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AN ANALYSIS OF INTERROGATIVES. PART 1 — THE PROBLEM OF PRIMARY TERMS OF THE LOGICAL THEORY OF INTERROGATIVES

1. THE AIM OF THE RESEARCH

In the period following the publication of *Erotetic Logic* by Mary and Arthur Prior (1953) the issue of the logic of interrogatives has aroused more and more interest. Several new ideas have been introduced. The incompatibility between the different approaches calls for further discussion of the subject.

A logical model of interrogatives ought to be constructed with the same methods that are used in creating any other type of formal logic. The first stage includes listing primary terms, followed by syntactic rules and a characteristic of the primary terms of such logic. The present article aims at determining the starting point for constructing a model for the logic of interrogatives. It also tries to answer the basic question of whether erotetic logic may be reduced to other logical systems and, more importantly, whether it needs to include primary terms unique to this model. The scholars' lack of agreement necessitates a full-length consideration of the mentioned issues.

2. THE RESEARCH METHOD

As specified in the above paragraph, the aim of this research is to construct a formal erotetic logic. Naturally, this system ought to have a practical application. Since at this point the majority of questions are formed in natural languages, erotetic logic has a chance at being practically applied

only if the questions of this logic have their equivalents in natural languages, in the form of ordinary questions. This equivalence enables the interrogatives of one kind to be roughly translated into the other. The condition for translatability imposed upon the logic of interrogatives determines both the choice of terms and the rules of syntax and influences the characteristics of the adopted terminology. Translatability should not, however, be defined too rigorously, as every system of logic needs to be able to extend the possibilities hidden within the apparatus of a natural language. When logic goes beyond the current limitations of a natural language, the expressions of erotetic logic cannot possibly be translated into ordinary questions. The reconstructions made within the logical framework ought not to be overly limited and need to encompass all those questions in a natural language which are appropriately formed and posed in earnest.

The easiest way to make the interrogatives of erotetic logic easily translatable into questions of a natural language and *vice versa*, is to substitute the typically used expressions with symbols and assume that in so doing we also determine the syntactic structure of interrogatives. However, such a method would simply be childish. Firstly, questions with identical meaning may make use of dissimilar expressions and have a diverse form in different ethnic languages. A literal translation of interrogatives occurring in natural languages would, at best, lead to the creation of as many different systems of erotetic logic, as there are natural languages. Moreover, such a simple method of ensuring translatability of colloquial questions into interrogatives of erotetic logic gives us no clue as to how to characterise the terms occurring in the model of erotetic logic in accordance with the requirements of the logic of terminology.

A more effective and frequently used method is, in fact, indirect. It involves seeking paraphrases of the analysed expressions, in this case — interrogatives. The paraphrases also ought to belong to a natural language, but contain only expressions which already have an acknowledged translation into logical terminology. It is therefore assumed that such paraphrases reveal the so-called logical structure of the analysed expressions. If all the expressions used in such paraphrases already have a known translation into a system of formal logic, we can surmise that there are no terms unique for erotetic logic. However, if colloquial language includes questions that do not have a translation into any known language of formal logic, it has to be assumed that specific terms of erotetic logic do exist. These unique terms would then have to be determined by axiomatic methods or using a set of appropriate rules.

When using the method of paraphrasing and translating, it is important to ascertain whether the suggested paraphrase of the analysed expression, i.e. its substitute, can indeed be perceived as its equivalent. To do this, one has to determine whether the substitute may be used interchangeably with the original utterance, also referred to as the analysandum. If there is no substitute that can take the place of the analysandum in all contexts, but there are ones that can be used in some situations, the aim of the scholar is to ascertain in what conditions this may be done, and to formulate conditional or relativised definitions. The basis for determining whether two expressions are interchangeable or not usually comes from our linguistic intuition.

