The Logic of Divinatory Reasoning

MSc Thesis *(Afstudeerscriptie)*

written by

Aafke de Vos

(born 02-09-1989 in Oud-Beijerland, The Netherlands)

under the supervision of **Prof. Dr. Michiel van Lambalgen** and **Prof. Dr. Martin Stokhof**, and submitted to the Board of Examiners in partial fulfillment of the requirements for the degree of

MSc in Logic

at the *Universiteit van Amsterdam.*

INSTITUTE FOR LOGIC, LANGUAGE AND COMPUTATION

Abstract

This thesis is a study of the logic of a specific form of mechanical divination, in which the diviner asks binary questions on the basis of previously gained knowledge. A comparison is made between Mambila spider divination, which is deeply embedded in the (partly illiterate) Mambila community of southern Cameroon, and an experiment with university students that resembles this type of divination. The motivation for this thesis stems from the traditional view that primitive cultures ignore the principle of non-contradiction, as well as from studies that have been conducted about the reasoning of illiterates in reasoning tasks. Those latter studies have shown that unschooled subjects experience difficulties interpreting certain reasoning tasks. Since this thesis focuses on a natural practice, those interpretation problems are avoided. By analyzing Mambila spider divination conceptually and formally, we investigate the logic of divinatory reasoning. Several divinatory sessions are formalized, using Inferential Erotetic Logic. The main result of this thesis is that the limitation to binary questions shapes divinatory logic, such that "no" possibly means "no, unless". Contradictory answers are often not problematic, neither are they ignored. They are, instead, taken as a sign for the diviner to reformulate his questions or think in a different way.

Acknowledgements

First of all, I am very grateful to my supervisors Michiel van Lambalgen and Martin Stokhof. Michiel's passionate teaching of the course 'Rationality, Cognition and Reasoning' triggered my interest in human reasoning. I remember that during our first appointment, I told Michiel about my wish to contribute to the field. He provided me an, yet unpublished, article of Keith Stenning and Thomas Widlok and this is where my investigation of divinatory reasoning began. Although writing this thesis has not been easy, Michiel always kept believing in me and helped me by sharing his interesting insights. Furthermore, he offered me the opportunity to travel to Oxford to meet David Zeitlyn, which has been a breakthrough for my research. I cannot express how grateful I am for getting this opportunity. Martin has been an excellent academic mentor during my Master of Logic and I was very happy that he wanted to co-supervise my thesis project. His calmth and constructive feedback have been of great help.

Secondly, I wish to express my deep gratitude to David Zeitlyn, who introduced me to the fascinating world of anthropology and taught me a lot about the Mambila and their divination practice. Since my number one problem was a 'lack of data', David's offer to collect extra data for me in Somié was a very welcome surprise. When I visited him at Oxford University, David emptied almost his whole agenda for four days and together we worked through the videos and recordings of Mambila spider divination. During the process, which I truly enjoyed, I got an impression of what antropological fieldwork involves. It made me respect David's work even more. David has been a great inspiration to me.

I would like to thank Tanja Kassenaar for helping me during difficult times in the research process, and Keith Stenning for the discussion we had in Michiel's office.

Finally, my warm thanks goes to my parents and to Luc for their endless support. Without you, writing this thesis would not have been possible.

Contents

1   Introduction

Many studies of reasoning in illiterate subject populations that have focussed on syllogistic-style tasks, provide a negative account of reasoning. For example, Alexander Luria [7] concludes that illiterate subjects do not grasp "the logic of the syllogism". Marian Counihan [2] provides a more positive account of reasoning, by arguing that logical aspects of illiterate reasoning performance have been neglected. "The logic of the syllogism" does not exist, since the logic of a task is always relative to an interpretation of the premises. She agrees with Stenning and Van Lambalgen [11] that logical form is not given but, instead, the result of an interpretative process. In this light, differences in reasoning performance can be explained by differences in interpretation. The fact that syllogistic premises usually do not resemble naturally occurring discourse explains why illiterates have difficulties in drawing conclusions in syllogistic-style tasks. Interestingly, Counihan [2] shows that in another reasoning task, the suppression-effect task, illiterate subjects and literate subjects behave surprisingly similar. These similarities and differences in reasoning performance between illiterate and literate subjects form the starting point of my research.

   Although the research on performance in reasoning tasks is useful, in my view it is important to study illiterate reasoning performance in natural practices as well. Solving reasoning tasks may be very unnatural for illiterate subjects, because reasoning is essentially goal-oriented and illiterates have never learned to reason with the goal of solving exercises *an sich*. Lucien Lévy-Bruhl [6] studied data of reasoning performance in "the wild". He concluded that the primitive mind does not address contradictions and is in a pre-logical stage of thinking. However, I believe that Lévy-Bruhl's focus on classical logic caused him to overlook the reality of natural practice as well as the stage of "reasoning *to* an interpretation". By studying and modelling a reasoning practice in a primitive society, using the multiple logics program of Stenning and Van Lambalgen [11], my aim is to gain new insights into the interpretive processes. I have chosen to focus on Mambila spider divination. According to Zeitlyn [16–21], who obtained field data of this type of divination, it is deeply embedded in the illiterate[1] Mambila community.

---

[1]The Mambila community is not strictly illiterate. Nowadays, most children and young adults are literate. Spider divination, however, is mostly practiced by older, illiterate adults. Furthermore, the Mambila language is an oral language. Children and young adults that are literate, have learned to read and write in French.

A Mambila diviner consults a spider by asking a binary question in a particular setting. Subsequently, the movements of the spider result in a pattern of leaves which determines the answer to the question. Zeitlyn has recorded several divination sessions, which consist of many questions and answers. By analyzing the field data both conceptually and formally, my aim is to investigate the reasoning of the Mambila diviners. Typical of this type of divination is that a question can be regarded as the conclusion of a reasoning process. For, the diviner reasons to a new question by taking into account the answers to earlier questions and other knowledge. Therefore, I will formalize the data with Inferential Erotetic Logic, a logic developed by Andrzej Wiśniewski [14, 15] that regards inferences in which questions can be seen as conclusions.

Sometimes several different spiders are consulted simultaneously, which allows for a consistency check by asking the same question to different spiders. In some cases such a consistency check leads to a contradiction. Since classical logic rejects the acceptance of a contradiction, I will particularly study the diviners' "reasoning to an interpretation" in these cases.

Interestingly, Zeitlyn [17] uses an American laboratory experiment performed by McHugh [8] and reanalyzed by Garfinkel [4] to study and explain divination from a cultural more familiar point of view. The experiment resembles the process of Mambila spider divination, and therefore it is valuable for studying the similarities and differences between the reasoning performance of subjects with different literacy levels. I will investigate the logical aspects of divinatory reasoning, by analyzing and comparing the data of the experiment and the data of Mambila spider divination. This analysis will be both conceptual and formal. Furthermore, special attention will be given to the responses to contradiction.

This thesis is structured as follows. Chapter 2 will be dedicated to the existing research of reasoning in illiterate subject populations. In Chapter 3, the syntax and semantics of Inferential Erotetic Logic will be presented and I will explain how we can use it for modelling divination. In Chapter 4, I will define the language which will be used for modelling divination. Chapter 5 contains the formalization of the data of McHugh's experiment. I have chosen to present this formalization first, because the discussed topics are more familiar. The data of Mambila spider divination will be formalized in Chapter 6. In Chapter 7, I will analyze and compare both divinatory practices conceptually and formally. And finally I will present my conclusions and suggestions for further research in Chapter 9.

2 Studies of reasoning among illiterates

In this chapter, I will discuss several studies that have been conducted on the reasoning of illiterate people.

2.1 The studies of Luria and Scribner

Together with his colleagues the Soviet psychologist Luria collected his observational data in 1931 and 1932, during the Soviet Union's most radical restructuring [7, p.v]. In those days, schools for adults were introduced in remote regions of Uzbekistan and Kirghizia in order to eliminate illiteracy, to create a collectivist economy and readjust the daily life to new socialist principles. Luria made two expeditions to these regions to investigate in what way the radical changes, among others the elimination of illiteracy, would influence the cognitive activity of individuals. The fifty-five subjects that participated in the experiment were all adults. Of them, twenty-six were illiterate. Ten subjects had very little education and could barely read and write. Seven subjects were young students, and twelve students were also young but had attended school for just one or two years before they started working. Luria tested his subjects on different cognitive activities, including the cognitive activity of reasoning. Within reasoning, Luria's experimental material consisted of mainly syllogistic-style tasks with a quantified or generalised major premise and a particular statement as the minor premise, followed by a question. An example is given below.

> In the Far North, where there is snow, all bears are white. Novaya
> Zemlya is in the Far North and there is always snow there. What
> color are the bears there? [7, p.108]

After his expeditions, Luria went back to Moscow where he made some public descriptions of his findings. However, due to their politically sensitive nature these were not well received. Therefore he did not publish them until much later, namely in 1974 [7, p.xiv][2].

Scribner investigated the performance in reasoning tasks of the Kpelle and Vai peoples in the 1970s and 1980s. The seventy-two Kpelle subjects that participated in her first study were all adults. Half of them were illiterate and

---

[2]Note that the publication of 1974 was in Russian. For this study the English translation is used which appeared in 1976.

the other half were young adults attending a junior high school. Comparable problems were presented to young adults living in New York. All of the forty-eight Vai subjects that participated in her second study were illiterate adults. Scribner's experimental material within reasoning also consisted of mainly syllogistic-style tasks. Most of the syllogisms were of the same form as those of Luria. One of Scribner's tasks, which she used to test the Kpelle people, is quoted below as an example.

> All houses in Kpelleland are made of iron. My friend's house is in Kpelleland. Is it made of iron? [10, p.110]

Luria classifies the responses of illiterate subjects to the syllogistic-style reasoning problem into two categories. This classification has been confirmed by Scribner. The first category of responses involves a denial to answer the question due to the lack of personal knowledge of the premises. For example, let us consider the following task Scribner used to test the Kpelle people.

> All Kpelle men are rice farmers. Mr. Smith is not a rice farmer. Is he a Kpelle man? [10, p.110]

One subject (S) responded in the following way to the experimenter (E).

> S: I don't know the man in person. I have not laid eyes on the man himself.
> E: Just think about the statement.
> S: If I know him in person, I can answer that question, but since I do not know him in person I cannot answer that question.
> E: Try and answer from your Kpelle sense.
> S: If you know a person, if a question comes up about him you are able to answer. But if you do not know the person, if a question comes up about him, it's hard for you to answer it. [10, p.133]

Both Luria and Scribner report this response as most common. The second category involves a specific formulation of the premises in order to align them with personal knowledge or conventional wisdom [2, p.36]. This response seems to arise only after repeated questioning by the experimenter, which we can see in the example below.

> Cotton can grow only where it is hot and dry. In England it is cold and damp. Can cotton grow there? [7, p.108]

One subject (S) responded in the following way to the experimenter (E).

> S: I don't know.
> E: Think about it.
> S: I've only been in the Kashgar country; I don't know beyond that...
> E: But on the basis of what I said to you, can cotton grow there?
> S: If the land is good, cotton will grow there, but if it is damp and poor, it won't grow. If it's like the Kashgar country, it will grow there too. If the soil is loose, it can grow there too, of course. [7, p.108]

From the response patterns Luria draws the conclusion that illiterate reasoners are unable to think logically; they simply deny the formal information in the syllogism. Since the reasoning of schooled subjects, even those with a very minimal education, does reflect the logical structure of the syllogisms, he concludes that literacy has a deep impact on human reasoning. Scribner, on the other hand, draws a less black-and-white conclusion. She notes that although some illiterate subjects handle the syllogistic problems "empirically" and others handle them "theoretically", most subjects have a "mixed strategy"; they sometimes rely on the formal information in the syllogism and sometimes on experience [10, p.134]. She suggests that "the factual status of the information supplied in the premises" influences in what way subjects handle the syllogism, but does not specify this relation further.

