A GAME-THEORETICAL ANALYSIS OF RIDDLES

LÁSZLÓ TARNAY

A. József University Szeged

1. Introductory Remarks: Games and Literature

There is hardly another field of what is termed literature in which the main features of games could be more conspicuous than in riddles; most native and foreign observers of the riddles of primitive peoples have given accounts of the hour-long sessions, when the community splits into two groups, one a riddle-poser the other a riddle-solver, and an almost infinite sequence of utterance pairs would follow. These empirical facts quite naturally convey the idea of there being two players to make their moves in a game. What at first sight seems problematic is how the possible outcome of such an infinite process can be defined. But concerning the relationship of two utterance pairs almost nothing is known - the sequence of pairs can at any point be interrupted or taken up again -, if we restrict the use of 'game' to a single pair, the outcome of such a game should be clear: the title of winner or loser is assigned either to the riddle-poser or to the riddle-solver if the riddle is left unsolved or is correctly answered respectively. From this it is already clear that the basic problem is whether one and the same type of game is being played all through a given sequence.

If the identification of the elements of a game with the elements of a riddle can be allowed, then some very natural theoretical assumptions follow;

(C1) Riddles are a kind of face-to-face game, in which physical contact is required to hold the two players together.

(C2) What counts as a move in such a game is an utterance.

(C3) The outcome of a game is intentional in that it is the intention of the player making the first move to determine what can count as a correct move in response.

From (C1) - (C3) it follows that

(C4) Riddles have the form of a dialogue.

from (C1) - (C4):

(C5) The possible roles of Speaker and Hearer are assigned to the two players respectively.

Finally, from (C1) - (C5) we conclude that

(C6) Riddles are a special kind of language game.

We dub (C2) as the Semantic Condition and (C3) as the Pragmatic Condition of Riddles (SCR, PCR), and call (C1) - (C6) the Language Game Criteria of Riddles (LGCR). Now, what further conclusions result if we consider riddles as a subdomain of literature? Accepting Abrahams' conception of folklore genres,[1] three important claims need stating; from (C1) it is clear that

(C7) Riddles belong to what are called conversational genres.

Sc we dub (C1) as the Conversational Condition of Riddles (CCR). Moreover, from (C1) - (C7) we have:

(C8) Riddles as a genre always contain the Hearer, without the possible moves of which they cannot be considered as such, neither can they be transmitted or even written down by any other means, either.

This would mean that riddles are a special sub-domain of literature in that the Hearer (or the Reader, respectively) is not only encoded in them but is an integral part of their semantic structure. It adds up to the claim that was first stated by Lord and Parry in connection with epic poetry about performances happening once for all. This with (C8) amounts to saying:

(C9) Riddles are highly performative in that the Hearer and the Addressee coincide in them.

This we dub as the Performative Condition of Riddles (PFCR). What it says is that "the performance is a moment of creation" not only "for the singer" but for the audience, too. But if a move in a riddle game is basically characterized by (CCR) and (PFCR), there seems to open an abysmal gap between riddles and any other literary form; this is because riddles cannot be assigned a whole semantical unit unless they are embedded in a game, in which the audience will react with a move to each move of the Speaker; whereas in case of other genres the Hearer or the Addressee is just one of the many pragmatic factors to be possibly considered as what can give a communicative aspect to either a text or a virtually pre-existing set of formulae. Genre is then pragmatic and must be construed while taking stock of anything that could be pragmatically relevant in the case of a literary utterance. Even if we accept this principle as correct, and let alone genre as such, we would like to inquire into the justification as to what can be taken stock of; whether it is right to consider the role of the Hearer as merely pragmatic and to construe the semantic model of the text with the assumption of an ideal Reader. We term 'the Pragmatic Fallacy' of literature as an affirmative answer to the above question. Here, in the forthcoming pages we would like to argue that, given the introduction of game-theoretical elements into one of the sub-domains of literature, a tentative theory to provide a general explanation of what we call literature will bear out the involvement of concrete Hearers in the construction of any possible semantic model of a literary text; i.e. the gap between riddles and other sub-domains of literature must needs be bridged. To prove this we aim at finding what can properly serve as formulae in case of riddles. Our use of 'formula' does not deviate from that of Lord, i.e. from "a regular unit of speech" but it deepens it in a very important sense: it shows how reference is involved in it and how the mapping of correct individuals relies on what the Hearer has chosen as his strategy.

Before developing our idea about riddles we should make clear what justifies the introduction of game-theoretical elements into the analysis of a literary genre. We have already mentioned some empirical observations that could strongly support such an approach. They tell us that orally riddles come into being as a result of certain games, i.e. they are played. This means that (C1) - (C3) are empirically justified. But there a theoretical justification can be found for them, too. The argument, from which this justification can be drawn, can be termed as the Variability of Surface Forms. To heavily empirically biased scientists (VSF) may sound too general. But we think that a careful reading of Eigen-Winkler's famous book about games played with/in Nature[2] would make such an argument reasonable. The introduction of game-theoretical strategies into scientific explanations raises two problems; one is whether there should be always something substantially manifested in Nature as a player at the same time that there is something to correspond to each move in the game? The strategies then would go back to what are somewhat imperfectly dubbed as 'players'. This imperfection is the uncertainty in determining why a given strategy has been chosen. And behind this question lies another question regarding the formulation of a possible causal chain: $what_1$ makes $what_2$ do $what_3$? Now, in game-theory we substitute moves into $what_3$ and players into $what_2$. $What_1$ is defined as the higher or lower degree of the reasonableness of choosing a strategy; this amounts to a probability factor. But what can justify my saying that moves are determined by the reasonable acknowledgement of a probability factor? Only that there is a more-or-less reasonable player. But how can this player be empirically detected? Only through and by the moves he makes; nothing else can I know of him but by what he does. To eliminate $what_2$ as a player we would have to totally conditionalize it, i.e. we would have to know all the conditions that have a role in the coming into being of $what_3$; then we could reduce "$what_1$ makes $what_2$ do $what_3$" into "$what_1$ makes $what_3$", which is identical with "$what_1$ causes $what_3$". For instance, in case of a Life-and-Death game I could claim to know all the $c_1, c_2, \ldots, c_n$ conditions required for eliminating the probability factor of an e_i event that has corresponded to a move in the original game, and consider their sum total $C\{c_1, c_2, \ldots, c_n\}$ as a cause of e_i. Then the idea of player may seem redundant: I could speak of some organic process in cells as causing e_i instead of speaking of Life as choosing a certain strategy. Although there are serious troubles about knowing C, i.e. whether C is enough to cause e_i, it will always allow a new question to a rise: while it reduces "$what_1$ makes $what_2$ do $what_3$" into "$what_1$ makes $what_3$" it asks for the extension of the latter into

"$what_4$ makes $what_1$ do $what_3$"; e.g. why are some chemical substances such that they cause e_i? And then there seems to be no way out of this infinite regress as the same extension can be applied to any $what_i$ element of a causal chain. The only reasonable solution appears to be to revert to some game--theoretical device considering all newly made extensions as infinite conditionalizing and making each chain correspond to an information processing. Our games then will be information--dependant; conditionalizing is made with respect to two possible moves of the players. The other point, which the introduction of game-theory seems to emphasize, is what we called (VSF). While the argument of causal chains may at least theoretically satisfy us, when applied to (VSF) it appears very unpromising; for as long as we deal with events we have to decide between two alternatives: it either comes down or not: if it does, we may more-or-less be happy with our definition of C and need not bother with a possible negative answer: but when we deal with structures we have almost infinite alternatives, and what we would like to do is decide why certain alternatives are preferred and others neglected. To apply the causal chain argument here would be an irremediable failure since it would never be able to account for the problem of mutated variants. For, to solve it we should also examine all possible variants, some of which need not be instantiated, or if so, we should not have come across any of them; and there can be no causal chain for possible structures which have never been observed to hold. The way-out again appears to be game-theoretical: to decide whether a mutation is preferable is strategy-dependant. Preference naturally relied on some pre-conditions C', but no possible extension of it can amount to explaning why a certain preference relation prevails. The most a heavily empirically biased scientist could say is that they are "out there".

From the two arguments above it is clear that game-theory blurs the distinction between a "de dicto" and a "de re" reading; for, appealing to the causal chain argument we arrive at a process of infinite conditionalizing of probabilities, and in this case a recurrance to strategies covers a lack of "de dicto" knowledge; whereas appealing to (VSF) we arrive at a preference selection of certain mutations and the probability of their survival, which is not information-dependent, and then recurrence to strategies would explain away a "de re" selection of forms. The ambiguity, or on the contrary, the disambiguation of ambiguities, is a characteristic feature of game-theory. From both arguments it follows that game-theory is adopted as a means to examine relations differently manifested and not concrete individuals, although it is always a concrete case that the theory can be applied to. And this seems to be the major advantage of game-theory; i.e. being thoroughly general it gains body from each new collection of data. The supposition of there being players making moves does not then require any substantial formulation, but it is the price we have to pay for the failure of founding all our theoretical knowledge on the principle of induction. And we consider it is a very small price to pay.