The subjective nature of linguistic intuition and the related arbitrariness do not add to the precision of any research, yet at the stage of discussing the properties of a natural language they are inevitable. To some extent, this method is more exact than it can be surmised at first glance. We need to communicate by means of language in matters which are often very subtle; this makes our linguistic intuition very precise, more so than any terminological equipment we use in our attempts to describe the properties of natural languages. It must be noted, however, that the results of various research projects based on linguistic intuition differ significantly. Some of these nonconformities arise from the fact that the search for exact paraphrases may be discontinued at any point: one might be satisfied with finding one paraphrase or seek paraphrases for some expressions included in the first paraphrase. Further still, one may investigate the possible paraphrases of the expression used in the substitutes of the second degree. In a nutshell, the discrepancies between different studies arise because these analyses have a varying degree of precision.

An even more significant source of arbitrariness may be found in the lack of exact, consciously used criteria of substitution. It is sometimes assumed that two expressions are interchangeable, if using one instead of another does not lead to any changes in the logical value of the context in which the substitution was made. In other frameworks it is the context that ought not to alter the meaning. Others still look at whether the original message and the paraphrase have the same effect on the recipient, etc. A precise definition of these criteria involves determining the meaning. It is therefore understandable that specifying the criteria for interchangeability is of utmost importance. It is equally apparent, however, that this is no easy task. Presenting a full specification of all criteria of substitution and equivalence would not be possible in the course of a single article, yet the

author shall endeavour to achieve maximum clarity of the argument.

3. SUGGESTED METHODS OF PARAPHRASING QUESTIONS

The paraphrases proposed by various authors are surprisingly diverse; at first glance the methods used may even be considered utterly groundless. In the following section the author shall attempt to explain the reasons behind these discrepancies.

A. If we take into consideration only those questions which are asked in earnest, we may assume that a recipient hearing such a question receives at least three pieces of information:

(a) the inquirer knows something;

(b) the inquirer does not know something else;

(c) the inquirer wishes to know something.

In the case of the question: *Who was the discoverer of America?* the recipient learns that the inquirer:

(a') knows that someone discovered America;

(b') does not know that the discoverer's name was Columbus;

(c') wishes to know the name of the discoverer of America.

B. Upon hearing the question, the recipient is given some information. It is not clear, however, how much of this information ought to be included in a proper paraphrase of the question.

It seems that the differences between various methods of paraphrasing advocated by different scholars are caused by three primary factors. Firstly, authors choose to paraphrase different types of utterances. Some decided to paraphrase only questions, whereas others included verbal expressions of all the information conveyed by the original question. Naturally, such substitutes would have to be different from those designed to paraphrase questions only. Some of the additional information received by the listener is not incorporated in the question as such, but inferred on the basis of the context and the communicative situation. In the present section, we shall focus on paraphrasing only the questions, disregarding their situational context. The analysis of the context and the communicative situation shall be presented later, as we shall determine the rules of using questions.

The second reason for the existence of so many dissimilarities between the methods of paraphrasing lies in the fact that some authors wanted to paraphrase the information that the inquirer already had, whereas others focused on paraphrasing the information the speaker lacked. Others still emphasised the pieces of information which the inquirer wished to obtain.

There were also scholars who wished to include more than one type of information in their paraphrases (what the inquirer knows and what knowledge they lack, or what they do not know and want to find out). The large number of dissimilar approaches may explain the variety of proposed methods.

Finally, the authors interested in interrogatives disagreed on the issue of the evaluation of expressions which could act as paraphrases. It has already been mentioned that paraphrases need to be more understandable than the analysanda. In other words, a given paraphrase ought to have a recognised translation into a well-known system of logic, or at least give us some reason to believe that it would be easier to translate into such a language than the analysandum itself. Some authors claim that the best paraphrases are constructed as affirmative sentences containing only extensional functors. Such sentences can be translated into languages of classical systems of logic. Other scholars consider it sufficient to use modal expressions; modal systems of logic are very elaborate. According to other authors, it is possible to paraphrase questions with utterances that contain expressions of probability. There are scholars who paraphrase interrogatives using terms such as 'knows' and 'does not know'. Translations of such paraphrases may only be found in epistemic logic. Finally, there are scholars who prefer to use expressions such as 'it ought to be indicated', 'please indicate', 'please determine', etc. Such paraphrases can be translated only into languages of the logical systems of norms, wishes and commands.