2.2   The work of Counihan

Counihan doubts whether Luria's and Scribner's response profiles truly represent the (un)ability of illiterate people to reason logically. She suggests that the peculiarities of the particular tasks could have led to a particular interpretation of the premises that is not necessarily connected with illiteracy. Before I will explain Counihan's research, I will shortly describe the view of Stenning and Van Lambalgen [11], since this plays an important role.

Stenning and Van Lambalgen believe that logic is relevant to human reasoning. They consider two stages of reasoning: reasoning *to* an interpretation and reasoning *from* an interpretation. They argue that logical form is not given, but that it is the result of the first stage. When someone performs a reasoning task, firstly he or she goes through an interpretative process *assigning* logical form. Although Stenning and Van Lambalgen take logic to be

9

normative, they believe that logic does not provide absolutely valid norms. Instead, logical norms relate to particular domains. There is not *one* true logic; we need multiple logics to model reasoning processes [11, pp.25-41]. Examples are classical propositional logic, fuzzy logic, intuitionistic logic, probability theory, deontic logic and Logic Programming. This latter logic, which is also called "planning logic", is nonmonotonic in the sense that inferences that were valid in one state, can become invalid when new information becomes available. It is the most prominent logic for Stenning and Van Lambalgen, who believe that reasoning developed out of planning.

Inspired by Stenning and Van Lambalgen, Counihan wants to investigate under what conditions the illiterate subjects adopt one or other interpretation of the premises [2, p.37]. Counihan performed a new experiment with, among others, syllogistic-type tasks in order to compare the results with those gathered by Luria and Scribner. The subjects were residents of a small town on the coast of South Africa's Eastern Cape. Of the twenty-nine subjects, six were illiterate, thirteen had less than ten years of education, and had been out of the education system for more than ten years, and ten had completed high school within the last twenty years. Note that in terms of literacy levels, the subjects are comparable to those of Luria and Scribner. The syllogistic-style materials of Counihan were comparable as well.

Although the illiterate South African subjects had a lifestyle very different from those of the subjects of Luria and Scribner, the data on syllogisms are strikingly comparable. Counihan's data show responses that would be identified by Luria as typically illiterate, albeit on a lesser scale [2, p.73]. However, Counihan questions the categories of response identified by Luria and confirmed by Scribner. With respect to the first category, the 'denial to answer the question', she wants to know *why* the subjects refuse to reason with the given premises, and if this reaction is only observed in illiterate subjects. She wonders whether the refusal to reason with the premises is related to particular materials and inferences. With respect to the second category, the 'specific formulation of premises', Counihan wonders what the interpretation is of the quantified statement assumed by the subject. She is curious if the interpretation of the quantifier varies across materials, and if so, if it does so consistently across subjects and/or groups [2, p.44].

Similar to Scribner, Counihan found that many less schooled reasoners use a "mixed strategy" in the syllogistic-style tasks. However, she argues that the seeming "mixed" character of their responses has to do with semantic confusions that occur in some cases. Counihan compares the question-answer

structure for the intended, "logical" interpretation with normal question-answer structure. She notes that in daily life there is epistemic asymmetry involved in the asking of a question: by asking a question, the questioner indicates that he does not know the answer but expects the addressee to know the answer. In a syllogistic-style task the subject is expected to answer on the basis of information that is given by the questioner himself, hence the epistemic asymmetry does not hold. This confuses subjects who have not received schooling [2, p.54]. In the light of this confusion, differences in performance between schooled and unschooled subjects might say something about the influence of schooling on the broadening of interpretations. A subject who does not have school-trained eyes might interpret the question in a normal (namely epistemically asymmetric) way, meaning that the experimenter wants information from him that he does not have himself. And what else than the subject's own knowledge can help him to provide the requested information? If the experimenter would have had the information himself, he would not have had to ask the question at all.

Counihan extends her study of reasoning among illiterate subjects by including suppression-effect task materials. The suppression-effect task, or simply 'suppression task', is a conditional reasoning task that was first reported by Byrne [1] in 1989. In Byrne's experiment, three different sets of materials are used for three groups of subjects. The first set consists of two arguments: one conditional sentence and one simple sentence that confirms the antecedent of the conditional. The arguments could, for example, be "If he sees a polar bear, he will start to scream" and "He sees a polar bear". The second set consists of the same arguments plus an extra one: a second conditional sentence that can be seen as "additional" in the sense that it suggests an extra requirement to make the consequent clause ("So he will start to scream") true. A possible additional to the example above is "If there are potential helpers nearby, he will start to scream". The third set consists of the same arguments as the first set plus a second conditional sentence that can be seen as "alternative"; its antecedent is by itself sufficient to make the consequent true. Looking again at the example above, an alternative could be "If he sees a crocodile, he will start to scream". The subjects are tested on their acceptance of several inferences: Modus Ponens (MP), Modus Tollens (MT), Denial of the antecedent (DA) and Affirmation of the consequent (AC). If humans use monotonic logic, an inference drawn when the first set of materials is used should also be drawn when new premises are added. However, as Table 1 shows this is not the case. The accep-

Inference type	First set	Second set	Third set
Modus Ponens (MP)	96%	96%	38%
Modus Tollens (MT)	92%	96%	33%
Denial of the antecedent (DA)	46%	4%	63%
Affirmation of the consequent (AC)	71%	13%	54%

Table 1: Rates of inference in the suppression effect task [1]

tance percentage of MP in the group which gets the simple set of materials equals that of the group which gets the alternative condition but is much higher than that of in the group with the additional condition. A similar pattern can be seen regarding MT. The acceptance percentages of DA and AC, on the other hand, are much lower in the group that gets the alternative condition than in the other two groups. Hence the presence of certain extra conditional premises decreases the rates of inference. This phenomenon is called the "suppression effect". The suppression effect was considered by Byrne as evidence that subjects do not use logical rules in drawing inferences. However, according to Counihan we should beware of drawing conclusions from the patterns in the rates of inference, since it has been shown that the combined premises in the suppression task lead to a wide range of responses that are far from 'correct' or uniform. Because the existing data have been collected only in schooled population, she extends her study of reasoning performance of unschooled subjects with suppression task materials. This examination is merely exploratory, since the suppression task elicits neither 'correct' nor uniform responses from schooled subjects and a comparison of the data across groups would therefore be difficult [2, p.61].

In comparison to the syllogistic-style materials, the suppression-effect task results show a more similar response between schooled and unschooled subjects [2, p.73]. Less subjects from the unschooled group reacted on the suppression task in a way that Luria would call 'denial to answer the question' or 'specific formulation of premises'. Such response was even relatively more common among the schooled subjects.

When we look at the literate and illiterate subjects that *do* seem to 'deny' to answer the question in the suppression task, many of them can be seen to interpret the conditional as including an abnormality clause. They reason to an interpretation that allows for abnormalities, hence they interpret the conditional "If A then B" in the following way:

> If A, *and nothing abnormal* is the case, then B, [2, p.74]

where what is abnormal is provided by the context" [11, p.163]. For example, let us consider the following task Counihan used in her investigation.

> If Ntombi wants to see her boyfriend, then she goes to East London. And she does want to see her friend. Will she go to East London? [2, p.67]

The initial response of one subject was as follows:

> S: How will I know? I Don't know.

This type of response makes sense when the conditional "If Ntombi wants to see her boyfriend, then she goes to East London" is understood as a more generic habitual relationship, allowing for exceptions, in other words something like: "If Ntombi wants to see her boyfriend and nothing else is going on, then she goes to East London" [2, p.65]. Counihan argues that there is much evidence that subjects interpreted the conditional as abnormality-sensitive. Other subjects that seem to 'deny' to answer the question can be seen to interpret the conditional as including a (necessary) precondition.

Looking at those subjects of which Luria would say that they adopt a 'specific formulation of premises', Counihan argues that they seem to interpret conditional premises as being temporally-bound. For example, let us consider the following task Counihan used in her investigation.

> If Thembi has to fetch water then she goes down to the river. She has to fetch water. Where will you look for her?

The subject (S) responded in the following way to the experimenter (E):

> S: If at home they said she's not there, I'll go to the river.
> E: Where will you look for her? Where do you think she is?
> S: Sometimes, she has to go to the river to fetch water. Thembi sometimes goes to the river, maybe in the afternoon or the morning. When I see her going to the river, maybe in the morning, I'll go to her then and see her.

Counihan notes that this temporal interpretation of the conditional has also been found in many schooled subjects [2, p.70].

According to Counihan, the abnormality-sensitive and temporally-bound nature of natural language conditionals strongly undermine Luria's conclusions that subjects rejected or ignored the given premises or their logical structure [2, p.74]. Furthermore, focusing on syllogistic-type tasks leads to overestimation of the differences in reasoning behavior between literates and illiterates. Counihan argues that the first response of all subjects, regardless of their literacy level, to task material is not acceptation or rejection but *interpretation*. It seems to depend on the task material whether or not literacy level influences the reasoning to an interpretation.

Counihan's investigation has made clear that the difficulties that less schooled subjects experience in reasoning tasks like the syllogistic-style task originate from interpretation problems. She performs a semantic analysis of the syllogistic-style task and concludes that "the difference between subject groups can be explained in terms of their ease in ignoring certain parameters of 'normal' interpretation, such domain specification preceding *all*-usage" [2, p.135]. According to Counihan, this indicates that logical aspects of illiterate performance have been overlooked because of the lack of attention to the semantic structure of reasoning tasks. Literacy might be "a broadening of ways of interpreting linguistic materials" [2, p.135].

Luria, Scribner and Counihan use measures of thinking that are not specifically related to everyday life, in order to "tap inferential ability independently of background knowledge or convention" [2, p.37]. However, the reasoning tasks are similar to school exercises and the education that literate people have received might enable them to reason with the goal of solving such exercises. Illiterate or unschooled people, on the other hand, might not be used to reasoning with such a goal and therefore the reasoning tasks may cause interpretation problems. Instead of forcing illiterate subjects to give answers in reasoning tasks which are unnatural for them, it would be interesting to model their reasoning in real life practices. This would eliminate the problems that illiterates have with interpreting reasoning tasks, like the problem of epistemic asymmetry in the syllogisms. The real life practice that I will study is that of spider divination in the Mambila community. The adult men of this community, some of which are illiterate, use divination to make all sorts of decisions in life. Spider divination is seen as the most reliable type of divination. Furthermore, I will study an experiment performed by McHugh that resembles the practice of spider divination.

2.3 Reasoning with contradictions in primitive cultures

Since in Mambila spider divination the obtainment of contradictory answers is not uncommon, I will shortly discuss the traditional literature about reasoning with contradictions in primitive cultures.