Now, how does this bear on the assumptions we have to make when we introduce game-theory into the field of humanities, the subject matter of which is basically characterized by the use of language? It is an ironical assertion that game-theory has been *neglected in a field where a metaphysical reading of* players would be once and for all excluded, while it has been being developed over since its first formulation in such fiedls as biology, mathemetics and abstract languages where the concept of player can never be defined in a philosophically satisfying way. The identification of the Speaker and the Hearer with the two players, then, is almost trivial. Where the trouble seems to lurk is in the value-assignment of possible moves or in the testing of the reasonableness of a given strategy. And even if we succeeded in this, it would always remain a hopeless effort to account for the players as being governed by a reasonable choice from their possible moves. What (PCR) tells us is just that speaking is intentional in that possible outcomes of games always rely on the expectations of the players. Although by stating some such expectations as pre--conditions of games we could achieve a pragmatic disambiguation, our semantic model is left inevitably ambiguous. For any method to restrict ambiguities would lead either to too narrow models (we simply exclude problematic data as irrelevant or erroneous) or to the introduction of some philosophically dubious entities (like possible worlds) in an infinite number. So, while we could successfully substitute into the second two elements of a "$what_1$ - $what_2$ - $what_3$" chain, the interpretation of $what_1$ remains inadequate in a sense that no causal relationship should be assumed to hold between "$what_1$" and "$what_2$", whereas in the natural sciences we can have a good probability factor. This means that even if any of the players tends to be reasonable taking into consideration the probability of a given move, it may not guarantee the successfulness of his move for the intention of his opponent my still aim at something quite different: he may put in: "My move was not what you made it out!"; whereas in other games from chese to economics we have in a sense a direct understanding of what a previous move can be. But as language games are basically governed by something like our (PCR) and as we have no means to detect what takes place in the human mind, what intention a player has just conceived when making his move, although the move of his opponent is going to be a reaction to what he deems his intention to be, games played with linguistic utterances are two times open to failures; (i) moves contain not just utterances but the interpretations of them, (ii) even an unambiguously counted interpretation cannot be put into a causal relationship with a given intention of the player. The first problem has arisen from the non-unique predictability of a reasonable move, and brings home the idea what a semantic game can be about: the uncertainty of a value--assignment of a move; while the second problem calls for a means of pragmatic disambiguation of the semantic uncertainty.

But how can we assign values to moves at all? Even if we might not know why or which value-assignment, i.e. interpretation, is being intended by a given move, we can try to evaluate it. Here we encounter something similar to what we can know about a player: only his action; to decide what the value-assignment of an utterance can be an action of seeking and finding is required with respect to a given individual who is thought to belong to one or more predicate-assignment contained by the utterance. It is always on the basis of certain predicate--assignment that an individual can be found out there in reality. But what if this individual is not found or it does not exist? Did we make a move by choosing a predicate-assignment all the same? Of course we did; we must have done, or else we should dispense with the idea of playing. But when can we make sure of the non-existence of an individual? Possibly never; for, we cannot limit our search to a certain domain unless it is an empirical one containing a deictic term as "this world", "this house", etc.; or else it being linguistic like "the *A* which are *B*", we can get lost again in an infinite procedure of finding at least one representative of class *B* which is also *A*. But we are going to argue that it need not be a counter-argument against game-theory as a language game for, as there is no causal relationship involved in such a game, we can very easily say that in case of an infinite seeking and finding games get blocked and play is interrupted. But if so, we must have some means of constructing what a possible course of a game may be regardless of whether it can be concluded with a successful search or not. To accomplish this we need (VSF); linguistic structures and their mutations in speech, together with the wide range of their possible interpretations, closely parallel the variability of forms in nature; in both cases we have to consider possible variants. We should be able to describe this semantic openness and how conflicting or correct selections from them are being realized. What we cannot do is predict without uncertainty whether a given selection will be realized as far as the players are concerned. But we do not see how else we could map the infinite variability of forms into concrete realisations other than game-theoretically.

The most extensive treatment of a field basically characterized by the use of language along the lines of game-theory has been accomplished by J. Hintikka and his followers.[3] So it may seem natural that in trying to apply game-theory to such an over--discussed problem as a literary genre we should go back to their major achievements in the field. There must be a very natural sense in which the strategies in ordinary communicative situations bear on the possible strategies of the riddle-poser and the riddle-solver respectively. This would not mean that there is nothing else in the latter that cannot be traced in the former. But the divergencies that can crop up would belong to what we called the pragmatic pre-conditions of games or to what can enter into the definition of a literary genre. But there should be a common semantic structure - let us term it 'Semantic Strategic Possibility' (SSP), which would run on parallel lines with our argument of (VSF). We call this possibility semantic because it involves reference. It should add to the fact why Hintikka's game-theoretical semantics turns on games for quantifiers in a language. The interpretations of certain terms are then defined by the application of some of the strategies of any of the two players as different substitutions of individuals. The disambiguation of different readings can easily be understood as a constraint on individual selection; at the same time one and only one individual is to be chosen, for to understand a predicate-assignment both empirically and psychologically can only be possible if one single individual is being considered at a time. We will not understand "All men are clever" or "The murderer must be insane" unless we take concrete individuals from the class of men and examine them one by one whether he is clever or not, or we take an individual of whom it is true that he is the murderer and examine whether he is also insane. It is important to emphasize that this is how we can understand these sentences, but we need not pursue the quest till we can find such an individual. For the quest can at any time be interrupted and the play abandoned. Then we are left with a sentence in some way connected with the vague idea of an individual, of whom we can have no direct perceptual knowledge. But we still have to understand the sentence, and our behaviour in understanding it is characterized by (SSP). So, we no longer need the distinction between definite and indefinite, notional and referential, 'de dicto' and 'de re' readings just because they are external to language. Of course, we can always add phrases like "Whatever he be", "I do not think there exists such a person", etc. but they would not tell us anything about the meaning of the original sentence; they rather inform us about the Speaker's attitude or his intention in communicating the sentence. (Cf. the Speaker's intention in ordinary communication to specify referentially even if he has only some means of notional specification vs what we have called 'secret' as being a deviation from it, when he intends the Hearer not to specify referentially although he (the Hearer) has a conflicting intention to do so even if he (the Hearer) has only some means of notional specification.)

From the above passage it results that in some way we cannot neglect the problem of reference in cases of what should be called literature, although reference in fiction has turned out to be an almost insurmountable problem. But what the argument of (SSP) along (VSF) has taught us lies in that just as a mutated variant can never be causally linked to any of the players (although it is "out there") no player can be made responsible for causally blocking the reference of expressions used in fictional discourse. Of course, he may intend to do so, or intend this intention to be recognized by his opponent in the game, but the posibility of a different move is already contained by (SSP). (SSP) is then a basic criterion of literature for it embraces (VSF) for the interpretations of utterances, without which no game for literature can have a beginning; otherwise it turns out to be like ordinary communication, in which unambiguous results, the lowest possible degree of variability, are expected.

To sum up our basic claims we can say the following: if we wish to apply game-theory in literature basically characterized by the use of some language, and if a game-theoretical model of semantics involves different intepretations of sentences, literature must be viewed as a possible extansion of divergent interpretations. This amounts to stating our (SSP), which should, in a very natural way, explain away every possible mutated variant that can crop up in a game. Moreover, if literature is considered from a game-theoretical point of view, then the answer to what can count as a formula in a given genre is forthcoming: each game can be defined by constructing a matrix or a fragment of a matrix which will contain what the players believe, i.e. the interpretations that are available for them. Such a matrix is a regular unit of speech in that it generates possible variants that belong to a given genre.

2. The Variability of the Surface Forms of Riddles and their Possible Logics

In the works of different ethnologists riddles have turned out to be such a complex phenomenon that even the categorizations of the variants appear divergent or conflicting; besides the term 'riddle', occasionally 'enigma', 'pun', and 'puzzle' are equally used to cover a range of utterances in which something is to be found out. In some cases 'enigma' is defined so that it should comprise data figuring in folk narrative' e.g. Flahault[4] seems to appeal to this kind of use, but later in his paper he uses the French 'devinette' almost interchangeably with 'enigme'. We feel that a distinction between riddles and enigmas as being narrative in character should be adequately grounded. Enigmas would then make up a different genre comprising stories that are ciphered in a certain way. But this is not all; for there are some Hungarian legends or folktales, which contain special utterances ordering particular actions to be carried out, but to do so they first need to be deciphered. We may dub them as 'enigmatic orders'. Somewhat similar to them are some childish sayings giving the order to draw what one can make out of them so that they might be deciphered. What all these examples have in common is that one needs to decipher them is a certain way to comprehend what they say. Something must be found out. This naturally relates to the problem of codes: we somehow do not seem to understand them at first sight. So, there is a unique character underlying each of these utterances, i.e. the way they can be comprehended. If to be understood they need to be decphered, the modes of deciphering them should reveal the modes of understanding that play an important part in their comprehension. And these modes should reflect the possible logics that can be applied to them. By giving a logical form to riddles, then, we should aim at developing a procedure governing our minds in comprehending them. And this procedure should give us the deciphering clues. This procedure is what a strategy in a game can prescribe. The procedure of finding a solution is a particular content of an algorithm by which it can be computed. When we choose such an algorithm to cipher a given utterance, we make a move in a language game. This language game differs in a very important sense from games for quantifiers: we do not select an individual at once and go over to see whether he instantiates a certain property, but we select a clue called algorithm, and as it is a language game, this clue has to be identified linguistically, i.e. it has to be an expression, be it a predicate or a term, for we have to be able to communicate it or make it manifest as a move, and what else can be communicated other than what can be part of an utterance? Seen from this point every utterance that would require the use of an algorithm will belong to a field characterized by the question of something to be found out. But the 'thing' itself should not enter into the definition of the algorithm; i.e. we have now a logical procedure in which all the former analyses of riddles can be reintegrated. These analyses are determined by the underlying question: What is there to be deciphered in a given utterance? Then a question for the clue is a question for the type of data it can be applied to. From this it follows that there should be as many logical forms of riddles as there are ways for the above question to be answered. According to Barabanova[5] there are not more than forty. From an entirely different point of view, Faik-Nzuji[6] enlists three different structures of riddles while specifying some sub-classes for each. E. Köngäs-Maranda[7], on the other hand, deals with one single structural type which is included in Barabanova's list. We give some of the criteria they can have used in setting up their categories in order to show

how our game-theoretical approach can reintegrate them.