C. The preferences for one kind of term or another are related to the choice of the subject of paraphrasing: it can be defined as the utterances (a) encompassing the knowledge of the inquirer, (b) expressing the inquirer's lack of knowledge or (c) revealing the inquirer's wish to know something. Scholars focusing on type (a) utterances, such as Harrah (1963) and Stahl (1962), use paraphrases which can be translated into the language of classical logic. Authors who prefer type (b) are ready to accept translations into systems of modal logic, languages of the theory of probability, or languages of epistemic logic.

According to the latter group of scholars, the lack of knowledge is expressed by utterances such as 'maybe' or 'probably', or simply by 'I don't know'. This explains why the reconstructions of questions ought to be found in the theory of probability or in systems of modal logic. A 19th-century logician, Friedrich Calker, presents a modal interpretation of interrogatives.[1] Given Sigwart's views, it may be assumed that he would advocate translating

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[1]According to Bernard Bolzano (1929, vol. 2: 74) this is what Calker postulates in his work entitled *Logic*, & 98. Cf. Fries 1837: 118.

questions into the language of the calculus of probability. In his opinion an interrogative is nothing but a hypothesis, i.e. an utterance of the 'probably *p*' type (Sigwart 1924, vol. 1: 238-239, 251; vol. 2: 307). Those logicians who claim that translations of interrogatives ought to focus on the wish to obtain information tend to interpret questions on the basis of the logic of imperatives. The advocates of such an approach include Friedrich Jodl (1916: 345) and R. M. Hare (1949: 21). Åqvist may also be counted among them (Åqvist 1965, esp.: 56-60, 85-89, 96, 101), as he looked at interrogatives in terms of epistemic logic — though this logical system also contains terms determining obligation. Most commonly, questions are considered to be manifestations of wishes. Such is the view of Bernard Bolzano (1929, vol. 1: 88; vol. 2: 71-73). The latter approaches may be presented within the framework of optative logic.[2]

What is more, there are scholars who believe interrogatives to be a specific type of utterances which cannot be brought down to any of the previously mentioned linguistic forms. They claim that questions ought to include unique terms of erotetic logic. This approach was represented by Kazimierz Ajdukiewicz (1958: 278, 286), Tadeusz Kubiński (1958; 1959; 1966a; 1966b; 1967) and Nuel Belnap (1963).

The abovementioned approaches to paraphrasing interrogatives and to their meaning and structure differ in their level of complexity. Detailed conceptual frameworks may be found in the works of Kubiński, Stahl, Harrah, Belnap and Åqvist. The findings of this latter scholar were broadly discussed by Kubiński (Kubiński 1966c; 1971; Åqvist 1969), therefore there is no need to review them in the present article. The ideas of the pioneers of logic are overly general and do not add anything to the issues discussed in the present section.

4. THE BASIS FOR EVALUATING SUBSTITUTES OF INTERROGATIVES

A. Paraphrases need to be as close in meaning to the analysanda (in this case: to questions) as possible. Particular care ought to be taken to ensure that the relations between paraphrases of various questions are analogous to those between the corresponding interrogatives. This would attest to the similarity of meaning and to the fact that the rules governing

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[2]Rescher presents a chart comparing different types of modality (cf. Rescher 1968). According to this chart the qualities of wishes ought to be translated into a separate system of optative logic.

paraphrases resemble the laws used to form questions. One of the most important associations between expressions is the relation of substitution, as it reveals the equivalence or similarity of the two utterances. If the substitutes of questions, i.e. the potential paraphrases, are in the same relation between one another as the original interrogatives, these substitutes may probably be treated as suitable paraphrases. If this is not so, one or more of the substitutes may not be an actual paraphrase for the given interrogative. The present article shall only focus on ascertaining whether the potential substitutes may be as interchangeable as the corresponding interrogatives.

The line of argument described above may be summarised by the following:

(1) x is a paraphrase of $y \cdot x'$ is a paraphrase of $y' \cdot x$ is interchangeable with x' with regard to $W \rightarrow y$ is interchangeable with y' with regard to W.

