adequate for that purpose constructed language are both due to Quine, W.V.O. *Word and Object*, M.I.T. Press 1960, ch. § 33, e.g.: [p 159] "Hence, to paraphrase a sentence of ordinary language into logical symbols is virtually to praphrase it into a special part still of ordinary or semiordinary language".

(¹⁴) The reference is to the International Congress for Logic, Methodology and Philosophy of Science held in Amsterdam in 1968, in which a colloquium on the role of formal languages has taken place.

(¹⁵) Cf. Tarski A. "The Concept of Truth in Formalized Languages" *Logic, Semantics, Metamathematics*, Oxford 1956.

(¹⁶) Bar-Hillel has always conceived of the demarcation between disciplines in terms of "division of labor". Take for instance his claim (*Aspects of Language*, ibid, p. 188): "This implication belongs with "universal semantics" or "logic" depending on the department you belong to". Hence, it seems strange that in this point his argument depends so crucially on the assumption that the demarcation between *professions* (or academic departments) is also a system of allocation of problems.
Now, even if the demarcation between Logic, Linguistics and Psychology would have been taken seriously, and in its traditional appellation, the psychological problem would be:
"Why do certain persons produce, on specified occasions produce absurd behaviors ?" and not. "What isan absurd behavior" The second question is assumed to be answered by sociologists, or logicians, or linguists. Any answer to it should also involve an answer to the question: "What characteristics of a behavior make it absurd ?" which is, essentially, a generalization of the question Bar-Hillel has faced when transferring the paradoxality of pragmatic paradoxes from sentences to utterances, i.e. behavioral acts.

(¹⁷) Thus, it could be believed that any attempt to fly is successful, provided that one "seriously intends" to fly. Hence, any failure to fly involves a non-serious intention.
This example relies on the Popperian assumption that what distinguishes theories from magical conceptions is that the latter are defended against refutations at all costs. Cf Popper, K. R. "Science: Conjectures and Refu-

tations", *Conjectures and Refutations*, Routledge & Kegan Paul 1965 [p 34]:
...I felt that these other three theories, hough posing as sciences, had in
fact more in common with primitive myths than with science..." [p 36]:
"(4) A theory which is not refutable by any conceivable event is non-
scientific."
[p 37]: "(7) Some genuinely testable theories, when found to be false, are
still upheld by their admirers — for example by introducing ad-hoc some
auxiliary assumptions, or by re-interpreting the theory *ad-hoc* in such a
way that it escapes refutation".

(18) Hintikka J. *Knowledge and Belief*, ibid.

(19) Hintikka, J. "Cogito Erg; Sum "*The Philosophical Review*, LXXI,
1962. No 1 [3-32].

(20) Cf. Tarski ibid. The point of this argument is that if natural language
is "inconsistent" than the consistency proofs given for any formal system
whatsoever are valuless to guarantee its consistency. This is so, since these
proofs have to be formulated within the meta-language of the language in
which the system is presented. Now, this meta-language is either a natural
language — in which case the inconsistency of all natural languages affects
also the proof of consistency of the formal language in question, or another
formalized language. If the later is the case, the same argument pattern is
repeated. Since it is impossible to prove the consistency of an infinite hier-
archy of languages, such that L_{n+1} is the meta-language for L_n, by proving
the consistency of a formal system represented in L_n within L_{n+1} for all
n — simply because of the finitude of duration of human life, it is necess-
ary to resort to a natural language as the meta-language for some L_n. But
then the proof of consistency for L_n is given within an inconsistent lan-
guage system, hence is valueless. But then we have no rational reason to
suppose that L_n is consistent. But then the consistency proof given within
L_n to formal systems represented wihin L_{n+1} is also suspect. So we have
shown, by induction on n (which is the "height" of the hierarchy") that if
natural languages are inconsistent, we can never be ascertained that any
fomalized language is consistent. So the minimal demand on rationality
formulated in terms of consistency loses its force — we can never prove
that any cognitive system is consistent. So, a danger of a very extreme
type of skepticism is aroused.