(i) Now many objects are described?

(ii) What kind of a relationship is there between the predicates and the object introduced first?

(iii) What kind of a relationship is there between the predicates and the object introduced second?

(iv) What kind of a relationship is there between the two objects?

(v) How much of this relationship is taken up by the predicates?

(vi) What kind of a relationship is there between the predicate themselves?

(vii) What kind of a relationship is there between the predicates given for the object introduced first and the predicates - that may not have been communicated - of the objects introduced second?

(viii) How does the relationship mentioned in (vi) relate to the object and/or its predicates introduced second?

(ix) Do meta-linguistic considerations play any part in the riddle?

(x) Does the riddle hint at a mathematical computation?

(xi) Does the riddle contain a question-word?

It is clear that any sort of combinations of these criteria would lead to different types of logical form. Naturally, the greatest problem is that other similar criteria can be added to the above (i) - (xi); e.g. we can define

(xii) Is an action other than speaking part and parcel of what a riddle says?

(xiii) Should an action other than speaking precede linguistic comprehension?

(xiv) Is there a narrative involved in what should be deciphered?

It is not that we do not admit any grounds for these criteria; they very well reflect some of the basic linguistic and extra--linguistic structures riddles can have, but it would be a mistake to identify a linguistic structure with logical form as such. If the underlying character of riddles proves to be algorithmic, then what we have to do is show in some straightforward sense how an algorithm is used in computing a solution to a riddle. Our approach then will be a further contribution to what Hintikka called the need for a fresh symbolism. He hinted at the possibility of this but never developed it. To achieve this aim we think it promising to resort to mathematical game-theory. Of course, we have no room here to work out everything in detail, so instead we rather present the mainlines of a transcriptional procedure in connection with a sub-domain of literature with the assumption that it can easily be generalized. This relates to the place of reference in literature or in fiction. Reference in case of riddles has always been an underlying problem; considering some of the criteria we have defined we note that objects enter into the picture that riddles describe. This would call for them to have a naming character, as to what can be named a straightforward answer is a class. This idea gathers force when a second term is introduced to name another class and the riddles are taken to be answered if an utterance of this term follows. This is the way in which E. Köngäs-Maranda's analysis is developed; it puts forward the view that riddles unfold the possible connections of the two classes named respectively in the two parts of their utterance. Formulated in this way however it would lead to a meta-linguistically-biased theory of riddles asserting similarities and identities of classes. We have already given a critical account of such an approach and have pointed out the absurdities that might follow.[8] We do not want to reproduce our argument here; suffice to say that riddles can neither be wholly extensional nor express intensional or meta-linguistic identity; Riddles do not assert an identity between mere extensions of classes for it cannot be permitted that one and the same object is referred to by any of its terms, i.e. the two general terms introduced in the first and in the second part respectively are just intensional variants of one and the same referent; and riddles cannot be mere analytical truths, i.e. intensionally identical terms used for extensionally different classes, something that happens when a child is learning a language, for it is unacceptable that, given a riddle about e.g. trees and men, which, say, defines a man as a kind of evergreen, anyone from among the community where such a riddle appears, should perceptually take a tree for a man. This will be further emphasized when we speak about the didactic role of riddles among the primitive.

It does not mean however that the role of naming does not have any part in riddle sessions.
Objects do figure in riddle sessions in a sense, i.e. as prototypes of classes. But they are recalled by means of explicating some of their properties. Naturally these properties do not remain the same; others can serve to convey reference to either the same or to a different class. These properties are used only to fix reference to one or another reference class. They do not have the role of proper names, nor that of general terms, for they cover a wide range of possible uses. This is exactly how stereotypes are used. To choose the right use of a stereotype in a given context would amount to computing the right algorithm of a possible strategical move in the correlated language-game of the utterance the stereotype occurs in. What we can say already at this point of the analysis is that riddles are somehow the prototypes of such computational processes. But it cannot be wholly segregated to a field of some literary genre, for it can become indispensable at any point of an ordinary communication, if the Hearer wants to have a thorough understanding of what has been said by the Speaker. For instance, saying that "The Daily News did not come to the press conference"[9] the Speaker intends the Hearer to recur to some algorithm about publication of newspapers in order to select the correct use of "Daily News" as a stereotype. But what would this mean? Do we refer all the time to such an algorithmic function when uttering a sentence? Are there hidden riddles in everyday speach? We could save something from the original idea on the difference

between ordinary and literary communication by saying that riddles should contain composite functions; but a quick survey of data soon refutes such a claim. The only thing we can do is give some criteria of linguistic identification of riddles as stereotypes necessitating certain computational procedures to get the correct referent. It would first of all call for some syntactical rules to be correlated with our forthcoming game-theoretical model. But what syntax can be defined along the lines of strategical matrixes? This syntactical problem has been already dealt with by Hintikka; he affirmed that in laying down the syntactical rules for a game-theoretical semantic model one will always include some elements which are in reality the formulations of some semantic conditions.[10] Moreover, syntactical transformation will be never meaning-preserving. Bearing this in mind we would like to extend Hintikka's insight over one important field: stereotypal reference. We would like to argue that this is the only type of reference that can be relied on in speaking, although there are different modes of carrying it out; refering to what Wittgeinstein called the entanglement of language with action we should emphasize that game-theoretical semantics has been conceived just in order to reveal this fact, namely that the mode of realizing a strategical move can be either an utterance or an act; reference, then, should be viewed as the possibility of correlating such an act with a linguistic mode of carrying out a move, i.e. an utterance. And it should be added again that there is no causal relationship between the two different modes of manifesting a strategical move: it is just the possibility of correlation that is required for the Hearer to understand the Speaker's utterance; namely, the Hearer should at any time be ready to look for such a correlation. The act of refering need not then be deictic, but rather any act whatsoever which carries out a certain order conveyed by the utterance. However, reference itself is not needed for the construction of the possible strategies as a matrix. It is just the special content of what we called (PCR), i.e. its possibility is incumbent on what the Speaker intends in a particular game. And this is what substitutes preference in language games. This is natural, for preference in case of human beings as players can be nothing else but intentional. An intention, which corresponds to preference relations between surface forms, and which is defined by (PCR), is an intention to correlate two model of carrying out a move in a game. From this argument results the possibility we have already hinted at that the two modes of carrying out a move in a game are, in reality, parts of two entirely different games. We will develop this idea further on when we have accomplished the construction of our game-theoretical model.

To sum up: stereotypal reference is intentional in that it is involved in computing a certain algorithm for a correct move in a game; it is linguistic in that it is carried out by uttering a stereotype with the possibility of correlating an act with it. The semantics of an utterance containing several similar stereotypes can be given with a matrix of a language similar stereotypes can be given with a matrix of a language game. So far as the linguistic formulation of such an utterance is concerned, it depends on the identification of a stereotype by a move. This is done by applying an algorithm to it. But a stereotype need not be uttered in order to necessitate the use of an algorithm. For instance, if I go to see the pictures in an art exhibition with a friend of mine, and looking at one of them I exclaim: "I like him", my utterance will carry different meanings according to how the stereotype "picture" is intended to be used without being uttered: whether (i) I mean to refer to the painter, or (ii) to the possessor; in the first case I should make use of a function like "x painted y", whereas in the second something like "x is possessed by y". But at the same time I can use the stereotype "picture" in a sentence with the intention of necessitating a function for understanding it correctly; e.g. saying "The picture you liked best won the two--thousand dollar prize in the end" I may convey reference not to the picture itself but rather to its painter in the sense that it must have been him - and not the picture - who got the prize. What makes this sentence more interesting is that to understand it one has not only to compute a function for the painter but to consider the very same stereotype once again as calling for a normal interpretation with respect to the clause "you liked"; in this latter case we simply use the identity function. What we have to underline is that not only the functions, which are used as algorithms to compute the correct referents, may not be uttered, but even the stereotypes themselves may not enter into the sentences to be uttered. This again raises the problem of identifying a stereotype. Although it may prove to be an insurmountable problem, we will never be able to make do with stereotypes and the functions they necessitate, for otherwise we cannot single out the correct referent in some ordinary examples like the one above; for, consider the same sentence "I like him" and suppose there are other visitors in the gallery, and one of them, a man, is even standing near the picture I happen to be looking at when uttering the sentence. How then could the correct referent be singled out as the painter of the picture against the spatio-temporally given without recurring to the stereotype "picture"? In the next part we investigate the problem of identifying riddles as stereotypes, how they can be singled out by some syntactic rules, and how these syntactic rules can correspond to the semantic moves of the players.