The same theorem may also be presented in a different way, better suited for verifying the accuracy of substitutes:

(2) x is interchangeable with x' with regard to $W \cdot \sim (y$ is interchangeable with y' with regard to $W) \rightarrow (\sim x$ is a paraphrase of $y. \vee \sim x'$ is a paraphrase of $y')$

The expressions may be interchangeable with regard to various qualities. Most commonly the aim is not to change the logical value of the context in which the substitution was made. More generally, the quality in question is often the so-called extension (Carnap 1947, mainly 26-32), or sometimes intension or the meaning of the context of substitution, defined in one way or another. The issue of qualities with regard to which questions may be considered interchangeable shall be discussed in a separate section.

B. If we assume that x and x' from theorem (2) are possible substitutes of questions, whereas y and y' are interrogatives, and ascertain that y and y' are not interchangeable in some respect while, in the same situation, x and x' are, in fact, substitutable, we may claim that at least one of the substitutes is not suitable for a paraphrase. In some cases it may even be justified to say that none of the substitutes are paraphrases. This happens if both the substitutes and the original interrogatives differ with regard to one and the same expression. Let us illustrate this with the following example: We may assume that the sentence x: *John beat Peter* is a paraphrase of the sentence y: *John physically abused Peter*. The sentence x': *John beat Jack*

differs from x only with regard to one expression, namely '*Jack*'. The same is true for sentences y and y': *John physically abused Jack.* On this basis we may assume that y is a paraphrase of y'. If we generalise the above example, we arrive at the following theorem:

(3) x is a paraphrase of y · the only difference between x and x' is the expression z · the only difference between y and y' is expression $z \rightarrow x$' is a paraphrase of y'.

Now, consider the following situation: If, instead of the word *Peter* we complete the sentence with the expression *the record*, we produce: *John beat the record.* On the basis of theorem (3), the claim that *John beat Peter* is a paraphrase of *John physically abused Peter* and the fact that the sentences *John beat the record* and *John beat Peter* differ only with regard to a single word (*the record/Peter*), it ought to be assumed that the sentence *John beat the record* is a paraphrase of the utterance *John physically abused the record.* This conclusion is obviously false, even though the premises leading to it certainly seem correct. The reason for the problem lies in the fact that the word *beat* has more than one meaning. The meaning changes if it is juxtaposed with the expression *the record.* Thus, the theorem (3) may only be true if neither the analysanda nor the paraphrases contain any polysemantic elements. In the present article we shall avoid using polysemantic terms, yet, if such words do appear and are deemed significant for our research, their ambiguity may be tested by means of theorem (3). Thus, the mentioned theorem ought not to be rejected — it shall have its use in the following analyses.

A combination of (3) and (2) reveals, under what circumstances none of the substitutes may be considered appropriate paraphrases

(4) x is interchangeable with x' with regard to W · y is not interchangeable with y' with regard to W · the only difference between x and x' is the expression z · the only difference between y and y' is the expression z · x is not a paraphrase of y · x' is not a paraphrase of y'[3]

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[3]*Proof:*
$(p \cdot q \cdot r \rightarrow s) \cdot (p \cdot t \cdot u \rightarrow q) \cdot (q \cdot t \cdot u \rightarrow p) \rightarrow [r \cdot \sim s \cdot t \cdot u \rightarrow (\sim p \cdot \sim q)].$

p/x is a paraphrase of y, q/x'is a paraphrase of y', r/x is interchangeable with regard to W z x', s/y is interchangeable with regard to W z y', t/x differs from x' only in the expression z, u/y differs from y' only in the expression z. Separation on the basis of (1), (3) and (3) x/x', y/y'.