In the early twentieth century, anthropologist Lévy-Bruhl argued that primitive cultures have a different way of thinking: the "primitive mind". In his work *How Natives Think*, Lévy-Bruhl [5] presented the "law of participation". According to this theory, in the mind of primitive people, one thing may at the same time be something else. His idea was based on a finding of anthropologist Karl Von den Steinen, who reported that the members of a Brazilian tribe, the Borono, claimed to be araras (a type of parrot) as well as humans. Lévy-Bruhl concluded that the primitive mind does not address contradictions. Primitive cultures do not subscribe to universal laws of logic, including the principle of non-contradiction, and are in a pre-logical stage of thinking [6]. In his book *Primitive Mentality*, Lévy-Bruhl writes:

> "To primitive mentality the law of contradiction does not exercise the same influence on the connection of ideas as it does on ours."
> [6, p.101]

In the late 1920's, anthropologist Evans-Pritchard studied the behavior of the Azande people of the upper Nile. In his book *Witchcraft, Oracles and Magic Among the Azande*, he describes how contradictions are encountered in inherited witchhood [3, p.3] and cycles of vengeance [3, p.7]. He writes that in cases where their ideas lead to contradictions, the Azande do not accept the conclusion but instead they side-step the contradiction in their belief-system. Contradictions can also be found in a divinatory practice of the Azande community. Divination is performed by using a poison oracle. During a séance, binary questions are asked after which poison is given to a fowl who either dies or survives, meaning "yes" or "no". Questions are often repeated in order to test the outcome. In séance 1 [3, p.141] we can distuinguish two ways of responding to contradictions. The diviners either continue with another subject leaving the question unanswered or, as Evans-Prichard reported, "the verdicts taken together were considered a bad augury" and a more specific follow-up question was asked.

3 Inferential Erotetic Logic

Before we can study the data of spider divination in the Mambila community as well as the data of McHugh's experiment, we have to find a logic that is suitable for formalizing it. Both practices involve the asking of binary questions by an operator and the receiving of answers which provide the operator 'knowledge'. The operator uses earlier gained knowledge to reason and finally *arrive* at a new question. It is this process of 'reasoning to a question' or 'arriving at a question' that is of interest in this study, since I want to reveal the reasoning that is going on in the divinatory practices. The 'arriving at a question' can be seen as 'arriving at a conclusion': based on a set of premises, the questioner performs some thought processes and arrives at a question. Wiśniewski [14, 15] developed Inferential Erotetic Logic (IEL) to study inferences in which questions perform the role of conclusions. He defines an erotetic inference as "a thought process in which we arrive at a question on the basis of some previously accepted declarative sentences and/or a previously posed question" [15, p.3]. Since IEL gives us the opportunity to study how diviners 'reason to' a question (how they use answers to previous questions as well as the rules from their knowledgebase) it is a promising candidate for modelling divinatory practice. In this section, I will elaborate on the syntax and semantics of IEL.

3.1 The syntax of IEL

First of all, I will introduce the basic terminology and notation according to Wiśniewski [14, pp.34-37]. Let J be an arbitrary fixed first-order language with identity. Let N be the set of positive integers. The vocabulary of the language J contains the logical constants: $\neg$ (negation), $\rightarrow$ (implication), $\vee$ (disjunction), $\wedge$ (conjunction), $\equiv$ (equivalence), $\forall$ (universal quantifier), $\exists$ (existential quantifier), and the identity symbol $=$. Furthermore the vocabulary of J contains an infinite list of individual variables $x_1, x_2, ...$, an infinite list of individual constants $a_1, a_2, ...$ and for each $n \in N$, an infinite list of n-place predicate symbols $P_1^n, P_2^n...$ and an infinite list of n-argument function symbols $F_1^n, F_2^n....$. In addition, the vocabulary of J contains the auxiliary symbols (,) (parentheses) and , (comma). Now we have presented the basic vocabulary, several basic syntactic concepts need to be introduced:

- By an *expression* of J we mean any finite sequence of the symbols written above.

- The set of *terms* of the language J is the smallest set which contains all the individual variables of J together with all the individual constants of J and fulfills the following condition: if $t_1, ..., t_n$ are terms of J, then an expression of the form $F_i^n(t_1, ..., t_n)$, where F_i^n is a function symbol of J, is also a term of J.

- A *closed term*, or *name*, is a term with no individual variables.

- *Atomic formulas* of J are expressions of J of the form $t_1 = t_2$ and of the form $P_i^n(t_1, ..., t_n)$ where $t_1, t_2..., t_n$ are terms.

- The set Γ_J of *declarative well-formed formulas* (d-wffs) of the language J is the smallest set containing all the atomic formulas of J and having the following properties: (a) if A is in Γ_J, then expressions of the form $\neg A$, $\forall x_i A$, $\exists x_i A$ are also in Γ_J; (b) if A, B are in Γ_J, then expressions of the form $(A \rightarrow B)$, $(A \vee B)$, $(A \wedge B)$, $(A \equiv B)$ are also in Γ_J.

- The d-wffs not containing free variables are called *sentences*.

- The d-wffs containing free variables are called *sentential functions*.

Each subset of the vocabulary of the language J which contains the connectives $\neg$ and $\rightarrow$, the universal quantifier $\forall$, both parentheses, all individual variables, at least one predicate symbol, the identity symbol $=$ and possible some other signs, such as other predicate symbol(s), the connectives $\vee$, $\wedge$, $\equiv$, the quantifier $\exists$, individual constant(s), function symbol(s) or the comma will be called here a *first-order language with identity*. The concepts of term, closed term, atomic formula, declarative well-formed formula, sentence and sentential function, as well as the remaining syntactic concepts are defined for J in the same way as for any first-order language with identity.

Before we can define questions in IEL in syntactic terms, we need to add some signs to the vocabulary according to Wiśniewski [14, p.71]. Amongst them are the *erotetic constants*: the symbols $?, \{\}, S, O, U, W, T$. Other signs we need to add are the technical signs: $|$ (stroke) and ,(comma). We will define the concept of question for some class of formalized languages, namely the class consisting of:

(a) first-order languages with identity enriched with the erotetic constants $?$ and $\{\}$;

(b) first-order languages with identity whose vocabularies contain infinitely many closed terms[3], enriched with: the erotetic constants ? and {}, at least one of the following constants: S, O, U, W, T, and, if necessary, the technical sign | (stroke);

(c) first-order languages with identity whose vocabularies contain at least two closed terms and some unary predicate symbols which perform the role of category qualifiers, enriched with: the erotetic constants ? and {}, at least one of the following erotetic constants: S, O, U, and the technical signs [,] (square brackets), / (slash).

Let $\mathscr{L}$ be an arbitrary but fixed language for which we want to define here the concept of question, that is, an arbitrary but fixed language which fulfills at least one of the conditions (a), (b) and (c) above.

A *question of the first kind* of the language $\mathscr{L}$ is an expression of the form ? $\{A_1, ..., A_n\}$ where $n > 1$ and $A_1, ..., A_n$ are syntactically distinct sentences of $\mathscr{L}$ [14, p. 72]. If ? $\{A_1, ..., A_n\}$ is a question of the first kind, then the sentences $A_1, ..., A_n$ are called *direct answers* to the question. Note that each question of the first kind has at least two direct answers, because $n > 1$. The set of all direct answers to a question Q is denoted by dQ [14, p.101]. The following question is an example of a question of the first kind: "Is it raining, is it snowing or is it dry outside?". Using a propositional language and interpreting the disjunction as an exclusive one, this can be modelled as ? $\{r, s, d\}$ where r :=it is raining outside, s :=it is snowing outside and d :=it is dry outside. Note that the three direct answers to the question are r, s and d.

Since the rules of Mambila spider divination and the rules in McHugh's experiment only allow for questions with two direct answers, my study will be restricted to questions of the form ? $\{A_1, A_2\}$. A commonly used type of question of this form is a "yes-no question". There are several different types of such "yes-no questions" [14, pp.73-74]:

- *Simple yes-no questions*, which are of the form ? $\{A, \neg A\}$, where A is a sentence. This can be read "Is it the case that A?". An example is the question "Do all polar bears live in the North Pole region?". Using a first-order predicate language, this question can be modelled as

---

[3]This means that among the signs of the language there are: (a) infinitely (denumerably) many individual constants, or (b) at least one function symbol and at least one individual constant [14, p.71].

$? \{\forall x(P(x) \to N(x)), \neg\forall x(P(x) \to N(x))\}$ where $P(x) := x$ is a polar bear and $N(x) := x$ lives in the North Pole region.

- *Focussed yes-no questions*, of the form $? \{A(x_i/u), \exists x_i(Ax_i \land x_i \neq u)\}$, where Ax_i is a sentential function with x_i as the only free variable and u is a closed term. This can be read "Is it u that fulfills the condition Ax_i?". An example of a focussed yes-no question is "Is it Luc that has sent me this Valentine's card?" Using a first-order predicate language, this question could be modelled as $? \{V(l), \exists x(V(x) \land x \neq l\}$ where $V(x) := x$ has sent me this Valentine's card and l is the constant that represents Luc. Note that both the way a question is asked and the context can influence whether a question is interpreted as a simple yes-no question or as a focussed yes-no question. The interpretation of the example above is straightforward, but the question "Has Luc sent me this Valentine's card?" can be interpreted in different ways. When the question is uttered in spoken language, the intonation "Has *Luc* sent me this Valentine's card?" gives the same interpretation as the example above, whereas "Has Luc sent me *this* Valentine's card?" is interpreted as the focussed yes-no question "Is it this Valentine's card that has been sent by Luc?". Since the divinatory data of the experiment is written, I do not know the intonation of the questions of the students.[4] However, a lot of contextual information is provided, which helps us interpreting the questions. Suppose that some student participating in the experiment of McHugh tells the student counsellor that his problem is that he has so many girlfriends and that he needs to choose between them. He has received just one Valentine's card and he wants to know who has sent this to him, since this knowledge could affect his decision. In the light of this information "Has Amy sent me this valentine's card?" is interpreted as "Is it Amy that has sent me this valentine's card?".

- *Conditional yes-no questions*, which are of the form $? \{A \land B, A \land \neg B\}$, where A and B are sentences. This can be read "Given that it is the case that A, is it also the case that B?". An example of a conditional yes-no question is "Given that it is snowing outside, is the outside temperature

---

[4]The problem of 'not knowing the intonation' does not hold for the data on Mambila spider divination, because Mambila is a tone language. Therefore, emphasis is established not through intonation but grammatically.

below zero?". Using a propositional language, this can be modelled as $? \{s \wedge b, s \wedge \neg b\}$ where $s :=$ it is snowing outside and $b :=$ the outside temperature is below zero. In this example, the conditional aspect is very clear. However, there are other examples where the conditionality is "hidden". Take for example the question "Has it stopped raining?", where the possible answers are "It has been raining and it has stopped" and "It has been raining and it has not stopped". Another example is the question "Will the polar bear population continue to exist although the ice caps are melting?", where the possible answers are "The ice caps are melting and the polar bear population will continue to exist" and "The ice caps are melting and the polar bear population will not continue to exist".

3.2   The semantics of IEL

First, the basic semantic concepts of IEL will be introduced as they are written by Wiśniewski [14, pp.102-104]. Then, I will present the semantic concepts of IEL that concern binary questions[5]. The semantic concepts defined in this paragraph concern any of the formalized languages for which in the previous chapter the concept of question is defined.

Definition 3.1. An interpretation of the language $\mathscr{L}$ is an ordered pair $\langle M, f \rangle$ where M is a non-empty set and f is a function defined on the set of non-logical constants of $\mathscr{L}$ which fulfills the following conditions:

- for each individual constant a_i, $f(a_i) \in M$,

- for each function symbol F_i^n, $f(F_i^n)$ is a n-argument function defined on the set M and whose values belong to the set M,

- for each predicate symbol P_i^n, $f(P_i^n)$ is a n-ary relation in M.

If $\langle M, f \rangle$ is an interpretation, the set M is called the domain of this interpretation, whereas the function f is called the *interpretation function*. For interpretations the symbols $\mathscr{I}$, $\mathscr{I}'$ are used.