3. Some Games for Riddles

In the foregoing passage we tried to argue that riddles contain some means of conveying references the modes of which can be either linguistic or not. As to what these means can be, we have said that they are certain computational algorithms selected by the use of different stereotypes. The idea of riddles as a means of reference may seem at first sight a bit outlandish; however many scholars observing the role played by riddles in primitive society do state something similar when they take the criterion (i) about how many objects can figure in a given riddle seriously. How should we understand 'objects' in (i) if not as something being referred to? How can we compare different objects without referring to them? We have seen that it is no way-out to say that riddles are about classes. On the other hand it seems natural that riddles are not references in the same way as for instance a proper name is in ordinary communication. This might result in a futile effort to prove in a straightforward sense of the word that riddles "refer" in some detectable way; we have seen that reference is not causally linked to speaking, which means that we cannot use any kind of proof procedure in going from an utterance to the objects referred to by it. But we can have empirical evidence for the role reference of riddles; we expect to find thus in the didactic role they play in the life of the members taking part in the sessions. Among many observers it is Permyakov[11] who discusses at some length the didactic role of riddles. In general it can be re--assumed in that they serve as means of storing up and transmitting the knowledge of the aged toward the new generation. Riddles had to convey adequately-founded information to provide some practical clues to nature for the young. Sessions were not simply for the sake of fun but served a very practical aim: they were a kind of school for the illiterate. Although this fact is not thought to be crucial by Permyakov as far as logical form is concerned, we believe that it has to be formulated as an important pre-condition of riddles; we may say something like

(PC1) The riddle-poser's intention must not aim at something far-fetched or even abnormal in the given folklore but at something available to the riddle-solver.

From (PC1) it follows that

(PC2) The riddle-poser must not aim at winning the game in the sense that the correct solution be never found.

Of course, what counts as 'far-fetched', 'abnormal' or 'available' in a given folklore is to be properly defined. Though (PC1) and (PC2) belong to the field of pragmatics, they heavily bear on how a winning strategy can be given as they govern the Speaker's intention, which according to (PCR) basically characterizes what can count as correct in a game. Considering the following examples we will see that as far as variants taken from the folklore are concerned the more possible ways there are to compute a solution the more indispensable the role of (PC1) and (PC2) gets. This means that the Didactic Argument focusses on the restriction of (SSP) and on reducing the possibilities of winning for the riddle-poser while it ensures a victory for the riddle solver. This would amount to saying that riddle games are unjust forward the riddle-poser. But they have to be if they are to guarantee that all profitable information should pass over to the young. The Didactic Argument then is evidence for the historical relationship between everyday life and a present literary genre. When we pass from literary utterances closely connected with practical life to more sophisticated forms of the same genre, what needs modifying is the definition of what counts as a winning strategy in the game. The first type of riddles that we are going to examine blocks totally the winning possibilities of the riddle-poser. They belong to what scholars have described as meta-linguistic riddles. Consider the following examples:[12]

(1)	Woman has got one, Rock has got two, Worm has got one, While leech none. Letter 'O'	(2)	In ball there is, In earth there is not, In baby there are two, In children there is none. 'B'

The logics of these and similar riddles is obvious: one has just to count the letters according to the list of numbers presented in the first part of the riddle to find the solution. Indeed, after the second word in (1) one is ready with the answer as in 'rock' there cannot be any other letter twice, which is also found in 'woman', than 'O'. Redundancy although should not be a common feature, for in (2) it is only after the third word that we can count for sure the correct answer, and it is only a change in the order of the words that is required to exclude redundancy at all. The logics of this kind of riddles is then a procedure of a virtually infinite well-ordering in which to each of the words an integral is assigned; so, we have an infinite set of well-ordered pairs, the first element of which is a lexical item, while the second an integral. If we would like to generalize this procedure to any possible ordering of words and numbers so that each ordering would map words into those integrals which indicate how many times each word contains an arbitral letter, we can draw the following matrix; let each horizontal line correspond to a series of numbers consisting of as many places as the number of the letters in a given alphabet; let each number in the series correspond to the times a certain letter is contained in the word written at the beginning of the line. As the number of the words that can be formed with the letters of a given alphabet is infinitely countable, the vertical lines will have infinitely many elements. Below we try to represent a small fragment of what such a matrix can be;

FIGURE I

	A	B	C	D	E	..	..	..	..	..	..	..	Z
W_1	a_i	b_j	c_k	d_l	e_m	..	..	..	..	..	..	..	z_n
W_2	a_j	b_k	c_l	d_m	e_n	..	..	..	..	..	..	..	z_o
W_3	a_k	b_l	c_m	d_n	e_o	..	..	..	..	..	..	..	z_p
..	..	..	..	..	..	..	..	..	..	..	..	..	..
W_n	a_n	b_o	c_p	d_q	e_r	..	..	..	..	..	..	..	z_s

In FIGURE I each word is coded uniquely according to how many times it contains a given letter of the alphabet provided that there is no letter which is contained more than nine times in any of the words. This seems however a very reasonable restriction. Each horizontal line runs through the whole alphabet, and the index of each letter in each line indicates how many times the given letter is contained in the word written at the beginning of the corresponding horizontal line. If we now correlate with each such line a possible strategy of the riddle--poser (call him Player I) and with each vertical line a strategy of the riddle-solver (call him Player II), then it will result that the utterance of a W_i is a move made by the riddle-poser (and the utterances of different $W_i, W_j, \ldots, W_n$ are a joint move of his respectively), whereas the utterance of any of the letters of the alphabet is a move made by the riddle--solver. Then the matrix of (i) appears as the following:

FIGURE II

	A	*C*	*E*	*H*	*K*	*L*	*M*	*N*	*Q*	*R*	*W*
Woman	1	0	0	0	0	0	1	1	1	0	1
Rook	0	0	0	0	1	0	0	0	2	1	0
Worm	0	0	0	0	0	0	1	0	1	1	1
Leech	0	1	2	1	0	1	0	0	0	0	0

By a closer scrutiny it becomes clear that each letter i_j in each line can be assigned a probability value with respect to a W_i and depending on how many letters W_i consists of and on how many times each letter is contained in it. We can easily formulate this condition:

(3) $$P_k = \frac{\pi = k}{(\alpha k+\beta l+\dots \iota r)-(\beta l+\gamma m+\dots+\iota r)} = \frac{k}{\alpha k} = \frac{1}{\alpha}$$

where any $1 \leq \pi \geq 9$ corresponds to how many times a given letter is contained in W_i, which consists of $s = \{\alpha k+\beta l+\dots+\iota r\}$ different letters, where k, l, $m,\dots r$ one by one stands for a number indicating how many times each letter is contained in W_i, while the Greek signs one by one stand for a number indicating how many letters are contained in W_i on a par. Usually P_k does not amount to 1, which means that if the riddle-poser wants the solver to be capable of computing a solution for sure, he has to play with a joint strategy with respect to the sum total Σ of each P_{k_i} for each strategical word. Naturally, if $P_k = 1$, then no possible inclusion of $n+i$ strategies into his original one would increase the probability of a possible correct answer; otherwise riddles become redundant. The riddle-poser's intention - if we accept (PC1) and (PC2) - is to maximalize P_k, so he chooses $W_i, W_j, \dots, W_n$ accordingly. Whereas the riddle-solver's task is to find an algorithm to $W_i, W_j, \dots, W_n$, which could select a vertical line as his correct strategy such that Σ be as near as possible to 1. In other cases there will be more than one vertical line for him to choose as a possible strategy. To compute Σ amounts to a selection of those letters in each W_i for which each P_{k_i} has been counted; then a new computation of probability is required with respect to them. It is clear that the new probability, i.e. the sum total Σ of all independent probabilities of the words uttered by Player I as his joint strategies will equal 1 only if there is one single letter for which each P_{k_i} has been counted. Formulating it we have

(3) $$\Sigma = P_{k_i} + P_{k_j} + \ldots + P_{k_n} = \frac{1}{m}$$

where P indicates an independent probability and m stands for the number of the letters which satisfy the above criterion. A final mention must be made concerning words which contain none of the letters satisfying that criterion. We write then a zero--sign in the place of the corresponding letter in the matrix. These words can for all purposes be neglected when one draws up an algorithm, for they add no new information to the previous words of the joint move, which contain such a letter. The riddle game described above has clearly brought home what we first stated about algorithms; they are applied to compute what strategy a player has to choose if he wants to maximalize his probability of finding a correct answer. So an algorithm does not coincide with a strategy; for, to define what should properly count as a strategy we ought to fill an infinite vertical line; the algorithm only selects some value-assignments of such a strategy. This game is naturally information-dependent: to count the probability value of a given series of words and to select an algorithm therewith, requires a knowledge of what moves the first player has made when uttering the words in question; the winning strategy of Player II can be defined as the correct computation of an algorithm, i.e. the selection of that strategy from among the vertical lines expressing a given letter of the alphabet which uniquely contains the value assignments indicated by the move of Player I (in case of (1) this is (1,2,1,0) which is the code of the letter 'O'); what we have is that each riddle contains only one such strategy, which means that the solution to it can be counted for sure; but theoretically it need not be the case, i.e. the game need not be unjust for Player I; so the winning strategy of Player I should be one that does not allow a unique computation of an algorithm for any of the letters of the alphabet for Player II. But it is easily seen that even in this case Player II might turn to the correct computation, and if so, he might turn a winning strategy of Player I into a losing one for him. This means that the concept of winning strategy can only be defined for Player II along the lines of ordinary game-theory: to select a strategy that secures winning; while Player I can only make ambiguous the selection of such a strategy, in which no strategy of Player II can be considered winning unless by (PCR) Player I is ready to decide which should be taken to be correct. If we turn to other games for riddles we note that it is this latter feature which has to be undelined: the importance of (PCR) increases as there is no easy way of computing the correct algorithm. It is obvious for we no longer have exact value assignment but reference to objects; in (1) and (2) we did not have to consider reference unless we wanted to take numbers or letters as something being referred to. But most of the riddles one encounters deal with objects and their properties. We have argued that reference has to enter into the way we understand sentences; but how can it be conveyed? This question has been so variously answered in the literature that it may seem tiresome even to list them: from causal chain theory to that of disguised descriptions, from notional to referential specification, from individual concepts to world-lines, from commonly believed bundles of descriptions to kinds of individuals. What our analysis is meant to illuminate is that the two aspects couched in the definitions are two sides of the same coin: the act of referring is then analogous to an act of ordering and re-ordering procedure accomplished by means of language, i.e. it is a linguistic function by which a re-ordering of objects can be achieved. We have seen that this function need not be uttered but is presupposed by the intention of the Speaker. Mutual recognition of it then runs on a Gricean line; but to construe such a function the moves of both players are needed. This is why we have to define whole matrixes to get the right re-ordering of objects, or at least that which the Speaker intends to be correct. These functions enter into the algorithms with which the correct reference is being computed. This brings home the fact that reference is accomplished by using a stereotype necessitating a given function. This is one side of the coin; the other is the possibility of correlating an act with each possible strategy; we can even say - further extending the idea of winning strategy - that a strategy is winning if such a correlation is actually carried out. A winning strategy then splits into two parts: first it selects the right functions to the stereotype uttered and establishes what the correct use of it can be, and second, it expresses an extra-linguistic act to find out the referents in reality. To explain away this two-faced character and their non-causal relationship, we have introduced the idea of two different games played independently. From now on this idea should be kept in mind. Consider then the following example:

(4) Red mastiff in red courtyard - Tongue.