C. Our evaluation of substitutes of interrogatives shall be based on one further principle. If we are looking at an utterance which is equivalent to a sentence in its logical sense, the utterance must also be a sentence in this sense. This claim is undoubtedly true, *ergo* if one of these sentences may have a negated form, it must also be possible for the other. We assume that if the paraphrase has a possible negation, the original sentence can also be negated. This line of argument may be summarised by the following formula (which uses Quine's quasi-quotation marks):

(5) x is a paraphrase of $y \cdot \Sigma z(z = \ulcorner \sim x \urcorner) \rightarrow \Sigma z'$ $(z' = \ulcorner \sim y \urcorner)$

5. THE INTERCHANGEABILITY OF INTERROGATIVES

A. In order to ascertain whether a suggested substitute is in fact a paraphrase of a given interrogative, we need to employ theorem (4) described above. It is also necessary to specify in what situations the original question may be substituted with the paraphrase. Let us first consider the following interrogatives:

(1) *Did Columbus discover America?*
(2) *Did Columbus discover the continent west of Europe?*
(3) *Did Columbus discover the continent he discovered?*

It seems that question (3) cannot be posed in earnest, even though there are people who do not know whether Columbus discovered America. The answer to question (3) is already known, thus it may only be asked rhetorically. Question (1), however, may be asked in earnest. In other words, (1) and (2) may not be used interchangeably with (3). Interrogatives (1) and (2) are interchangeable for those individuals who know that America is the continent west of Europe. In case on an inquirer who does not possess this knowledge, questions (1) and (2) will be as unsubstitutable as:

(4) *Did Columbus discover America?*
(5) *Did Columbus discover Madagascar?*

Therefore, questions (1) and (2) are interchangeable if the inquirer either knows the answer to both or to neither. This conclusion may be expressed as the following: If the inquirer knows the answer to the first question, he or she must also know the answer to the second. Thus, if p and q are the answers to questions y and y' respectively, then y and y' are interchangeable if:

(6) The inquirer thinks: I do not know (I doubt) whether p = I do not know (I doubt) whether q.

This formula was based on examples of open questions, but it also applies to probe questions.

B. It is now relatively clear which interrogatives may be used interchangeably and under what circumstances is this allowed. A more detailed analysis of this issue is not yet needed. What is more, such an analysis would be impossible to conduct, as it would force us to define both the answers and the questions in much detail. However, we ought to consider the issue of non-interchangeability of interrogatives. Questions (1) and (2) determine answers which are empirically equivalent, and yet these interrogatives may not be used interchangeably. The fact that $p \equiv q$ does not imply that not knowing whether p is tantamount to not knowing whether q. I may not, for example, know the law of the simple destructive dilemma, but instead be familiar with the law of excluded middle, even though these principles are equivalent. This means that interrogatives are not interchangeable on the basis of their equivalence.

The same is true in the case of logical equivalence. Sentences "$2 = 2$" and "$2 = {}^8\sqrt{256}$" are logically equivalent, but questions:

(1) Does $2 = 2$?

(2) Does $2 = {}^8\sqrt{256}$?

May not be used interchangeably. The first one is practically never asked, whereas in most circumstances the second may be assumed to be earnest. It is so because everybody is likely to know that $2 = 2$, while the number of people aware that ${}^8\sqrt{256} = 2$ is significantly smaller. Most language users will not, therefore, claim that not knowing whether $2 = 2$ is equivalent to not knowing whether $2 = {}^8\sqrt{256}$. In other words, the logical equivalence of sentences x and x' does not mean that not knowing value x is tantamount to not knowing value x'. This implies that interrogatives may not be interchangeable on the basis of their logical equivalence. Even in the case of utterances equivalent on the basis of a definition, e.g. *John is playing with a whip* and *John is playing with a lash* (and we assume that *whip = lash*) questions:

(3) *Is John playing with a whip?*

(4) *Is John playing with a lash?*

Are not equivalent, because the inquirer may not know the definition. In this case, the inquirer's not knowing the logical value of the sentence *John is playing with a whip* does not have to imply not knowing the logical value of the sentence *John is playing with a lash*. To generalise: the equivalence of two sentences based on their definitional equivalence does not imply that not knowing the answer to one of the questions is tantamount to not knowing

the answer to the other. Thus, questions are not interchangeable on the basis of definitional equivalence of the sentences.