Let $\mathscr{I} = \langle M, f \rangle$ be an arbitrary but fixed interpretation of $\mathscr{L}$. A $\mathscr{I}$-*valuation* is a denumerable sequence of elements of the domain of the interpretation $\mathscr{I}$. Let s be an arbitrary but fixed $\mathscr{I}$-valuation. Let us designate

---

[5]Note that we only need to study this restricted part of the semantics of IEL, because the divinatory data does not consist of questions other than binary questions.

by s_i the ith element of sequence s. The concept of value of a term t in the interpretation $\mathscr{I}$ with respect to the $\mathscr{I}$-valuation s (in symbols: $t^{\mathscr{I}}[s]$) is defined by:

Definition 3.2.

- for each $i \in N$, $x_i^{\mathscr{I}}[s] = s_i$.

- for each individual constant a_i, $a_i^{\mathscr{I}}[s] = f(a_i)$.

- for each function symbol F_i^n, for any terms $t_1, ... t_n$, $F_i^n(t_1, ..., t_n)^{\mathscr{I}}[s] = f(F_i^n)(t_1^{\mathscr{I}}[s], ..., t_n^{\mathscr{I}}[s]$

The concept of *satisfaction* of a d-wff A in the interpretation $\mathscr{I}$ by the $\mathscr{I}$-valuation s (symbolically: $\mathscr{I} \models A[s]$) is defined as follows.

Definition 3.3.

- If A is of the form $P_i^n(t_1, ..., t_n)$, then: $\mathscr{I} \models P_i^n(t_1, ..., t_n)[s]$ iff $f(P_i^n)(t_1^{\mathscr{I}}, ... t_n^{\mathscr{I}})$.

- If A is of the form $t_1 = t_2$, then: $\mathscr{I} \models t_1 = t_2[s]$ iff $t_1^{\mathscr{I}}[s] = t_2^{\mathscr{I}}[s]$.

- If A is of the form $\neg B$, then $\mathscr{I} \models \neg B[s]$ iff not $\mathscr{I} \models B[s]$.

- If A is of the form $(B \to C)$, then: $\mathscr{I} \models (B \to C)$ iff $\mathscr{I} \models C[s]$ or not $\mathscr{I} \models B[s]$.

- If A is of the form $(B \vee C)$, then: $\mathscr{I} \models (B \vee C)[s]$ iff $\mathscr{I} \models B[s]$ or $\mathscr{I} \models C[s]$.

- If A is of the form $(B \wedge C)$, then: $\mathscr{I} \models (B \wedge C)[s]$ iff $\mathscr{I} \models B[s]$ and $\mathscr{I} \models C[s]$.

- If A is of the form $(B \equiv C)$, then: $\mathscr{I} \models (B \equiv C)[s]$ iff $\mathscr{I} \models B[s]$ if, and only if, $\mathscr{I} \models C[s]$.

- If A is of the form $\exists x_i B$, then: $\mathscr{I} \models \exists x_i B[s]$ iff there exists a $\mathscr{I}$-valuation s' that differs from s in at most its ith element such that $\mathscr{I} \models B[s']$.

- If A is of the form $\forall x_i B$, then: $\mathscr{I} \models \forall x_i B[s]$ iff for each $\mathscr{I}$-valuation s' that differs from s in at most its ith element, $\mathscr{I} \models B[s']$.

Given this concept of satisfaction, we can define the concept of truth of a d-wff in a given interpretation of the language as follows.

Definition 3.4. A d-wff A is *true in an interpretation* $\mathscr{I}$ iff for each $\mathscr{I}$-valuation s, $\mathscr{I} \models A[s]$.

If a d-wff A is true in $\mathscr{I}$, we write $\mathscr{I} \models A$. If a d-wff A is not true in $\mathscr{I}$, we write $\mathscr{I} \, non \models A$.

By a model of a set of d-wffs X we mean any interpretation of the language in which all the d-wffs in X are true. If an interpretation $\mathscr{I}$ is a model of a set of d-wffs X, we write $\mathscr{I} \models X$. If an interpretation $\mathscr{I}$ is not a model of a set of d-wffs X, we write $\mathscr{I} \, non \models X$.

So far I have reproduced the basic semantic concepts of IEL as written by Wiśniewski. Before we continue with the semantic concepts of IEL that concern (yes-no) questions, it must be noted that Wiśniewski distuinguishes normal interpretations from the remaining ones. He writes: "It seems natural to call normal interpretations only those interpretations in which each element of the domain has a name: by doing so we can avoid the situation that there are objects which satisfy the appropriate sentential function(s), but nevertheless the analyzed questions have no true direct answers" [14, p.105]. Wiśniewski does not define the general concept of "normallness" of interpretation, since this concept varies from language to language. However, he assumes that concerning language $\mathscr{L}$ the class of normal interpretations exists and is non-empty [14, p.105].

Wiśniewski works with the concept of *entailment in a language*, that he defines as follows.

Definition 3.5. A set of declarative well-formed formulas (d-wffs) X of $\mathscr{L}$ *entails in* $\mathscr{L}$ a d-wff A of $\mathscr{L}$ iff A is true in each normal interpretation of $\mathscr{L}$ in which all the d-wffs in X are true. [14, p.106]

We will use the symbol $\models$ for entailment in a language. As a generalization of this concept of entailment, Wiśniewski introduces the concept of *multiple-conclusion entailment* or, simply, mc-entailment. The definition of this concept is quoted below.

Definition 3.6. A set of d-wffs X of $\mathscr{L}$ *multiple-conclusion entails in* $\mathscr{L}$ a set of d-wffs Y of $\mathscr{L}$ iff the following condition holds: (*) whenever all the d-wffs in X are true in some normal interpretation of $\mathscr{L}$, then there exists at least one d-wff in Y which is true in this interpretation of $\mathscr{L}$. [14, p.108]

For multiple-conclusion entailment we will use the symbol $\|\!\models$.

IEL does not assign truth and falsity to questions. Instead, the more neutral semantic concept of *soundness* of a question in a given interpretation of a language is used. Below I will quote Wiśniewski's definition of this concept.

Definition 3.7. A question Q of $\mathscr{L}$ is *sound in an interpretation $\mathscr{I}$ of the language $\mathscr{L}$* iff at least one direct answer to Q is true in $\mathscr{I}$ [14, p.113]

Simple yes-no questions, of the form $?\{A, \neg A\}$, are always sound. We can even say something stronger, namely that they are always *safe*: a simple yes-no question of some language is sound in *each* normal interpretation of the language [14, p.113]. For, in any interpretation, according to the law of the excluded middle either A is the case or $\neg A$ is the case. If we take the example "Do all polar bears live in the North Pole region?" either all polar bears live in the North Pole region or not. Focussed yes-no questions, of the form $?\{A(x_i/u), \exists x_i(Ax_i \wedge x_i \neq u)\}$, are not always safe. For example, the focussed yes-no question "Will it be Luc who is the first to congratulate me with receiving my master's degree?" may have no true direct answers. For, if I never receive my master's degree, no one will be the first to congratulate me. However, since in some interpretation I will receive my master's degree, it is still a sound question. But focussed yes-no questions are not always sound either. For example, if we consider the focussed yes-no question "Was it Obama who won the presidential election of the United States in the year 2010?" there is not even a single interpretation in which there is a true direct answer, since there was no presidential election in 2010. Hence, this is not a sound question. Conditional yes-no questions $?\{A \wedge B, A \wedge \neg B\}$ can also be unsafe and even unsound. If it is the case that $\neg A$, then there is no true direct answer. For example, consider the conditional question "Will Anne and I remain friends although I will move to Argentina next year?" This may have no true direct answers, since in at least some interpretation I will not move to Argentina next year. I might have the intention to move, but we do not know if it is really going to happen. Still, the question is sound, because in at least *some* interpretation I will move to Argentina, and then either Anne and I will remain friends or we will not. However, if we consider the conditional question "Given that Obama won the presidential election of the United States in the year 2013, is he the most influential man at present?" we must conclude that it is not sound. For, there was no presidential election in 2013 and therefore there cannot be a true direct answer to the question.

Another important concept is that of *presupposition* of a question, whose truth is necessary for the soundness of the question. The definition is quoted below.

Definition 3.8. A d-wff A of $\mathscr{L}$ is a *presupposition* of a question Q of $\mathscr{L}$ iff A is entailed in $\mathscr{L}$ by each direct answer to Q. [14, p.115]

For example, "John had dinner today" is a presupposition of the question "Did John eat chicken or pork for dinner today?" since the truth of "John had dinner today" is necessary for the existence of a true direct answer to the question. If John did not have dinner, he certainly did not have chicken or pork for dinner. The set of presuppositions of a question Q is denoted by $PresQ$. When the truth of some presupposition is not only a necessary, but also a sufficient condition for the soundness of the question, we speak of a *prospective presupposition*. Wiśniewski provides us with the following definition.

Definition 3.9. A presupposition A of a question Q of $\mathscr{L}$ is a *prospective presupposition* of Q iff A mc-entails in $\mathscr{L}$ the set of direct answers to Q. [14, p.115]

For example, "Mary has been to the dentist" is a prospective presupposition of the question "Will Mary return to the dentist?" since the truth of the former statement is not only necessary but also sufficient for the existence of a true direct answer to the question. If Mary has been to the dentist, she either will return or she will not. Note that this example is a conditional yes-no question, just like the question "Has it stopped raining?" that I have used as an example earlier. It holds that for any conditional yes-no question, of the form $?\{A \wedge B, A \wedge \neg B\}$, A is a prospective presupposition. The truth of A is necessary and sufficient for the existence of a true direct answer to the question. The set of prospective presuppositions of a question Q is denoted by $PPresQ$.

Wiśniewski distinguishes between erotetic inferences whose premises are only declarative sentences and erotetic inferences whose premises are a question and possibly declarative sentence(s). In both cases the question should be seen as the conclusion of the inference. For the former type of inferences he developed the semantic concept of *evocation of a question by a set of declarative formulas* and for the latter type of inferences he developed the semantic concept of *erotetic implication*. For studying divinatory practice

the former concept is of importance, since the operators of divination reason to questions on the basis of answers that have been given before by the oracle as well as on the basis of their own knowledge. Therefore I will present the definitions of this concept below.

Definition 3.10. A question Q is evoked by a set of d-wffs X, or $E(X, Q)$, iff

  i $X \models dQ$ and

  ii for each $A \in dQ$, $X \ non \models A$. [14, p.127]

By using definition 3.5, we know that condition (i) is fulfilled if and only if Q is sound in each normal interpretation of the language in which all the d-wffs in X are true. Condition (ii) is fulfilled if and only if no direct answer to Q is entailed by X [14, p.128]. If $E(X, Q)$ then we call X the evoking set and Q the evoked question.

    What does it mean for a question to be evoked? The first condition states that there is no other possible direct answer to the question. For example the question "Will Federer win Wimbledon 2017, will Nadal win Wimbledon 2017 or will Djokovic win Wimbledon 2017?"[6] does not satisfy the first clause for Murray could also win. If, however, we already know that Federer and Nadal are in the final, than this question does contain all possible answers and satisfies the first clause. The second condition states that the truth of no direct answer could already be deducted from the knowledgebase. In the example above it is given that Djokovic is not in the final (because we know that Federer and Nadal are in the final) so we already know that this direct answer is false, hence the question does not satisfy the second clause. However, if this question was asked without the knowledge that Federer and Nadal are in the final, then it would satisfy the second clause. One could say that an evoked question is a question that can always be answered correctly and has no redundant answers.