Let us give a matrix to (4) first. Modify our original in FIGURE I in the following respects; still define the horizontal lines as the possible strategies of Player I, and suppose that the first part of a riddle like (4) contains a selection from among these strategies, i.e. it expresses a joint move of his; the number of these lines then still remains to be infinite; correlate now with each vertical line a function (or a composite) that is needed for the correct re-ordering of objects (4) prescribes for the riddle-solver in order to give the correct solution. Allow that in some cases these functions are the identity itself, and indicate it by choosing a vertical line whose head-word corresponds exactly to that of a given horizontal line which is thought to require the application of the identity function. Now, we should naturally modify the value-assignments of possible moves (the cross-points of each horizontal and vertical line); as letters of the alphabet have given place here to what we can call reference to objects, the values should reflect somehow the possible referents of a given stereotype.

We are here in favour of a so-called Fregein alternative to accept objects as values of functions; we could assign a value according to whether a given move has achieved a successful re-ordering, i.e. it aims at existing objects. Then we can either define this value so that it corresponds to the number of these existing individuals, or consider only two cases: whether there is at least one such existing individual or there is none, and define the first case as a positive value 1, whereas the second as a zero value o. We prefer the latter choice just to escape futile complications; but it is important to note that a value 1 for a move does not decide between an existential or a universal quantification, but rather indicates existing individuals there. Absurd properties can easily be evaluated in this way; a stereotype like 'angel' or 'unicorn' indicates a zero-value if any player happens to choose it for a move; they necessitate an identity function which results in a zero-value. While an expression like 'winged horse' necessitates a function other than the identity but results in a zero-value as well. Of course, there will be possible moves to which no value can be assigned at a certain stage of the play; but this is no surprise if we think of language as means of expressing, transmitting and preserving knowledge about objects: for it is shown by our construction of a matrix that the divulgation of a move is only possible with the help of one or the other head-expression, i.e. it can be a move made either by the Speaker or by the Hearer, or both. If it is the first case, the stereotype has been communicated, if it is the second, it has been left to be a presupposition of what was uttered, and if it is the third, no re-ordering is required by the Speaker for it necessitates the use of the identity function while in the first case it is some other function that he gives which is intended. From this it is clear that one and the same property can convey reference to distinct classes of objects depending on what strategy Player II selects. A sequence of riddle games or of any other form of communication can be viewed as a gradual filling up of a potentially infinite matrix, i.e. newer and newer combinations of properties are achieved through the help of different functions other than the identity; every new correct move indicates an extension of the set of objects players have already encountered during the play. A play is then a potentially infinite series of games that aims at transmitting as much information about the world as possible. The domain of all existing individuals will not be defined in advance just because it is a domain that can only be described by the actual stage of the play, i.e. how many games have been already played off. The realm of known objects is always extending, its boundaries always questioned with a new assignment. We think it is a very reasonable account of what an epistemological process can be. Of course, the process can have started at a certain time, but why should we have noted it; we can start playing again, and need or need not take into consideration what the previous games resulted in. It may very easily happen that a game played long ago is restarted again for the players simply do not remember what the original moves were. This equally bears out the fact that the actual seeking and finding of the individuals referred to with the selection of functions are inevitably removed from the moves made in the course of an algorithmic game; so much so that it must count as a new game. The relationship of the two types of games is postponed to a later stage of our analysis.

We can now represent the matrix according to which players play with respect to (4);

FIGURE III

	Red	...	in the mouth	...	in a closed space	Red
Mastiff	0	...	0	...	1	0
Red	1	...	1	...	1	1
In a courtyard	0	...	0	...	1	0
Red	1	...	1	...	1	1
...	...	...	...	...	...	...
Tongue	1	...	1	...	1	1

In FIGURE III we proceeded as it was prescribed; the strategies of Player I are indicated horizontally and those of Player II vertically; we designated the words appearing in the first part of the riddle of (4) as moves of Player I and selected some functions as moves of Player II and indicated them by their natural ranges: so, 'in the mouth' stands for "x is in the mouth of y" or equally for "y has in his mouth x", and 'in a closed space' stands for "x is in the closed space of y", while

'Red' indicates an identity function. Finally we filled in a possible solution (indeed the solution (4) presents) and defined it as what has a positive value for each assignment with respect to the functions indicated vertically. We indicated it in as a possible strategy of Player I just to show that it is his intention that decides whether a solution can be correct and that uttering a corresponding term like this he may have necessitated only the identity. All possible solutions should satisfy this criterion, but it is not necessary that there should be only one such term. For the ominious point in computing an algorithm for (4) with the matrix of FIGURE III is how we name our move as Player II. This we have to do because the selection of an algorithm is heavily influenced by what we deem to be the intention of Player I. In FIGURE II each different veritically running algorithm gives us the very same result, i.e. the same letter can be coded in different games but requires the same algorithm; this goes for our vertical head--expressions here as well; but the algorithms which these expressions determine are no longer the same just because the value-assignments they run through indicate different configurations of objects, which may even overlap, and not simple integrals. With other words we can say that their integrals stand in a sense for 'themselves' or are unanimous, while here integrals or the zero-sign stand for objects. But as we have said we cannot extend our knowledge of these individuals without recurring to a commonly accepted term. We can wholly formulate how to count value-assignments by using algorithms: we consider one or many assignments already counted in a vertical line and try to find or select an algorithm with the properties belonging to those assignments and/or to another property with still a zero-assignment by using a function defined by a veri-tical property. A joint move by Player I may necessitate a joint move by Player II, i.e. a selection of a composite function or diverse independent functions; and the more strategies a joint move of Player I goes back to, the easiest it is for Player II to compute a correct algorithm. We then formulate a route to fill in a matrix for (4) in the following manner:

(a) Define class *A* as the class of mastiffs and as an already computed move from a previous stage of the play, and enter it as a strategy of Player I (naturally *A* would contain all possible value-assignments along its horizontal line); call *A* as the Designatum Class;

(b) Define class *B* as the range of reference so that it contain red things, and enter it both as a strategy of Player I and Player II (note: it necessitates the identity function);

(c) Select a function *f* from a set of reference functions *RF* such that "*x* has in his mouth *y*";

(d) Define *Y* as the natural range of *f*, i.e. things in one's mouth, and enter it as a strategy of Player II;

(e) Allowing that no *A* is *B*

(f) Select a class *B*' such that it be the intersection of *B* and *Y*;

(g) Define *B*' as a possible move of Player II, and term it (if it has not been termed yet) like 'tongue'.

The same computation can be given for each expression of (4). We indicated it on our matrix. If we computed a function for each expression (note: identity functions have to be computed first) we may be able to formulate them in a composite like "x has in his mouth y in a closed space of z". This is then the correct algorithm for (4). It is a composite function extending from a Designation Class A to a reference class Y which are W. Naturally, computing such an algorithm depends on the selection of the range of reference to which an identity function is available; here it amounted to the choice of red things as such; this may seem arbitrary, but it is many times indicated by the fact that a riddle contains incompatible properties; namely that mastiffs and courtyards cannot be red. This is in accord with saying that a game at a certain stage of play presupposes some already counted assignments from previous stages. Mention must be made about the kind of functions that can enter into an algorithm; there are two possibilities: it either extends from a zero-assignment to any other one, or considers an already counted positive value and looks for any other such that it be equally true of the corresponding individuals. The first we call a normal reference function, while the second can be called an Equal Distribution Function as it maps the sub-classes of a class into sub-classes of another. Selecting a correct algorithm then depends on uttering more and more properties to which an identity function can be applied and/or M-intending functions which can make up an algorithm as a whole. All this seems right except for one point: nothing can guarantee that an identity function has to be computed in each case where it is possible. There are riddles which are based on exactly this feature, i.e. they necessitate a new function to be applied although they can necessitate an identity. But consider a more difficult example, namely

(5) Blind cock jumping crows - Axe.