The same is true with regard to probe questions. The interrogatives:

(5) *Who discovered America?*

(6) *Who discovered the continent west of Europe?*

May only be interchangeable for an inquirer who does not know the answer to (5) and considers not knowing the logical value of the answer to (6) equivalent to not knowing the answer to (5). If the inquirer knows that it was Columbus who discovered the continent west of Europe, but did not know that it was America, then questions (5) and (6) would not be used interchangeably.

The above conclusion lead to a hypothesis that shall constitute the basis for our further analysis: interrogatives *y* and *y'* may only be interchangeable if the inquirer considers that not knowing the answer to *y* is the equivalent to not knowing the answer to *y'*.

The provisions for question interchangeability specifically included the inquirer and their lack of knowledge. This involves a level of subjectivity. In the logical system of reconstructing interrogatives, the development of which is the aim of the present analysis, there shall be no mention of the inquirer's lack of information, in order to avoid any subjectivism. The reconstruction of questions shall be constructed within the framework of pragmatics, the basis for the previous analyses. As it has already been mentioned, the logical form of the interrogatives must be as close as possible to the actual method of using questions. However, this factual use may only be described if we include the inquirer. If interrogatives are interchangeable on the basis of the relation towards the inquirer's lack of knowledge, then the same ought to be true for paraphrases and reconstructions. The only problem is finding a way to eliminate the inquirer from the reconstruction while keeping the basis for interchangeability that take the inquirer into account.

The information the inquirer lacks may for example be presented as a set of theorems which are known but not yet acknowledged before a given moment or — which is easier to express in terms of logic — before a given stage in a logical proof. It is possible to completely eliminate the inquirer as a factor if one treats the lacking information as a set of theorems which are written down but not proven beyond a certain point. Such an approach invalidates the subjectivism related to ascertaining the range of the inquirer's lack of knowledge, while keeping the interchangeability of questions similar to that observable in colloquial language.

The range of the lack of knowledge does not need to be specified at

this point. It is sufficient to define the most crucial elements necessary for determining whether the reconstructions of questions contain any terms which cannot be defined within other systems of logic.

The above analysis introduces the concept of an answer to a question and is to a great extent based on this very idea. However, since the concept of an answer has not been clearly defined, the following line of argument is purely intuitive. This course of action seems inevitable. We first base our conclusions on intuition and arrive at first specifications. The conclusions then form the basis for defining the intuition that has brought us to the first specifications. This order of consideration allows us to avoid unjustified assumptions. In this case the intuitive concept of an answer for a question helps us to specify the concept of a question or, to be more precise, to specify the terms a question is composed of. When the concept of an interrogative has been sufficiently defined, it will be possible to characterise the idea of an answer. Despite all appearances, this method is not a vicious circle.

6. EVALUATION OF THE SUGGESTED SUBSTITUTES OF INTERROGATIVES

Harrah (1963: 32, 33, def. 7.2, 7.5, 7.7) divides interrogatives into 'disjunctive questions' and 'which questions'. The former type includes questions such as: *Is Columbus the discoverer of America?*; *Is Magellan the discoverer of America?*; *Is Amerigo Vespucci the discoverer of America?* Examples of the latter type include the following question: *Who is the discoverer of America?*

A. According to Harrah, disjunctive questions are paraphrased with alternatives of the following conjunctions. Assuming that the alternative question includes sentences $p_1, \ldots, p_n$, the conjunctions would be as follows:

$$p_1 \cdot \ldots \cdot \sim p_{i-1} \cdot p_i \cdot \sim p_{i+1} \cdot \ldots \cdot \sim p_n$$
$$\sim p_1 \cdot \ldots \cdot p_{i-1} \cdot \sim p_i \cdot \sim p_{i+1} \cdot \ldots \cdot \sim p_n$$
$$\sim p_1 \cdot \ldots \cdot \sim p_{i-1} \cdot p_i \cdot \sim p_{i+1} \cdot \ldots \cdot \sim p_n$$
$$\sim p_1 \cdot \ldots \cdot \sim p_{i-1} \cdot \sim p_i \cdot p_{i+1} \cdot \ldots \cdot \sim p_n$$
$$\sim p_1 \cdot \ldots \cdot \sim p_{i-1} \cdot \sim p_i \cdot \sim p_{i+1} \cdot \ldots \cdot p_n$$

If the disjunctive interrogative is simply a closed question, e.g.