---

[6]Note that this question would be written down in Erotetic Logic as follows: ?{Federer will win Wimbledon 2017, Nadal will win Wimbledon 2017, Djokovic will win Wimbledon 2017}.

4   The modelling language $\mathscr{L}*$

We are now in the position to choose an appropriate language for modelling divination, taking into regard that IEL works with all first-order languages with identity and the erotetic constants ? and {}.

The language we will use for modelling divination, from now on $\mathscr{L}*$, is a modified first-order version of the situation calculus of Reiter [9] with identity and first-order yes-no questions. The alphabet consists of the standard alphabet of logical symbols and the following alphabet of situation calculus, which is a modified version of the alphabet presented by Reiter [9, pp.47-48]:

- Constant symbols of sort *object*, for example f which stands for "father".

- A constant symbol of sort *context*, namely c_0, denoting the initial context.

- Countably infinitely many individual variable symbols. We will use c and a for variables of sort *context* and *actiontype*, respectively. Letters x, y and z are used for variables of sort *object*.

- A binary function symbol $do : actiontype \times context \rightarrow actiontoken$. which is interpreted as follows:

  Definition 4.1. $do(a, c) :=$ the performance of action a in context c.

- A predicate symbol DO which takes the do-function as its argument and which is interpreted as follows:

  Definition 4.2. $DO(do(a, c)) :=$ perform action a in context c.

- A binary predicate symbol $result : actiontype \times context$ of which the interpretation is:

  Definition 4.3. $result(do(a, c), c') :=$ the context after performance of action a in context c is c'.

- For each $n > 0$, countably infinitely many context-independent predicate symbols with arity n. These do not have c as a parameter. An example is $fof(x)$ which stands for "the father of x".

- For each $n > 0$, countably infinitely many context-dependent predicate symbols with arity n. These do have c as a parameter. An example is *unhap*(x, c) which stands for "x is unhappy in context c".

- For each $n > 0$, countably infinitely many actiontypes with arity n, which appear as arguments in the *do*-function and whose instantiations (actiontokens) are the output of the *do*-function. An example is $P(x)$ which stands for "x pays interest".

- A binary predicate symbol $\nabla : context \times context$, representing a partial ordering relation on contexts.

- The erotetic constants ? and {} which have been introduced earlier in this chapter.

Given the above defined modelling language, we can use Definition 3.10 to create a new theorem regarding evocation of a question in our language $\mathscr{L}*$. I will use the symbol $E_{\mathscr{L}*}$ for evocation in $\mathscr{L}*$, and the symbols $\models_{\mathscr{L}*}$ and $\parallel\!\!\models_{\mathscr{L}*}$ for entailment and mc-entailment in $\mathscr{L}*$. Since we only deal with binary questions, the following theorem holds:

Theorem 4.1. $E_{\mathscr{L}*}(X, ?\{A_1, A_2\})$ *iff*

   i $X \models_{\mathscr{L}*} A_1 \vee A_2$, *and*

   ii $X \ non \models_{\mathscr{L}*} A_1 \ \wedge \ X \ non \models_{\mathscr{L}*} A_2$

The proof is a specific case of Wiśniewski's proof of his "theorem 5.30" [14, p.141].

We can use Theorem 4.1 to check whether some specific binary question of a divinatory client is evoked according to IEL. As mentioned in the previous chapter, simple yes-no questions are always safe and thus satisfy clause i). The same does not hold for all other binary questions; it depends on the question and on the knowledgebase. However, before we can start analyzing divination according to IEL, the divinatory data need to be formalized. This is what I will do in the next two sections.

5   Divinatory practice in the laboratory

Before we can use Theorem 4.1 in order to check whether some specific yes-no question of a divinatory client is evoked according to IEL, the divinatory data need to be formalized. In this section I will consider the data of an experiment reported by McHugh (1968) [8] and Garfinkel (1984) [4] that are quoted in Appendix I. However, first of all I will provide a brief explanation of this experiment.

5.1   The experiment of McHugh

The subjects of McHugh's experiment are university students who are asked to test a method of "giving persons advice about their personal problems" that is less complicated and time-consuming than psychotherapy. Each subject is told to first provide background information about the problem on which he or she would like advice, and then ask about ten questions that can be answered only "yes" or "no". The experimenter, who is presented as "a student counsellor in training", answers the questions from another room through an intercom. The subject does not know that these answers are predetermined and would be the same regardless of the question asked. After receiving an answer, the subject shuts off the intercom and explains how he or she understands the answer without the experimenter hearing these comments. When the subject wants to ask another question, he or she puts the intercom on again. After ten questions have been asked and answered, the subject summarizes what he or she has learned from the session [8, p.66, p.78] [4, pp.79-80].

McHugh performs the experiment on thirty subjects and the different subjects receive answers according to a different table of random numbers, with different proportions of yeses and noes. Some subjects get fifty-fifty splits and others get only yeses or only noes. When new responses contradict answers given earlier in the experiment, the subject may wonder about the legitimacy of the experimenter and/or the experiment. Doubts about the legitimacy of the experimenter and/or the experiment may not only be caused by contradictory responses, but also by disproportionate yeses and noes [8, p.68].

In each of the following three paragraphs, I will formalize one part of one dialogue that is quoted in Appendix I, using IEL and the language $\mathscr{L}*$.

5.2 Formalization of Dialogue A

The subject (S) of dialogue A is a student who needs money in order to finance certain investments in stocks, insurance, a loan and a car. He asks the counsellor, who is in fact the experimenter (E), ten questions. A specific part of the dialogue, consisting of three questions and answers, is shown below.

> **S:** I can do a lot of things: loans, installments, that sort of thing. What should I do?
> Do you think a bank loan is a wise course of action?
> **E:** No.
> **S:** I assume you're opposed to debt or loaning money from banks. I might assume you're opposed to my loaning from a bank. Banks really collect the interest, and they make money on you. I agree with that; by the time the interest is paid off, you've spent a lot of money. It's a good idea to be leery of banks. Get somebody else's opinion but watch out for banks. But where to get the money? It has to come from somewhere. Maybe the insurance companies.
> What about an insurance company? Would that be wise?
> **E:** No.
> **S:** Hmm. Not an insurance company, huh? Well, I don't know what to say. No bank, no insurance company. What's the reasoning here? He says no bank loan and then doesn't think insurance companies are good either. Maybe he's the kind of person who doesn't believe in loans. Loans aren't too smart sometimes, since no matter where you get the money there's going to be interest. Unless a friend gives it to you without asking for any extra. If I could get that kind of bargain—maybe from my father.
> Do you think I should approach my father about the loan?
> **E:** Yes.
> **S:** That's it, you think I should approach my father about it because a relative wouldn't ask for a loan with interest if he had the money to begin with. This way it would be possible to have more for the same amount of money. I could get more stocks or a better car. Or I could have the same thing for less money. I shouldn't get the money from banks or insurance companies, but from a relative because you get more that way.

Before I will formalize the student's questions and the counsellor's answers, I will formalize the information that must be in the student's knowledgebase for him to reason. That information consists of the following knowledgebase rules:

KA1a: If someone needs money, he should get a loan.
$\forall x(needmoney(x) \rightarrow \exists y(DO(do(l(x,y),c))))$ where
$needmoney(x) := x$ needs money,
$l(x,y) := x$ loans from y.
KA1b: Someone should not loan from more than one unique financial intermediary
$\forall x\big((DO(do(l(x,y),c)) \wedge DO(do(l(x,z),c)) \wedge y \neq z) \rightarrow \bot\big)$
KA1c: The student needs money.
$needmoney(S)$ where $S :=$ the student

I will now rephrase and formalize the questions (QA1, QA2, QA3) and answers (AA1, AA2, AA3) of the dialogue. Note that, at several points in the dialogue, the subject adds rules (respectively KA2, KA3 and KA4) to his knowledgebase[7], which he immediately uses to reason further.

QA1: Should I loan money from a bank?
$?\{DO(do(l(S,B),c)), \neg DO(do(l(S,B),c))\}$ where:
$B :=$ the bank,
AA1: No. $\neg DO(do(l(S,B),c))$

KA2: As a result of loaning from a bank, one has to pay interest.
$\forall x(result(do(l(x,B),c)) \rightarrow \forall c' \nabla c\ DO(do(P(x),c')))$ where
$P(x) := x$ pays interest.

QA2. Should I loan money from an insurance company?
$?\{DO(do(l(S,I),c)), \neg DO(do(l(S,I),c))\}$ where:
$I :=$ the insurance company,
AA2: No. $\neg DO(do(l(S,I),c))$

KA3: As a result of loaning from an insurance company, one has to pay

---

[7]We could argue that the student does not add these rules to his knowledgebase, but that he recalls them. The knowledge was already there, but the student became aware.

interest.

$\forall x (result(do(l(x, I), c)) \rightarrow \forall c' \nabla c\ DO(do(P(x), c')))$

KA4: As a result of loaning from a friend or family member, one does not have to pay interest.

$\forall x \forall y \big((result(do(l(x, y), c)) \wedge F(x, y)) \rightarrow \forall c' \nabla c\ \neg DO(do(P(x), c'))\big)$ where, $F(x, y) := y$ is a friend or family member of x

QA3. Should I loan money from my father?

$?\{DO(do(l(S, fof(S)), c)), \exists x (DO(do(l(S, x), c)) \wedge F(S, x) \wedge x \neq fof(S))\}$ where $fof(x) :=$ the father of x.

AA3: Yes. $DO(do(l(S, fof(S)), c))$

5.3   Formalization of Dialogue B

The subject (S) of dialogue B is a Jewish student who has been dating a Gentile girl for several months. Although his father has never said directly that he is opposed to his son dating a Gentile girl, the subject feels that father is not very pleased with the situation. He asks the counsellor, or experimenter (E), ten questions about the situation. The first two questions and answers are presented below.

> **S**: My question is, do you feel under the present circumstances that I should continue or stop dating this girl? Let me put that in a positive way. Do you feel that I should continue dating this girl?
>
> **E:** My answer is no.
>
> **S:** No. Well, that is kind of interesting. I kinda feel that there is really no great animosity between Dad and I but, well, perhaps he feels that greater dislike will grow out of this. I suppose or maybe it is easier for an outsider to see certain things that I am blind to at this moment.
> I would like to ask my second question now.
>
> **E:** Okay.
>
> **S:** Do you feel that I should have a further discussion with Dad about this situation or not? Should I have further discussion with Dad over this subject about dating the Gentile girl?
>
> **E:** My answer is yes.
>
> **S:** Well I feel that is reasonable but I really don't know what to

say to him. I mean he seems to be not really too understanding. In other words he seems to be afraid really to discuss the situation. I mean at least it appears that way to me so far. But I guess if it is worthwhile to me, if I really want to continue to date her that I will go on and have this discussion with Dad. I really don't know what to say because I mean I am dating her. I am not in love with her or anything but I really never know what is going to come out. I guess we should have a discussion based on what the future possibilities might be and how he would feel about that. He may not be too strongly opposed now because we are only dating, but perhaps he sees future complications that he would really like to get off his chest at the moment.