In constructing a matrix for (5) no function f seems to be available for the term 'hen'. We may choose something like "x is cut down by w" but it would not press our computation further, for a range of reference B_1 defined as things that jump will not select out a significant sub-class of the natural range Y of f like things used for cutting, while the fact whether it can be true of the class of cooks A_1 adds nothing to our computational algorithm. Then we can proceed as follows: start with a range of reference B_1, for example jumping things;

(a) Define a function "x is cut down by w" such that W be a class of men;
(b) Define a function "w uses in cutting y" such that Y intersects with B_1;
(c) Define an Equal Distribution Function g such that it equally maps Y into Z or A_1 into A_2 where g is "y makes a sound of z", A_1 is the class of hens and A_2 a class of things that crow;

(d) Define the new composite function as "w uses in cutting y making a sound of z";

(e) Define a function h as "t directs v" such that it intersects with a range of reference B_2 like the things that are blind;

(f) Allowing that W and T, V and Y have common sub-classes

(g) We arrive at a final composite like "w directs in cutting y making a sound of z" that should have overlapping sub--classes with both ranges of reference B_1 and B_2.

The single moves through which the above algorithm runs along may or may not be given a name in the course of the game; cf. the definition of tongue in FIGURE III. If we do not name each range our functions map out we can have in the end something like "a means used for cutting that is jumping while being directed by somebody". This has to serve for as adequate information to provide the term 'axe'. Representing (5) in a matrix we can have the following figure; this time we indicate only those assignments that are required during the computation of the algorithm;

In FIGURE IV we wrote with capital letters the moves of Player II when he rearranged the matrix by corresponding a natural range of a function with a new range of reference. Our new game then again turns out to be information-dependent, for it is based on the selection of a correct range of reference. This modifies a bit what we have said about a possible winning

FIGURE IV

	jumping	cut down	used for cutting	making a sound	directed	blind
Cock	1	0	0	1		0
Jumping	1		1			
Crows	1			1		
MEANS TO CUT THAT JUMP	1		1	1	0	
Blind	0				1	1
MEANS TO CUT THAT JUMP AND MAKE A SOUND	1		1	1	1	0

strategy of Player I; to minimalize the possibility of Player II winning he should select his joint move either so that it contains very few - probably no - moves that express a zero-assignment, or so that it contains almost only - probably all - moves that express zero-assignments. From FIGURE IV it is clear that (5) belongs rather to the first than to the second case. If it did not contain the expression 'blind', (5) would very much resemble normal communication in that an identity function could be used for each element it contains. Whereas in the other case riddles would be similar to metaphores used in more sophisticated litarary forms. Another important thing that FIGURE IV illuminates is that although value-assignments depend on what common knowledge about previous stages of the play is presupposed and there can be no restriction to what function Player I intends Player II to select - be it the identity or not, the most what we can say about the winning strategy of Player I is that his only choice is to minimalize his opponent's possibility of winning by carefully selecting his joint move from among his possible strategies expressed by the expressions that can be formulated within a given language. From this it follows that what the pre-conditions of a game do is that they clearly prescribe in what sense Player I can minimalize the possibility of Player II winning. In other words they tell us what his possible intentions could be during a series of games; and moreover, by defining such notions as 'available', 'absurd' etc. we can significantly restrict the chances of Player I cheating: what may be resonably expected in a game must be intended by Player I. Of course this cannot go as far as a "reductio ad absurdum", for then playing will have no sense and the game will be wholly unjust for Player I and very partial to Player II. And this is the point where normal communication may start; although even in the latter there remains a slight impartial feature from which new games might have a start. And this possibility of new games, we urge, is an inherent character of language; it can be suppressed or it can be set free but it can never be totally eliminated.

4. Some Syntactic Considerations: A Semantic Dependence

In drawing some conclusions about our matrixes from their syntactic characteristics we should instead turn to the results of game-theoretical semantics. However there are two important points in which our games differ from those described by Hintikka and his followers; namely that (i) the roles of the two players are assigned to the Speaker and the Hearer respectively, and (ii) they often introduce individuals, the seeking and finding process of which has been interrupted or deadlocked or simply has not already been accomplished.[13] What our matrixes have taught us is that we can very easily use a zero-assignment in computing a correct move, i.e. a move which expresses a positive value; nothing impedes me saying: "Going to sweep the house?" - "There are some very nice witches in the bathroom." - giving that there is a function "x is used to fly with by y" intended with which a correct computation of the stereotype 'brooms' can be carried out. From this it results that a verification process relies heavily on what we called the computation of an algorithm. This dependence we believe is already in Hintikka's works when he speaks about partial functions as being substituted into propositions. Such a function is a further specification of some individual(s), and a forthcoming seeking process should be pursued on the basis of such a specification. G. Nunberg[14] procided some very explicit cases when a seeking process cannot even have a beginning unless such specifications are computed. Sentences like "The soprano played wrong" "I like chicken", "I have not read Dickens", etc. can only be understood if we are aware of such functions as "x play y", "x is the meat of y", "x wrote y", etc. In riddles we do nothing but ask for such functions, or rather for those further specifications that such functions can map. In riddles however we are not for concrete referents as in ordinary communication when we consider to the use of such a function; we rather map out whole classes, which we may or may not redub when making a move. This very naturally parallels what Hintikka called the naming of an individual to be substituted into a given variable. What needs further emphasizing is that it is not the communication of such given functions that is required but the moves themselves, which becomes possible by re-dubbing them. But how can this be done? The most simple answer is that we as Player II have to make a quick survey of assignments of the properties enlisted as the possible strategies of Player I along the line of a given function and select the greatest of them, and define the horizontal property as a new specification required by Player I in the game. This amounts to saying that he could have used this new specification as a definition of his move, but then he would have intended the identity function, which in turn reduces the possibility of playing. This throws open our matrix to infinite possiblities.

In laying down our rules for syntactic formulations we have to answer some very important questions; first, how can rules of introducing these specification functions be incorporated into a general syntactic framework? Second, at what stage will our rules introduce these functions into propositions or other types of utterance in order to leave variables unbound, and when should games for quantifiers start? Third, how can we account for the fact that our matrixes do not differentiate between general terms and predicates? How can functions for verbs be introduced? And forth, how can the difference between propositions and such specification functions be explained away?

Syntactically riddles are like propositions or can be transformed into constructions similar to propositions; however what refutes such a claim is that in applying some rules from game-theoretical semantics to arrive at atomic sentences, one will find them unverifiable or irremediably false. As the latter cannot be accepted empirically (if they are false how could they serve as means of transmitting important information?), we have to account for their different character. Take e.g. the following construction after Hintikka as explicating a riddle:

(6) *X* - every *Y* who *Z* - *W*

If we apply Game (every) to (6) we undoubtedly get a false proposition:

(7) *b* is a *Y* and *b* *Z*

just because *Y* and *Z* may very well contain incompatible properties as in (5) "blind cock" or in (4) "red mastiff", etc. This comes down to the fact that (6) requires some specification functions. However, as we have seen, many riddles contain property for the range of reference so that the solution could be computed. If so, consider *Z* such a range and take *T* as a computable property for *Y*; then our verifying rule has to give us something like

(8) *b* is a *T* and *b Z*

(8) can now be put to a verification test of individual seeking and may still prove either true or false; if it is the former, then we have solved the riddle correctly; if it is the latter, then we have committed some mistake and a corresponding game should start again. This approach naturally would raise the problem of false constructions; for, it follows from what we have already said, that a false truth-value can at any time make us re-consider our original sentence and may suggest the need of applying a new specification function to it, i.e. it may necessitate a new game. If so, then a false proposition cannot be false in reality but rather it calls for the game to be played anew. The straight-forwardness of this claim appears to be grounded if we differentiate once again between the two kinds of game: to play a verificational game is based on the seeking and finding processes of individuals, i.e. it is a game played in and with Nature, and it seems right that games for quantifiers should be given in this way; if a sentence results in being verified by such a process, then we are get confirmed by having uttered it; whereas if it proves to be false, then there can very easily be some problem with any of the expressions occurring in it, and we may feel an urgent need to eliminate and substitute it. But this latter process is no longer a process in and with Nature; it is a process within the boundaries of language and theory: they simply have to be re-written, and our new game rules should provide us with instructions about the way they can be reformulated. Call this

game a sort of transcriptional game; its role will be to re-write a sentence so that it could prove to be true with the greatest probability, i.e. it maximalizes our winning probability in the second, verificational game. And this is the most we can make out of their relationship: each successful verificational game presupposes a successful transcriptional game, whereas a lost verificational game will prove a sentence false only if it does so with each outcome of a different transcriptional game that can be played over the given sentence. This latter claim may not seem normal, but this is what makes riddles possible to be posed: a necessarily false truthvalue calling for a transcriptional game; and this is what our (SSP) has already indicated. Riddles then can be considered as a special call for such games; although they are not propositions, they can be correlated with an act, be it an act of referring or not, i.e. the possibility of a verificational game cannot be excluded, but their semantic structure is based on the rules one can associate with transcriptional games in order to provide new surface forms. Their semantic structure should contain in some sense those specification functions that are required for arriving at the new surface forms. We distinguish two such functions, namely one that takes any of the expressions of the original sentence as an argument or a correct substitution instance and specifies a new one as a corresponding value, and we call it a Reference Function, and another that we have called an Equal Distribution Function; we can correlate two different transcriptional rules with our matrix:

$G_{(RF)}$ If a sentence has the form *X* - every *Y* who *Z* - *W*, play should not proceed unless a new function *F* has specified one or other of its constitutents; if *Y* is such a constituent, the Hearer may choose *F* with *T* as a corresponding value, and the game can start with respect to *X* - every *Y* who *F T* who *Z* - *W*.

$G_{(RF)}$ clearly does not depend on every, i.e. on what quantifiers a given sentence may contain. So $G_{(RF)}$ can really be generalized to any kind of sentence.

$G_{(EDF)}$ If a sentence has the form *X* - every *Y* who *Z* - *W*, play should not proceed unless a new function *G* has equally specified one or other of its constituents and any new constituent too; if *W* is is auch a constituent to be equally specified as *V*, the Hearer may choose *G* and *V* respectively and the game can have a start with respect to

X - every *Y* who *Z* and *G V* - *G W*.