(1) *Did Columbus discover America?*

and we assume the correct form of this interrogative to be:

(l') *Did Columbus discover America? or did Columbus not discover America?*

then, according to Harrah, the paraphrase of (1) ought to look like this:

(2) $\sim$ *Columbus is the discoverer of America* $\cdot$ $\sim$ *Columbus is the discoverer of America* $\vee$ *Columbus is the discoverer of America* $\cdot$ $\sim$ $\sim$ *Columbus is the discoverer of America.*

which is equivalent to:

(3) *Columbus is the discoverer of America* $\vee$ $\sim$ *Columbus is the discoverer of America.*

In Harrah's view, 'which' questions are paraphrased by existential questions, e.g. the interrogative:

(4) *Who discovered America?*

may be paraphrased with the sentence:

(5) *Somebody discovered America.*

Let us now apply the rules specified in § 4 to consider whether the substitutes of interrogatives suggested by Harrah are indeed paraphrases of questions. In other words, we shall determine whether Harrah's formal framework is applicable to questions.

According to Harrah's suggestions the interrogative:

(6) *Is the morning star the evening star?*

may be paraphrased by the following sentence:

(7) *The morning star is the evening star.* Or *The morning star is not the evening star.*

Due to empirically defined equivalence:

(8)*the morning star = the evening star*

it must be assumed that (7) is equivalent to the sentence:

(9) *The morning star is the morning star.* or *The morning star is not the morning star.*

In extensional contexts it is possible to use (7) and (9) interchangeably, without changing the logical value of the utterance. However, if we consider the closed question which ought to be equivalent to (9) in Harrah's terms, i.e.:

(10) *Is the morning star the morning star?*

We realise that (6) may not be used interchangeably with (10). No language user is likely to ask question (10), as the answer is already apparent. However, many people may pose question (6) in earnest. With regards to these inquirers, not knowing the answer to (6) would not be tantamount to not knowing the answer to (10).

It should be pointed out that (7) and (9) are interchangeable only on the basis of their logical value. What is more, the only difference between these two interrogatives lies in the terms '*evening star*' and '*morning star*'.

Similarly, question (10) differs from (6) only in the fact that in the latter the term '*evening star*' has been replaced with '*morning star*'. All conditions specified in theorem (4) from paragraph 4 are met. We may, therefore claim that (7) is not a paraphrase of question (6) and (9) is not a paraphrase of question (10). Thus, Harrah's framework seems inadequate. The laws and principles of interchangeability of questions, described in his erotetic system, diverge considerably from actual linguistic practices.

What was said about Harrah's method of paraphrasing is also true for all attempts at creating a system of erotetic logic in which the paraphrases of interrogatives are interchangeable on the basis of their logical value alone.

B. Let us consider the following questions:

(1) *Does 2 = 2?*

(2) *Does $2 = \sqrt[8]{256}$?*

We may assume that these interrogatives can be paraphrased with modal sentences:

(3) *Maybe 2 = 2*

(4) *Maybe $2 = \sqrt[8]{256}$*

As we know, '2 = 2' is logically equivalent to '$2 = \sqrt[8]{256}$'. According to Carnap (1947: 177, theorem 39-7), such sentences may be used interchangeably in modal contexts, which would include (3) and (4) if the contextual intension remains unchanged. What is more, theorems (3) and (4) have the same intension, and thus may be substituted one for the other. The only difference between sentences (3) and (4) and interrogatives (1) and (2) is the appearance of the expression '$\sqrt[8]{256}$'. Since (1) and (2) are not interchangeable on the basis of their intension, once again the conditions specified in the predecessor for theorem (4) from paragraph 4 are met. This means that (3) and (4) cannot be considered paraphrases of (1) and (2). Carnap's model of interpreting questions is equally inadequate — interrogatives cannot be described in the language of modal logic.

As with the previous examples, the conclusions pertaining to specific substitutes may be generalised to include all paraphrases and reconstructions of interrogatives which use sentences that are interchangeable on the basis of their intension.