Like in the previous dialogue I will first formalize the knowledgebase information:

KB1a. If some Jewish boy dates a Gentile girl, his father is unhappy about it.
$\forall x \forall y (jewboy(x) \wedge gengirl(y) \wedge DO(do(date(x,y),c)) \rightarrow \forall c' \nabla c \; unhap(fof(x),c'))$
where
$jewboy(x) := x$ is a Jewish boy,
$gengirl(x) := x$ is a Gentile girl,
$date(x,y) := x$ dates with y,
$unhap(x,c) := x$ is unhappy under circumstances c.
KB1b. The Jewish student is dating with a Gentile girl.
$jewboy(S) \wedge gengirl(G) \wedge DO(do(date(S,G),c))$ where
$G :=$ the girl whom the student is dating with.
As a result from *KB1a.* and *KB1b.* the father of S is unhappy.
KB1c. $DO(do(date(S,G),c)) \rightarrow \forall c' \nabla c \; unhap(fof(S,c'))$

Next, I will rephrase and formalize the questions (QB1, QB2) and answers (AB1, AB2) of the dialogue, as well as a rule and an abnormality added to the knowledgebase during the conversation (respectively KB2 and KB3).

QB1: Given that father is unhappy about the girl I am dating with, should I continue dating her?
$?\{unhap(fof(x),c') \wedge DO(do(contdate(S,G),c')),$
$unhap(fof(x),c') \wedge \neg DO(do(contdate(S,G),c'))\}$ where
$contdate(x,y) := x$ continues dating with y.

AB1: No. $unhap(fof(x), c') \wedge \neg DO(do(contdate(S, G), c'))$

KB2. If some boy dates a girl and his father is unhappy about it, and nothing is abnormal, he should not continue dating her.
$\forall x \forall y \big((DO(do(date(x, y), c)) \wedge \forall c' \nabla c\ unhap(fof(x), c') \wedge \neg ab) \rightarrow \neg DO(do(contdate(x, y), c')) \big)$

QB2. Should I have a discussion with my father about dating the Gentile girl?
$?\{ \big(DO(do(D(S, fof(S), G), c)) \wedge DO(do(contdate(x, y), c)) \big),$
$\neg \big(DO(do(D(S, fof(S), G), c)) \wedge DO(do(contdate(x, y), c)) \big) \}$ where
$D(x, y, z) := x$ and y have a discussion about G.
AB2: Yes. $\big(DO(do(D(S, fof(S), G), c)) \wedge DO(do(contdate(x, y), c)) \big)$

KB3. Abnormality for KB2: the boy has no future plans with the girl.
$ab = \neg fp(S, G)$ where
$fp(x, y) := x$ has no future plans with y.

Note that this transforms rule *KB2.* into:
$\forall x \forall y \big((DO(do(date(x, y), c)) \wedge \forall c' \nabla c\ unhap(fof(x), c') \wedge fp(x, y)) \rightarrow \neg DO(do(contdate(x, y), c')) \big)$

5.4 Formalization of Dialogue C

The subject (S) of dialogue C is a physics student who has to make up a deficit in grade points in order to get his degree. He asks the counsellor, or the experimenter (E), twelve questions. Two parts of the dialogue are shown below. The first part consists of three questions and answers, the second part consists of two questions and answers.

> **S:** Do you think I could get a degree in physics on the basis of this knowledge that I must take Physics 124?
> **E:** My answer is yes.
> **S:** He says yes. I don't see how I can. I am not that good of a theorist. My study habits are horrible. My reading speed is bad, and I don't spend enough time in studying.
> Do you think that I could successfully improve my study habits?
> **E:** My answer is yes.

S: He says that I can successfully improve my study habits. I have been preached to all along on how to study properly, but I don't study properly. I don't have sufficient incentive to go through physics or do I?
Do you think I have sufficient incentive to get a degree in physics?
E: My answer is yes.

...

S: Do you think I can develop sufficiently good study habits and incentive to actually achieve developing those habits such that I wouldn't have to stay up late at night and not get the work done in the first place?
E: My answer is no.
S: He says no. I can't develop the study habits properly to be able to pull myself through. If you don't think that I can develop the proper study habits and carry them through to reach my goal do you on the basis of this still believe that I can get a degree in physics?
E: My answer is no.

Again, I will first formalize the knowledgebase information:

KC1. If someone is a student with a deficit in grade points but with sufficient incentive and the ability to improve his study habits, and nothing is abnormal, he could get a degree.
$\forall x (\mathit{def}(x) \wedge \mathit{si}(x) \wedge \exists c\ DO(do(\mathit{ish}(x), c)) \wedge \neg ab \rightarrow \exists c' \nabla c\ \mathit{deg}(x, c'))$
where $\mathit{def}(x) := x$ has a deficit in grade points,
$\mathit{si}(x) := x$ has sufficient incentive,
$\mathit{ish}(x) := x$ sufficiently improves his study habits,
$\mathit{deg}(x, c) := x$ has a degree under circumstances c.
KC2. In order to get a degree in physics, one has to pass Physics 124.
$\neg p124(x, c) \rightarrow \neg \mathit{deg}(x, c)$
where $p124(x) := x$ passes Physics 124.

I will now rephrase and formalize the questions (QC1, QC2, QC3, QC4, QC5) and answers (AC1, AC2, AC3, AC4, AC5) of the dialogue, as well as an abnormality added to the knowledgebase during the conversation (KC3).

QC1: Given the fact that I need to take Physics 124, could I get my de-

gree in physics?

$?\{DO(do(p124(S),c)) \wedge \exists c' \nabla c\ deg(S,c'),$
$\neg\big(DO(do(p124(S),c)) \wedge \exists c' \nabla c\ deg(S,c')\big)\}$
$AC1$: Yes. $DO(do(p124(S),c)) \wedge \exists c' \nabla c\ deg(S,c')$
$QC2$. Could I successfully improve my study habits?
$?\{\exists c DO(do(ish(S),c)), \neg \exists c DO(do(ish(S),c))\}$
$AC2$: Yes. $\exists c DO(do(ish(S),c))$
$QC3$. Do I have sufficient incentive to get a degree in physics?
$?\{si(S), \neg si(S)\}$
$AQ3$: Yes. $si(S)$

...

$QC4$. Could I develop sufficiently good study habits such that I wouldn't have to stay up late at night for studying?
$?\{\exists c\ DO(do(ish(S),c)) \wedge \neg DO(do(sul(S),c)),$
$\exists c\ DO(do(ish(S),c)) \wedge DO(do(sul(S),c))\}$
where $sul(x) := x$ has to stay up late.
$AQ4$: No. $\exists c\ DO(do(ish(S),c)) \wedge DO(do(sul(S),c))$
$QC5$. Given that I cannot develop the proper study habits and carry them through to reach my goal, could I still get a degree in physics?
$?\{\exists c\ DO(do(ish(S),c)) \wedge \neg DO(do(sul(S),c)) \wedge deg(S,c),$
$\exists c\ DO(do(ish(S),c)) \wedge \neg DO(do(sul(S),c)) \wedge \neg deg(S,c)\}$
$AQ5$: No. $\exists c\ DO(do(ish(S),c)) \wedge \neg DO(do(sul(S),c)) \wedge \neg deg(S,c)$

$KC3$. Abnormality for KC1: if the student has a family life but should stay up late at night for studying, he cannot get a degree.
$ab = fl(x)$ where
$fl(x) := x$ has a family life.

Note that this transforms rule KC1. to $\forall x(def(x) \wedge si(x) \wedge \exists c DO(do(ish(x),c)) \wedge \neg fl(x) \rightarrow \exists c' \nabla c\ deg(x,c'))$

6 Divinatory practice in the wild

In the experiment of McHugh, the students are uncertain about what to do in some situation. By answering their yes-no questions, the 'student counsellor' provides them with knowledge they use to make up their minds. This practice resembles divination, which according to Zeitlyn "may be defined loosely as any means by which people gain occult knowledge, which is: knowledge not available from everyday, practical activity and more or less esoteric in object." [20, p.83] The student counsellor can be seen as an oracle by which the students gain such occult knowledge. Of course, the American students participating in the experiment are not familiar with this divinatory practice, like people who practice divination in "the wild". For the adult men of the Mambila community, divination is part of life: they use it to choose new chiefs, as evidence in court, to decide how to cure illness, to choose their wives and to decide whether it is the right moment to undertake a certain journey [20, p.66]. The biggest part of the Mambila community lives in Nigeria (where the spelling "Mambilla" is used). However, I will study Zeitlyn's fieldwork regarding the Mambila in southern Cameroon, more specific regarding the Mambila of the village of Somié on the Tikar Plain. Zeitlyn documented useful data of Mambila spider divination, the type of divination that is seen by the Mambila people as the most reliable of all types of divination. In this section I will explain how Mambila spider divination works and I will formalize parts of Zeitlyn's data.

6.1 Mambila spider divination

In Mambila ηgam is the general term for divination, and spider divination is called $\eta gam\ d\grave{u}$ (literally: "divination from the ground"). This type of divination is either performed by spiders or by land crabs, which are referred to by the same name. In what follows, "spider" therefore refers to either spider or crab. Mambila spider divination is, like all types of divination in the Mambila society, exclusively performed by adult men. Women do not have access to divination, they are not even allowed to witness it.

Before the start of Mambila spider divination, either a spider is dug out of his hole and placed in an abandoned hole or an inhabited spider-hole is located and the area around it is cleared of vegetation [20, p.113]. The hole is covered by an inverted pot. A couple of ritual actions are performed to oficially begin the divination. From that moment the diviner can consult the

spider by asking a binary question and placing several markers, a stick and a stone, together with a set of leaf cards in the pot. The markers are associated by the diviner with alternatives posed in the question. I will quote Zeitlyn's translation of the general form of the question below.

> "My divination, you shape-changer, you witch, if XXXXX then take the stick, my divination.
>
> No, it is not that, not-XXXXX / YYYYY / divine further, then take/bite the stone, my divination." [20, p.115]

It is up to the diviner whether he wants to associate the answer "no" with either the negation of XXXX, which makes it a straightforward yes-no question, or with an element from its contrast set (YYYY), which may be more or less precisely specified [20, p.115], or with the alternative "divine further". This last alternative implicitly means that something evil is involved. The leaf cards usually represent individuals involved. However, according to Zeitlyn, the meanings of these cards are rarely referred to in Mambila divination [20, p.116]. When the spider emerges, it disturbs the markers and the cards, and the resulting pattern determines the spider's answer to the question. It does so in an entirely mechanical way [18, pp.225-229].

In the Mambila society, the results of spider divination are considered as authoritative evidence. Therefore, they are important for the detection of witches. Mambila spider divination is the only type of divination whose results can be used in court, provided that it is carried out by two respected diviners who are not personally involved. Most of the adult men know the principles of interpretation of spider divination, but it takes a long way to gain respect. To become a respected diviner, a beginning diviner has to practice with experienced diviners, who judge the beginner's interpretations by, among others, checking the (non-)occurence of predicted events [18, pp.227]. Even though a respected diviner, outside of the court, usually performs spider divination alone, he cannot easily manipulate the process, since the truthfulness of any particular divination result may be questioned by the participants. In other types of Mambila divination, it is much easier to 'cheat'.

Several specific techniques are used to guarantee the truthfulness of Mambila spider divination, of which I will mention three. First, a question can be repeated in the same pot, transposing the stick and the stone. Second, the diviner may ask a spider whether any witchcraft is attempting to interfere with him. Interestingly, the liar paradox that results if the spider's answer

is "yes" is not recognized by the Mambila as a fallacy [18, p.230]. If such an answer occurs, the spider is simply not used for divination that day. Third, a question can be repeated by using another divination pot at the same time, or by repeating the question several times. If such a "consistency check" leads to a contradiction, Zeitlyn notes, the contradictory result is either taken to be "criticising the question" or explained away [18, p.230]. By using such techniques, and by using inductive tests, diviners check the truthfulness of a spider. Non-truthful spiders are abandoned for a day.