(21) Generative Semantics is taken here to cover all those linguists which
conceive of the organization of grammar in terms of a system of semantic
representations (which are taken to be quite similar to logical formulas)
and a system of rules of grammar which convert these representations to
surface structures. The literature is too extensive o be adequately docu-
mentable by an appropriate list of references. Only Lakoff, G — *Linguistics
and Natural Logic*, STIGS no 1, 1970, will be mentioned.

(22) McCawley D. "Semantic Representations", in Garvin P.L.: (ed) *Cog-
nition: A Multiple View*, Spartan Books 1970, ch. 10.

(23) Cf. e.g. Katz, J. "Semantic Theory", in Steinberg D. & Jakobovits L.
ibid,.

([24]) Occurring prominently in Chomsky's *Aspects,* ibid, e.g. p 16: "Consequently, the syntactic component of a grammar must specify, for each sentence, a *deep structure* that determines its semantic interpretation and a *surface structure* that determines its phonetic interpretation".

([25]) Lakoff G. & Ross J.R. "Is Deep Structure Necessary", Reproduced by the *Linguistics* Club Indiana University, 1908, p. 4.

([26]) Lakoff, G. *Linguistics and Natural Logic,* ibid, p. 1.

([27]) Frege G. "The Thought: A Logical Inquiry", Strawson P.F. (ed) *Philosophical Logic,* Oxford 1967 [pps 23-24]: "Much of language serves the purpose of adding to the hearer's understanding, for instance the stressing a part of the sentence by accentuation or word order. One should remember words like "still" and "already" too. With the sentence "Alfred has still not come" one really says "Alfred has not come" and at the same time hints that his arrival is expected but it is only hinted... Such suggestions in speech make no difference to the thought. A sentence can be transformed by changing the verb from active to passive, and making the object the subject at the same time... Naturally, such transformations are not indifferent in every respect, but they do not touch the thought." Thus, Frege distinguishes the thought which is "what is communicated" from the sentence which serves to express it, and stresses that transformations affect the "accessibility" of the thought — to use a phrase of Langendoen — but not its content. (Cf. Langendoen D.T. "The accessibility of Deep Structures" in Jacobs R.A. & Rosenbaum P.S. (eds) *Readings in English Transformational Grammar,* Ginn & Company, 1970, ch. 6).

([28]) The major point of Tarski's definition was the utilization of the fact that the structure of wffs of a formal system is determined by system of formation rules. This system provides a recursive definition of the notion "wff". Hence, the notion of Truth could be defined for these wffs by induction over formation rules. But "statements", being formless, cannot be subject to any truth-definition analogous to Tarski's, while it seems inconceivable to define the notion of Truth in a manner essentially different from Tarski's.

([29]) Cf. Chomsky N. "Deep Structure, Surface Structure and Semantic Interpretation", in Steinberg & Jakobovits, ibid, [p 185].

([30]) Cf. Lakoff G. "On Generative Semantics" in Steinberg & Jakobovits, ibid, [p 236].

([31]) Cf. Chomsky's and Lakoff's papers referred to in the two preceding notes. Thus Chomsky says ([p 187 - 8]: "The standard Theory generates quadruples (P,s,d,S) (P a phonetic representation s a surface structure, d a deep structure, S a semantic representation). It is meaningless to ask whether it does so by 'first' generating d, then mapping it onto S... There is no general notion "direction of a mapping" or 'orders of steps of generation'."

Lakoff says [pps 236-7]: "Some writers on transformational gramma have, however, used locutions that might mislead readers into believing that they assume some notion of directionality."

(31) Cf. Morgan J.L. "On the treatment of Presupposition in Transformational Grammar", in Binnick R.A. Davidson G. Green G. & Morgan J. (eds) *Papers from the Fifth Regional Meeting of the Chicago Linguistic Society*, University of Chicago, Linguistic Department, 1969.

(32) Cf. Postal P. *Constituent Structure*, Mouton 1964, for a discussion of these conceptions.

(33) Like most of the behaviorists from Watson to Skinner. Cf. Hilgard E. & Bower G.H. *Theories of Learning*, Appleton Century Crofts, 3rd edition, 1966, for a discussion of these conceptions.

(34) Cf. note 15, 20.

(35) A sentence is nonproblematic in a context if its utterance does not seem to be "absurd" in the sense discussed above.