The same goes for $G_{(EDF)}$ as for $G_{(RF)}$. The two rules naturally can be applied together, the Hearer then is making a joint move. If we apply them to (4) we can say something like: applying $G_{(RF)}$:

(9) Every mastiff who has in his mouth a tongue which is red is in a red courtyard.

applying $G_{(\mathrm{EDF})}$

(10) Every mastiff who has in his mouth a tongue which is red and is in the closed space of a cavity which is red is in the closed space of a courtyard.

In getting the surface form (10) we should further segment W into U who Z and apply G to U or to U who Z depending on what constituents we consider can be eliminated. This need not be any restriction on our rules but amounts to predicting that by the help of a function a syntactically dependent constituent may or may not be eliminated together with its head-phrase. But to bring the idea home we should pair our game-rules for the introduction of certain functions with game-rules for real elimination. As we never answer with (10) to a riddle, we have to get rid of all those constituents for which the new functions have been introduced. To generalize it we can formulate all our conditions in one rule as the Hearer may have applied $G_{(\mathrm{RF})}$ and/or $G_{(\mathrm{EDF})}$ many times,

$G_{(Eli)}$ If a game has resulted in a sentence of the form

X - every Y who F T who Z and G V - G W

all constituents for which new functions have been introduced, all functions F and all functions G with eliminable constituents can be left out, and the Hearer may define his (joint) move with respect to

T who Z and G V.

Applying $G_{(Eli)}$ to (10) we get the acceptable form of (11):

(11) A tongue which is red and is in the closed space of a cavity which is red.

In some cases a modified version of $G_{(Eli)}$ is applied when all functions G can be eliminated except the new constituents each G_i has introduced. To make a move in a transcriptional game amounts to applying $G_{(RF)}$ and/or $G_{(EDF)}$ together the correspondent $G_{(Eli)}$. Having played off this game the players can start a new verificational game as soon as they agree on a surface form like (11). To start a verificational game appears to be dependent on the players' recognition that no transcriptional semantic game could be played. This adds to the interdependence of the two games; for, it is not only that a verificational game actually verifies a surface structure sentence but the possibility of such verification must be presupposed before any new game can start. This we called the maximalization of winning probabilities in the new verificational game. This amounts to defining a given sentence as containing expressions whose categories are licensed by what G. Nunberg calls 'normal beliefs'. This would mean that the final output of a transcriptional game has always to be governed by normal beliefs. This condition can also be imposed as a pre-condition of games for a certain sub-domain of linguistic data. The use of transcriptional games always shows the level of conventionalized beliefs correlated with a specific utterance. From this it follows that maximalization relies on what has been accepted as normal in a given context. This accords very nicely with our (PC1) and (PC2). The end of transcriptional games is tested by such beliefs of the players. And as long as no such surface structure is arrived at, a sentence cannot be deemed true or false. But if riddles are considered to be special calls for such transcip-tional games, they cannot again be either true or false. They are just 'waiting' to be verified. But if so, riddles cannot be taken to be normal questions, either. For, questions are correctly viewed as what can be truely answered by responding with a given proposition. How else can we account for the fact that almost any riddle can be made to be part of a syntactic question? If question-words do give an interrogative character to riddles, then to keep up with an erotetic logic we could say that our rules map the input forms against the output so that they preserve meaning; but it should be clear already that no two surface forms can be considered perfectly the same for different strategy applications would have resulted in different output sentences; this means that each output sen-tence has a quasi-uncountable output structure set into which it can be mapped provided there are certain functions contextually available for the players. Then the relationship specified by riddles is quite different from the question-answer relationship. Another piece of evidence for this is that questions are usually thought to be functions over individuals, whereas riddles contain functions over expressions that we called stereotypes, and so question-words here can only be taken to be functions over functions. So while there is syntactic evidence for riddles being considered as questions, there is a strong semantic argument against this. For we can by all means transform (4) into a syntactically interrogative structure and say

(12) What dog is red and is in a red courtyard?

But we can by no means reply to (12) with something like (13) trying to meet the demands of erotetic logic:

(13) The tongue is a red dog and is in a red courtyard.

That (13) is highly flawed can be seen from there being eliminable expressions in it, which would mean in turn that, if put to a verificational game, (13) is going to be found hopelessly false. And this should amount to telling us that in making a move like (13) in our transcriptional game we became irremediably lost. To clarify what we have said about the interrogative character of riddles, we can try to re-formulate (12) in order to show correctly what the role of a question--word can be;

(14) What function(s) can be applied to a red dog in a red courtyard?

or (14') What function is such that a red dog is in a red courtyard?

Question-words in riddles cannot be applied directly to the referents of the expressions therein, but to the expressions themselves. Each interrogative form like (12) if found in the data should be transformed into something like (14) or (14'). It would prompt a meta-linguistic reading; however it is immediately seen that it is meta-linguistic only in the sense that an answer informs as about what moves have or will have been made in the course of a given game; i.e. question-words specify our $G_{(RF)}$ and $G_{(EDF)}$ rules, but do not tell us anything about the actual input structures and their possible verification. But without the latter, as we have seen, riddles cannot have a full sway in the life of a given community. Question-words in riddles belie then an ambiguous character: they do not belong to the same linguistic level as the remaining elements do, but they express the need for playing a transcriptional game before playing any other.

5. Actions and Riddles: A Problem of Narrativity

That verificational games are functions of transcriptional ones is borne out by the general relationship of language and action as such; we have seen that a language game consists of two separate games: a 'pure' semantical game in which the correct reference expressions are sorted out and a 'referential' in which the right individuals are singled out. Their interdependence was straightforward: every referential game presupposes a correct surface structure with which its moves can be correlated, but any surface structure results from a previous game played over the expressions themselves. In case no such game seems to be apparent, the function of identity is presupposed, and it then means that the beliefs licensing it are readily available.

On the other hand a transcriptional game is always dependent on previously played-off referential games when strategical functions are being selected from among (SSP); for these functions should always select a natural range of individuals so that it overlaps with what has been defined as the range of reference for the utterance. Their interdependence clearly illuminates the entanglement of language with notions; but it also illuminates the lack of any causal relationship; for their functional interdependence relies on which algorithm has been selected in the first transcriptional game; but it is always contingent on the strategical move of Player II, even if he does his best to make up with his opponent's intention. Whereas even Player I, the Hearer himself may intend the most far-fetched functions when uttering a sentence. And in some cases, such as in fiction, it can result that the intersection of the range of reference and of any natural range is empty; this amounts to acquiring new information; then we can either set out on our search, which may turn to be infinite, or else interrupt the second game as deadlocked. But there are no such ways out if the correlated action is not an act of reference but something different; we have already hinted at the possibility of a special riddle session when each answer should be accompanied by a deictic gesture with respect to the object meant. But the riddle-solver may be requested to carry out some action as well; he may be expected to do something with the correct referents; then the actions themselves have to be deciphered by the use of some transcriptional game-rule. And a correct deciphering is indicated by carrying out the action in question and not just by uttering it: e.g. in a legendary folktale King Matthias asks a young maiden - among many other things - both to bring and not to bring him a present; this is all the more interesting because it is the last game in a riddle session in which she always has to reply in a cunning way but never to do anything. And in the last she answers by bringing a dove as a present which flies away at the moment of its deliverance. To draw up an algorithm for it may appear a bit complicated, but it should precede the accomplishment of any kind of action; first, a choice has to be made on the correct range of reference: select 'present' as such for 'bringing-and--not-bringing' is contradictory, so unrealizable; now, a function must be counted for the latter: it can either give another action like 'sending', or be further segmented into a correct range and an aliminable part: then it can be either 'bringing' or 'not-bringing'; in either cases the contradictory character is dispensed with by finding another predicate like 'flying away' for 'not-bringing'; as 'not-bringing' is to be specified as a three-placed predicate 'x not-bringing y to z' and 'flying away' is only two-placed 'y flying away from w', during the transcriptional game different pairings of the corresponding variables are possible; from them $y=v$ and $w=z$ are selected on the basis of a function like "t does not have/possess/get/etc. u" which is an *EDF* for y and v, and w and z respectively; then we should select a sub-domain of the intersection of the natural range of 'flying away' with the range of reference of 'present' so that we negate something that is a present but cannot fly away. This with 'bringing' as also a range specifies birds as such presents. In computing the final 'x bringing to z y flying away from z' composite function we have alternative choices; they would specify other results like the previously mentioned 'x sending y to z', or 'x not-bringing to z y flying to z'; computing them would necessitate the accomplishment of other actions.