6.2 Divining about illness

For the Mambila, illness is either caused by nature, more precisely by the "supreme god" *Chán* [20, p.63], or by witches. Most illnesses are regarded as caused by nature, or natural, which for the Mambila means that they must be accepted and dealt with. However, when an illness is severe or persistent, divination is consulted in order to find its cause and choose the right course of action. The right course of action depends on whether divination detects witchcraft, and when witchcraft is detected it also depends on whether divination identifies the witch or witches or not.

There are several possible ways to stop witchcraft. Among those are many different treatments, a public declaration and different oaths [20, p.64]. Most important is the *sua*-oath, that is used when divination identifies a person or several persons that could have caused the trouble by witchcraft. Actually, the term "*sua*-oath" is a bit misleading, since it covers a range of related rites. The most important type of *sua* is that performed at the Chief's Palace at the conclusion of the public hearing of the person or persons that has or have been identified as witch by divination. It is this oath which I will refer to with the term "*sua*-oath" or simply with "*sua*". The person that officiates a *sua*-oath, or the sacrificer, needs to meet some requirements [20, p.177]. The oath includes a set of addresses to a bundle of leaves and to a chicken which is placed over them. The addresses consist of paragraphs, which begin with "formulaic paragraph introductions" and end by "clearly defined refrains" [20, p.175], on which Zeitlyn comments as follows.

> The refrain has the form "if I/you/they did evil, may I/you/they eat maize for one day, not two. ("Eating maize for one day, not two" implies a swift death). If not, if innocent, may I/you/they be strong and turn my/your/their eyes to the East." [20, p.175]

All persons involved in the dispute at issue can make an address during *sua*, except for women.[8] During the final refrain the chicken is beheaded by the sacrificer, and subsequently several ritual actions are performed to conclude *sua* [20, pp.176-177]. As we can see from the form of the refrain, *sua* is a "conditional curse". It is believed that **if** the accused person has done or will do evil, he or she will be killed by *sua*. However, as soon as the oath has been taken, nothing more is said about the possible witches at issue. The audience is not interested in what happens to the possible witches. As Zeitlyn quotes, "It is too late to say anything more. The affair is no longer in our hands, it is up to *sua*." [20, p.79] Another oath, *sua kare*, is preferred if divination detects witchcraft but does not identify the witch or witches. It is taken at home to protect the household against witchcraft [20, p.72]. I will not consider other types of *sua* and other oaths, since they are not relevant for my investigation.

The Mambila believe that witches are able to *bury* substances of witchcraft medicine, that will continue to do harm unless they are removed. In the community, some people are well-known for being successful in removing buried medicine. Often, if divination says that "something is buried", Mambila diviners divine further to determine who is the right person to remove the buried substance.

In the rest of this section, I will formalize fragments of two divination sessions about illness. The first fragment can be found in a more schematic way in Table 3 of Appendix II. It results from a divination session in 1987 and is documented by Zeitlyn. The second part is a cut of a long divination session that is shown in Table 4 of Appendix II. This session has been conducted and documented by Zeitlyn in September 2016, together with seven other sessions.[9] Zeitlyn and I have made the table based on the 'rough data' (videos and recordings). However, it is not as 'polished' as the data from 1987; several gaps can be noticed. In the following two paragraphs, I will formalize both the old and the recent fragment using IEL and the language $\mathscr{L}*$.

---

[8]Women are not even allowed to witness the procedure. This holds for any kind of oath in the Mambila community, as well as for any kind of divination that is performed by men.

[9]Four sessions of Mbollo Pierre, two sessions of Suop Sylvestre, one session of Jieh from Njere and one session of Vu Paul have been recorded.

6.3   Formalization of Dialogue D

The fragment that I will study in this paragraph results from a six-hour divination session that was held on the 30th of January 1987 in the presence of Zeitlyn. The session was held in the house of Wajiri Bi, who is a respected diviner living in an outlying hamlet of Somié. When the session starts, Bi and Zeitlyn are the only persons present, and Bi asks some divinatory questions about a money issue concerning Zeitlyn. Shortly after the start of the session, a man called Wong Israel enters Bi's house and together they divine about the main problem at issue: the illness of Wong's daughter. She has malaria and the diviners want to know whether this can be blamed on witchcraft. Furthermore they want to know whether a *sua* oath will protect the girl from further attack. Both Bi and Wong are illiterate.

The set of data that I will study is shown in Table 3 of Appendix II. Of the forty-two questions that are asked during the session, question number thirty-three up to and including question number thirty-eight are presented in the table. These are all questions asked to either pot 1 or pot 2, as is shown in the table. The table also shows the interpreted answers of divination. Below I will repeat the questions and answers in a somewhat different form and I will include useful background information provided by Zeitlyn [17] as well as my first interpretations.

QD1 (pot 1).Will *sua* end the problem or not?
This simple yes-no question is asked to pot 1.

QD2 (pot 2). Will *sua* end the problem or do we have to divine further? / Will *sua* end the problem or do we have to cut *sua kare*?[10]
At the time the diviners ask this question to pot 2, they haven't yet obtained an answer to question *QD1* from pot 1. The first posing of *QD2* is a simple yes-no question. Even though it is formulated a bit differently, the diviners

---

[10]At first, this question was formulated as "Will *sua* end the problem or do we have to divine further?" However, just before inspecting the pot, the question was repeated as follows: "Will *sua* end the problem or do we have to cut *sua kare*?" Since diviners normally repeat the exact same question before inspecting the pot, Zeitlyn suggests that the diviner made a mistake in this case. He might have forgotten his original question [20, p.131]. I have chosen to use both formulations. The first formulation is important, because questions can be seen as conclusions in this study. We want to know how diviners *reason to* questions. However, the second question is important, because this one is used in determining the answer. We will notice this kind of mistakes in Dialogue E as well.

mean the same as in *QD1*. The second formulation, that of the inspection, is not a yes-no question because *sua* and *sua kare* are not the only possible solutions to the problem.

AD2 (pot 2). Sua will end the problem.

QD3 (Pot 2). Will *sua* end the problem or not?
This third question is asked directly after obtaining *AD2*, using the same pot, namely pot 2. The diviners still haven't received an answer to question *QD1*. We can see that question *QD3* is exactly the same simple yes-no question as *QD1*. The answer to QD3 is as follows:
AD3 (pot 2). Sua will not end the problem.
It is clear that this answer contradicts *AD2*, and according to Zeitlyn [17, p.662] it forces the diviners to examine the possibilities that the problem is more complicated. The diviners assume that witchcraft is involved.

QD4 (pot 2). Is there a male witch involved or is there a female witch involved?
The diviners ask this fourth question after obtaining *AD3* but before receiving the answer to *QD1*. It is a conditional yes-no question, because it can be rephrased as: "given that witchcraft is the cause of the problem, is the witch male or female?" The answers is:
AD4 (pot 2). There is a female witch involved.
According to Zeitlyn, this answer was related by the diviners to a quarrel between Wong's wife and his sister about which the diviners asked some questions earlier in the session[11]. The answer *AD4* is enough for the diviners to be sure that the witchcraft is connected with the quarrel. However, since both Wong's wife and his sister swore that they do not want to use witchcraft to win the dispute, the *sua*-oath is taken to be "an appropriate and sufficient course of action" [17, p.662]. In order to check this conclusion, more questions are asked.

QD5 (pot 2). Will *sua* end the problem or is there other witchcraft to be dealt with?
This question, which seems not to be a yes-no question, is asked after obtaining *AD4* but before obtaining the answer to *QD1*. Directly after asking

---

[11]The answers to question number twenty-six and twenty-nine indicate that the problem is connected with the problems among the women in Wong's house [20, p.133].

the question, the answer to *QD1* is obtained.

AD1 (pot 1). Sua will not end the problem.
The diviners see this as an indication that there might be other witchcraft that could not be solved by *sua*. Although the spider of pot 2 has not yet answered *QD5* the diviners decide to ask the spider of pot 1 about other witchcraft.

QD6 (pot 1). Will *sua* end the problem or is there a witchcraft treatment of buried substance that remains active until discovered and destroyed?[12]
From Zeitlyn we learn that in the case of buried witchcraft substances, *sua* does not end the problem, because *sua* may kill a witch, but it cannot destroy the substances that already have been buried by the witch. Note that *QD6* is similar to *QD5* in the sense that it does not have a yes-no structure. However, it specifies more precisely the type of other witchcraft that would not be eliminated by a *sua* oath. After asking *QD6* to pot 1, the first spider to react is that of pot 2. The answer obtained is:

AD5 (pot 2). Sua will end the problem.
Next, the movements of the spider of pot 1 determine the following answer:

AD6 (pot 1). Sua will end the problem.

Answers *AD5* and *AD6* are the same, and according to Zeitlyn this is interpreted by the diviners as a consistent result. It is clear to them that a *sua*-oath needs to be performed in order to protect Wong's daughter from further attack. Zeitlyn suggests that *AD3* and *AD1* were seen by the diviners as question-rejecting answers of the divination, since the process of Mambila spider divination is seen as a dialogue between the diviner(s) and divination [17, p.662].

Before I will formalize these questions and answers, I will formalize the information that must be in the diviners' knowledgebases for them to reason

---

[12]The formulation of this question is based on a table made by Zeitlyn [17, p.661] that is reproduced in Table 3 of Appendix II. However, it must be noted that in the original table with data in Zeitlyn's dissertation [20, pp.129-130] there is a typo in the question: instead of "*Sua* will end it" the original table says "*Sua* will *not* end it". I know this is a typo, because the explanation of the data in the very same dissertation [20, pp.133] corresponds to the formulation of Table 3 of Appendix II.

at the moment of asking *QD1*. Note that all answers to questions that divination gave earlier in the session contribute to the knowledge of the diviners. The rules in the knowledgebases of the diviners at the moment of asking *QD1* are as follows:

KD1: If a problem is caused by witchcraft and the witch is identified, and nothing is abnormal, *sua* will end this problem. (General knowledge of Mambila people.)

$\forall p \forall x ((w(x) \wedge DO(do(cau(x,p),c)) \wedge i(x) \wedge result(do(sua,c)) \wedge \neg ab(x,c)) \rightarrow \forall c' \nabla c \, end(p,c'))$

where:

$w(x) := x$ is a witch;

$cau(x,y) := x$ causes y;

$p :=$ a problem. We will use p_w for the specific illness of Wong's child. In the formalization, the problem is not seen as a token of a type (Malaria disease) but as an isolated problem.

$i(x) := x$ is identified;

$ab(x,c) :=$ something is abnormal with x in environment c;

$end(x,c) := x$ is ended in environment c;

$sua :=$ perform *sua*.

KD2: The quarrel between Wong's wife and sister has something to do with the problem. (Knowledge gained from question 26 and question 29 [20, p.129].)

$rel(qua(W_w,W_s),p_w)$, where:

$rel(x,y) := x$ is related to y;

$qua(x,y) :=$ a quarrel between x and y;

$W_w :=$ Wong's wife;

$W_s :=$ Wong's sister.

Next, I will rephrase and formalize the questions (QD1, QD2, QD3, QD4, QD5 and QD6) and answers (AD1, AD2, AD3, AD4, AD5 and AD6) of the dialogue, as well as the information added to the knowledgebase during the conversation (respectively KD3, KD4, KD5 and KD6).

*QD1 (pot 1).*Will *sua* end the problem or not?