C. Let us assume that the definition:

(1) *A human is a creature capable of laughter*

is true and that there is a certain person x who does not know this definition and is not aware of the fact that laughter may be considered a defining characteristic of a human being. In such circumstances person x will not regard the following questions as equivalent:

(1) *Is a human a creature capable of laughter?*

(3) *Is a human a human?*

All conceivable substitutes for questions (2) and (3) that may be interchangeable on the basis of the terms used will not be accurate paraphrases of the interrogatives (2) or (3). This conclusion is reached through the same line of argument which was used in the previous two examples.

D. Are there any substitutes for interrogatives which would not meet the conditions specified in paragraph 4? Finding them does not appear to be difficult, if one realises that earnest questions are asked if the inquirer does not know something, has some doubts or wishes to acquire some information. The interrogatives:

(1) *Did Columbus discover America?*

(2) *Did Columbus discover what he discovered?*

May be substituted e.g. with the following sentences that do not fall into the trap described in paragraph 4:

(3) *I do not know that Columbus discovered America.*

(4) *I do not know that Columbus discovered what he discovered.*

Interrogatives (1) and (2) are not interchangeable, because no language user is likely to pose question (2). Likewise, (3) and (4) are not interchangeable, as nobody would say they do not know that Columbus discovered what he discovered.

Let us assume that set X comprises sentences recognised as plausible or proven within a certain system up to the nth stage of the logical proof. We must also assume that sentences considered obvious (let us imagine that there is a scientific method for ascertaining which sentences are self-evident) are counted among the axioms of the system, and therefore are recognised as true at every stage of the logical proof. Under these preliminary conditions (1) and (2) may be substituted with the following:

(5) $\sim$ *"Columbus discovered America"* ϵ X

(6) $\sim$ *"Columbus discovered what he discovered"* ϵ X

(5) and (6) cannot be used interchangeably, because their value is different. (6) is false, since according to our preliminary assumptions the sentence *Columbus discovered what he discovered* belongs to the set X.

The same applies to the following utterances:

(7) *I wish to know that Columbus discovered America* or that *Columbus did not discover America.*

(8) *I wish to know that Columbus discovered what he discovered* or that *Columbus did not discover what he discovered.*

(9) The sentence *Columbus discovered America* should be included into the set *X* or the sentence *Columbus did not discover America* should be included into the set *X*.

(10) The sentence *Columbus discovered what he discovered* should be included into the set *X* or the sentence *Columbus did not discover what he discovered* should be included into the set *X*.

The substitutes suggested here have a certain flaw — they may be negated. It is e.g. possible to say: *it is not true that I do not know that Columbus discovered America*; the sentence *Columbus discovered America* or *Columbus did not discover America* should not be included into the set *X*. However, the negation of interrogatives, or at least the kind of negation observable in the mentioned examples, is difficult to notice. The substitutes presented in this paragraph do not meet the conditions specified in theorem (5) from paragraph 4, which suggests that these utterances are neither declaratives nor imperatives, nor sentences expressing norms or wishes. This fact may have escaped the attention of some logicians, yet it was generally acknowledged. Since the conditions of the mentioned theorem (5) are not met, the final substitutes cannot be considered accurate paraphrases for interrogatives.

We have gradually arrived at the conclusion that sentences expressing the extent of the inquirer's knowledge, the inquirer's lack of knowledge or the inquirer's wish to obtain information are equally unsuitable in acting as paraphrases. This means that it is impossible to paraphrase questions in those systems of logic that enable such sentences to be reconstructed. Interrogatives may not be translated into the language of classical, modal, epistemic, deontic or optative logic. It must therefore be assumed that erotetic logic needs to include terms that are not found in any other logical system — i.e. terms unique and specific to this logic. This conclusion confirms that Kubiński and Belnap were correct in their assumptions. It becomes apparent that the desire to create a simple method of reconstruction can lead to serious mistakes.

The number of these unique terms of erotetic logic is a matter that requires further research, together with the issue of characterising them (or it, if there is only one specific term) in a manner that would enable the new system of erotetic logic to be interpretable into questions of natural language.

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