In the above case we substituted another action into the second, verificational game usually taken up by an act of reference. The range of actions is naturally as wide as the range of objects that can be referred to; what makes possible the introduction of actions into riddles is that to understand what one should do requires the use of certain functions as well as to understand what some stereotypes or predicates mean. This accounts for the universal character of riddles. To put it more exactly, if transcriptional games are played over some range into which the Hearer of the utterance containing it can be substituted, then to play off a game might involve the Hearer as a sample of the correct individuals. This is a syntactic device to show it can be the imperative; then the whole sequence of transcriptional and verificational games have to be played off; but this need not bear on the general character of riddles; a riddle game can stop at any point. Of course, we can introduce new terms for riddles when the second, verificational game is played off differently. But if sequences can be interrupted, how can we define winning strategies? Naturally a winning strategy in a sequence must be a composite of each; but whether there is a winning strategy in the first, transcriptional game strongly depends on whether it is also winning in the second, verificational game, which in turn can never be considered as winning unless it is a function of some transcriptional game from which a correct surface structure has resulted. This leads to a vicious circle; a winning strategy in a transcriptional game depends on whether three is a winning strategy in a correlated verificational game, while one in the latter depends on there being a transcriptional winning strategy of which it can be the function. However this is as it should be; for to escape from such a vicious circle language can do nothing else but resort to conventionalized uses, i.e. it accepts certain surface structures as a priori correct, although this 'a priori' has nothing to do with analiticity. It means that convention licenses certain correlations as accepted to be correct; but there are no once-and-for-all winning strategies in transcriptional games that uniquely define winning strategies in the second, and there are no once-for-all winning strategies in verificational games that uniquely define winning strategies in the first; neither analiticity nor inductivity works perfectly. Speaking is not only an act of referring but an act of selecting linguistic expressions by which an act of referring can be most easily and most probably carried out. But nothing prescribes that any particular correlation should be fixed for ever. And if it can vary once, then it has to be allowed that it might vary at other times. This way we naturally lose the possibility of determining meaning uniquely if meaning has anything to do with reference. But this is what game-theoretical semantics seems to prompt us to do all the more. If we dispense with all fixed correlations, then any surface structure may convey the possibility of correlation. This was what helped in creating fictional discourses, although there may be some ultimate barrier to our (SSP) that something like "Finnegans' Wake" indicates.

Our game-sematnical approach shows then some very important ways of disambiguations: terms, predicates, imperatives and stereotypes are all treated on a par; so far so good; but how can we explain away the ambiguity in a riddle about samples of objects and actions which are particular in the sense that persons like the Hearer can carry them out? How can we explain away the difference between the universal character of riddles and the existential character of an action? As far as transcriptional games are concerned we have observed many times that there is no uniqueness of individuals being required but rather a sample of them (Cf. the abbreviated form of value-assignments of our matrixes). And this goes for our game-rules, too: there is no specially quantified character involved; variables are still open. This accords with the fact that games for quantifiers are verificational games; a player chooses an individual which is no longer a sample but concrete in the sense that even he should be named if he has not been already. If we speak about riddles with a universal character, it is Player II who, playing the part of Nature, should select an individual in the second, verificational game of the sequence, and prove the resulted surface structure against his choice; whereas if we speek about existentially quantified sentences, particular actions or narrative texts, it should be Player I to choose an individual but it is still Player II to prove the resulted surface structure against his opponent's choice. But this considerably adds to the difficulty of Player II to prove a certain surface structure; for any instance would not do; so much so that in most cases Player II gives up, and Player I should verify his own riddle. Communication breaks down: the winning strategy of Player II is always the condition of successful communication.

6. Some Conclusive Remarks: A Parable of Fiction

To end our investigations we should revive some of the previous assumptions and state them in a more concise form. First, riddles are played, and can be either a sequence of sequences of two games, a transcriptional and a verificational game, or a sequence of transcriptional games. Of course, a given sequence need not be the same all through the play for it may incorporate different actions or different transcriptional games as well: Player II has always to decide what game the moves of his opponent define before he can correctly react. We presented two kinds of transcriptional games, a meta-linguistic and one for property-selection; there are certainly others, but they are analyzable along the lines described here. Second, riddles reveal a very important character of language in that the reference classes of the expressions can further be removed from the utterances the expressions appearing or not; so much so that the Hearer first should compute possible reference functions to get to the correct referents. If so, then third, cur transcriptional rules are part and parcel of what an utterance may mean, and as such it should contain the Hearer without which it will be simply meaningless or ununderstandable. In this and only in this sense can riddles enter a text whether narrative or not. For narrativity depends just on which player chooses an individual in the verificational game with respect to which a given sequence should be played off over a surface structure that resulted from the first, transcriptional game. This means that there is no constraint on forthcoming role selection, i.e. the games for quantifiers or for other verifying processes must be independent in type from what functions have been chosen to compute a correct surface structure before. It can be either verified universally by Player II or existentially by Player I choosing an individual. This seems right; for our transcriptional rules cannot have any direct bearing on Hintikka's rules for quantifiers. Variables are still unbound for no moves have been made to bind them; The use of 'any' comes in handy here to show the openness of transcriptional games; for, in "I like anything there is to eat" there can be nothing against a possible verification of it by the Hearer's saying "There is only spinach". If you say "I will have any horse you give" I can make you agree with saying "I've got only Blackie left". In both cases a single instance verifies a sentence containing 'any' with the only difference to an existential quantifier that it is always the Hearer that can come up with it; for it would sound strange if the Speaker put in something like "Okay, please, bring beefsteak with roast potatoes" and "Right, I will have any horse you own, so please give me Brownie". Although in the above examples there was one and only one instance that could verify what the Speaker said. If 'any' were ab ovo universal, the Hearer could not verify the Speaker's utterance containing 'any' in case of there being a single existing individual that can count as an instance. Naturally it is possible to answer that there is nothing to eat, or that there are no more horses left. Then nobody could choose an individual with respect to which a given surface structure can be verified or not. Then a sequence of games gets deadlocked. This can equally happen when we speak about dragons that do not exist or of horses that are winged. The corresponding moves in the game scan zero-assignments; but one can never know that it is zero because no strategy can lead to a correct substitution instance, that the predicates are true of no possible object, or because there are no objects such that the given predicates could be true of; in the first case a sequence of games are thought to have been played off and proved to have been played with losing strategies; in the second no such play has been conducted yet, or if it has it has been deadlocked. But how can we prove that a strategy is losing by finding none? What difference can there be between a game that is deadlocked and another that cannot have come up with a true instance? Fictional discourse indicates this kind of ambiguity: there can at any time start a new seeking process which becomes deadlocked without being able to prove that strategies in the transcriptional games are losing. There is a last corollary of this argument; namely that if a value--assignment belonging to a move in a transcriptional game is zero, then Player II has got nothing to choose as his forthcoming move in the second, verificational game, which turns out to mean that with fictional surface forms, i.e. with structures of deadlocked games, no universal conclusions are possible. If a move-assignment is already positive, then a new instance can add to its universal character. So, about fictional beings - if there are any! - we cannot coherently assert universal propositions like "All dragons are seven--headed" just because we have no single true instance with respect to them. So, in fiction we are forever doomed to be narrative; for, we can always claim that a new verificational game might start although later becoming deadlocked, while we can never say that there are fictional objects because then we should have other than zero-assignments belonging to the moves we make in asserting something about them. Naturally in many cases values are assigned by different belief contexts, in epistemic logics or in fiction within fiction. The problem of beliefs looms large, for false or misfired beliefs can threaten our conception of winning strategy since within a certain text there is no explicit criterion about what can count as a possible endpoint of search. A normally deadlocked strategy can then turn out to be winning as well. Universal statements can also appear to be verifiable, although we do not think that the can destroy all our whole argument; for any kind of play consisting of a transcriptional and a verificational game needs the incorporation of something which counts as ultimately verifying a sentence; why cannot we have e.g. a text in front of us as players in order to look for each correct surface structure in it? If we can find one, it is true, if not, then it is false. But we can even play with a sage of the tribe and ask him after each move whether there is anything on the plate of his memory to verify a given form. And we could go on. But whatever conventions we do have about truth, the logic of our games would not change: we are still computing algorithms with the help of which we want to keep up with the Speaker: understand him and follow him. Truth is always a sort of correlation, here a correlation of two games making up a sequence; but in many cases we as Speakers and much loss as Hearers know on.nothing about actual end-points of verificational games; we presuppose that some - if any - correlation obtains, and revert to (SSP).

Notes

1 Cf. Abrahams (1969).

2 Cf. Eigen-Winkler (1975).

3 The main lines of such an approach can be found in "Language--Games for Quantifiers" in Hintikka (1973), and in Hintikka (1979).

4 Cf. Flahault (1981).

5 Cf. Permyakov-Barabanova (1982).

6 Cf. Faik-Nzuji (1973).

7 Cf. E. Köngäs-Maranda (1972).

8 L. Tarnay "Megjegyzések a találós egyszerü formájához", manuscript.

9 Cf. Nunberg (1978).

10 Cf. Hintikka (1976), especially Chapter 11.

11 See fn. 5.

12 These are taken from Barabanova's text, but naturally they cannot be word-for-word translations of the original.

13 For the idea of interrupted games see Tennant (1979).

14 See fn. 9.

References

Abraham, Roger D.

1969 The Complex Relations of Simple Forms, in: Ben-Amos (ed.): Folklore 1976

Eigen, Martin-Winkler, Ruthild

1975 Das Spiel, R. Piper and Co. Verlag, München

Faik-Nzuji, Clémentine

1973 Procédés de voilement dans l'énigme luba,

Flahault, Francois

1981 Spéculations du conte populaire sur l'idée d'énigme, Poétique VI, pp. 20-28.

Hintikka, Jaakko

1973 Logic, Language-Games and Information, Clarendon Press, Oxford

Hintikka, Jaakko

1976 The Semantics of Questions and The Questions of Semantics, Acta Philosophica Fennica XXVIII, pp. 5-200.

Hintikka, Jaakko

1979 "Is", Semantical Games, and Semantical Relativity, Journal of Philosophical Logic VIII pp. 433-468.

Köngäs-Maranda, Elli

1972 Theory and Practice of Riddle Analysis, Documents de travail, XI/D, Università di Urbino

Nunberg, Geoffry

1978 The Pragmatics of Reference, Bloomington Indiana

1982
manuscript

Tennant, Neil

1979 Language Games and Intuitionism, in: Synthese XLII, pp. 297-314