$?\{result(do(sua,c)) \rightarrow \forall c' \nabla c \, end(p_w,c'),$
$\neg(result(do(sua,c)) \rightarrow \forall c' \nabla c \, end(p_w,c'))\}$

QD2 (pot 2). Will *sua* end the problem or do we have to divine further?
/ Will *sua* end the problem or do we have to cut *sua kare*?
$?\{result(do(sua, c)) \rightarrow \forall c' \nabla c \, end(p_w, c'),$
$\neg(result(do(sua, c)) \rightarrow \forall c' \nabla c \, end(p_w, c'))\}$
/
$?\{result(do(sua, c)) \rightarrow \forall c' \nabla c \, end(p_w, c'),$
$result(do(kare, c)) \rightarrow \forall c' \nabla c \, end(p_w, c')\}$ where:
$kare :=$ perform *sua kare.*

AD2 (pot 2). *Sua* will end the problem.
$result(do(sua, c)) \rightarrow \forall c' \nabla c \, end(p_w, c')$

QD3 (Pot 2). Will *sua* end the problem or not?
$?\{result(do(sua, c)) \rightarrow \forall c' \nabla c \, end(p_w, c'),$
$\neg(result(do(sua, c)) \rightarrow \forall c' \nabla c \, end(p_w, c'))\}$

AD3 (pot 2). *Sua* will not end the problem.
$\neg(result(do(sua, c)) \rightarrow \forall c' \nabla c \, end(p_w, c'))$

KD3: The possibility that witchcraft is the cause of the problem, $\exists x(w(x) \wedge DO(do(cau(x, p_w), c)))$, needs to be examined.

QD4 (pot 2). Is there a male witch involved or is there a female witch involved?
$?\{\exists x(w(x) \wedge DO(do(cau(x, p_w), c)) \wedge male(x)), \exists x(w(x) \wedge DO(do(cau(x, p_w), c)) \wedge \neg male(x))\}$, where:
$male(x) := x$ is male.

AD4 (pot 2). There is a female witch involved.
$\exists x(w(x) \wedge DO(do(cau(x, p_w), c)) \wedge \neg male(x))$

The previous answer, together with a diagnosis earlier in the divination session, leads to new knowledge:
KD4: The problem is caused by witchcraft from Wong's wife or sister.
$DO(do(cau(W_w, p_w), c)) \vee DO(do(cau(W_s, p_w), c))$

Since it is now known that $\exists x(w(x) \wedge DO(do(cau(x, p_w), c)) \wedge i(x))$ with

deduction from *KD1* we get:

KD5: If *sua* is not going to solve te problem, there is something abnormal.
$(result(do(sua, c)) \wedge \neg \forall c' \nabla c\, end(p_w, c')) \rightarrow \exists x\, ab(x, c)$

QD5 (pot 2). Will *sua* end the problem or is there other witchcraft to be dealt with?
$?\{result(do(sua, c)) \rightarrow \forall c' \nabla c\, end(p_w, c'), \exists x(DO(do(cau(x, p_w), c)) \wedge \neg w(x))\}$
This is not a correct yes-no question, since it is possible that *sua* doesn't end the problem even though there is no witchcraft to be dealt with. The illness could theoretically be caused by nature.

AD1 (pot 1). *Sua* will not end the problem.
$\neg(result(do(sua, c)) \rightarrow \forall c' \nabla c\, end(p_w, c'))$

KD6: Conclusion of KD5 and AD1 is $\exists x\, ab(x, c)$:

The possibility of the following abnormality to *KD1* needs to be examined: the witchcraft has the form of buried substance.
$ab(x, c) = \exists x DO(do(cau(buriedwitchcraft(x), p_w), c))$ where
buriedwitchcraft$(x) := x$ is a buried object of witchcraft.

QD6 (pot 1). Will *sua* end the problem or is there a witchcraft treatment of buried substance that remains active until discovered and destroyed?
$?\{result(do(sua, c)) \rightarrow \forall c' \nabla c\, end(p_w, c'),$
$\exists x DO(do(cau(buriedwitchcraft(x), p_w), c))\}$
Like the previous question, this question lacks a yes-no structure. The possibility exists that the problem can not be ended by *sua* and that there is no buried object. There exist other options that can cause problems.

AD5 (pot 2). *Sua* will end the problem.
$result(do(sua, c)) \rightarrow \forall c' \nabla c\, end(p_w, c')$

AD6 (pot 1). *Sua* will end the problem.
$result(do(sua, c)) \rightarrow \forall c' \nabla c\, end(p_w, c')$

Conclusion: $\neg \exists x\, ab(x, c)$

6.4 Formalization of Dialogue E

The fragment that I will study in this paragraph results from a four-hour divination session that was held on the 18th of September 2016 in the presence of Zeitlyn. The session was held in the house of Mbollo Pierre, who took over the work from his father, a senior diviner, after his death on the 20th of January 2014. Mbollo is quite experienced and therefore respected as a diviner. It must be noted that, like most young adults, Mbollo is not illiterate. His client, Taran[13], is a diviner as well and participates actively in the session, sometimes taking over the role of Mbollo. Taran is illiterate.

Mbollo and Taran divine about Taran's son, Luke[14], who is in hospital at the time of the session. Luke is seriously ill, and the diviners think that his illness is related to the adultery of one of his wives. Luke had two wives, but no children. In the Mambila community, childlessness is considered to be a big problem, and often witchcraft is taken to be the cause. About a year before the session, Luke caught one of his wives in bed with one of his best friends. He assumed that the adulterous man was a witch and the cause of his childlessness, and he didn't want a traditional divorce, until the witchcraft was proven and treated. However, when spider divination was performed at the Chief's palace, the village court, the result said that it was not witchcraft that caused the sterility. Luke got very ill, and in early September he was taken to the hospital in Banyo, where he got diagnosed with tuberculosis and typhoid. While Luke is in hospital, his father Taran visits Mbollo to perform spider divination.

The whole divination session about Luke is shown in Table 4 of Appendix II. Of all[15] questions, the set that I will study consists of question number two up to and including question number eight.[16] For these seven questions, three different pots are used, as is shown in the table. The table also shows the interpreted answers of divination. Below I will repeat the questions and answers in a somewhat different form and I will include some more background information as well as my first interpretations.

---

[13]Name has been changed for privacy reasons.

[14]Name has been changed for privacy reasons.

[15]Due to the gaps in the data, it is hard to say how many questions exactly were asked. However, the table gives a good impression of the length of the session and the approximate amount of questions.

[16]These question numbers are based on the table. It appears that in the beginning there are no gaps, therefore I think these numbers are correct.

QE1 (pot 1). If Luke will remain ill, choose the stick. No, if it is not finished, something has been buried, choose the stone. (44, Table 4, Appendix II)
This question, which lacks the yes-no structure, is asked to pot 1. For Luke to remain ill means that he needs more hospital treatment, and that there is no witch or buried witchcraft involved. This option implies that the illness of Luke is natural, and caused by the supreme god *Chán*. The alternative specifies that buried witchcraft is the cause of Luke's illness. The possibility of non-buried witchcraft is not taken into account (yet).

QE2 (pot 2). If Marty[17] is going to affect Taran's family members, then choose the stick. If it is just empty talk, then choose the stone. (45) / If the dispute with Marty is responsible for the trouble in the house, then choose the stick. If the dispute with Marty is not connected with the trouble in the house, then choose the stone. (48A)
Some extra context is necessary to understand this question, which is asked to pot 2. Taran and his wife are in dispute with their immediate neighbour Marty about the ownership of their house plot. It seems that in the divination session Taran considers the possibility that Luke's illness does not have to do with the adultery, which is the default assumption, but with the quarrel with Marty instead. Multiple times, Taran states that Marty is going around, saying bad things about the family of Taran. The question now is whether this talk will hurt the family members. Hence, the question can be read as a conditional yes-no question. Later, when pot 2 gets inspected, the question is repeated as if it is a focussed yes-no question, as can be seen above. The question is whether or not Marty's going around and saying bad things is responsible for Luke's illness. This implies that if Marty is not causing it, the illness has to have a different cause.

QE3 (pot 3). Marty is going around saying that Taran's place was Marty's father's place. If he will do evil to Taran's compound, then choose the stick. If nothing will happen, choose the stone. (46) / There is trouble coming from Marty. If it is Taran, his wife, his children, his grandchildren who will die in the future, choose the stick. No, if the trouble is for someone else, choose the stone. (49A)
This time the posing of the question and the inspection are similar. The question, which is asked to pot 3, is whether, given that Marty is going

---

[17]Name has been changed for privacy reasons.

around and saying bad things, the family of Taran will get affected. It is clearly a conditional yes-no question.

The first answer of the divinatory dialogue is obtained, in pot 1:
AE1 (pot 1). The stone has been selected. There is something in the ground, something is buried. Maybe they should look for somebody to remove buried stuff from the house. (47A)
The stone has been selected, and the position of the leaf cards is taken to point to extra information, namely the fact that something is buried.

QE4 (pot 1). If we cut *sua*, will that end it? If it will, choose the stick. No, divine further, something buried in the house, choose the stone. (47B)[18]
This question is asked in pot 1, immediately after receiving answer *AE1*.

AE2 (pot 2). The stone has been selected. (48A)
In pot 2, this answer to *QE2* is obtained.

QE5 (pot 2). Marty is going around saying stuff. He is making trouble. If it is going to effect Taran's family, his children, his grandchildren, his house, if Marty is going to do evil to them, then choose the stick. No, if it is just empty talk, then choose the stone. (48B)
This question is asked in pot 2, immediately after receiving answer *AE2*. It is basically a repetition of question *QE3*.

In pot 3, the answer to *QE3* is subsequently obtained:
AE3 (pot 3). One card has been flipped over, overlapping. But not obviously one way or another. It is thinking about something. The flipped over one is looking towards the stack, there is something going on. It has not chosen either the stick or the stone. (49A)
Divination has not made a decision, but the card that has been flipped over, shows that something is going on. For the Mambila, this may be a sign that something is abnormal.

---

[18]When the question gets repeated in 52A, another formulation is used: "We've already cut *sua*, and if that's the end of it, choose the stick. If there is something buried in the house, which we must remove, choose the stone." As can be seen, this question is a bit different from the orginial QE4 (which is 47B). I have chosen not to formalize this new formulation of the question, because the 52A is not included in the formalization.

QE6 (pot 3). If I tell the chief and invite Gam Song to cut *sua* (at the chief's palace), if they will want it, choose the stick. No, not that, if I speak with Marty, I talk with him, he will not want it and he runs away so that he can do that work (witchcraft, bad thing), choose the stone. (49B)

This question is asked in pot 3, immediately after receiving answer *AE3*. In this question it is being asked whether Marty will cooperate or run away (to avoid *sua* being cut). It is a simple yes-no question. Marty not cooperating could be the abnormality that divination pointed out with *AE3*. It could be seen as an abnormality to the knowledgebase rule *KD1*, which stated that "If a problem is caused by witchcraft and the witch is identified, and nothing is abnormal, *sua* will end this problem.".

Next, the answer to *QE5* is obtained in pot 2: *AE5 (pot 2).* The stick has been selected. (50A)

This answer implies that Marty will do evil to Taran's family. It is in contradiction with *AE2*, which stated that Marty's talk was harmless.

QE7 (pot 2). Someone (Marty) is looking for an inheritance. Someone has come to do evil tomorrow. If this person will not do it tomorrow, if it is just empty talk choose the stick. (50B)

This is a repetition of the same question being asked in question *QE3* and *QE5* albeit formulated in a slightly different way.

Before I will formalize these questions and answers, I will formalize the information that must be in the diviners' knowledgebases for them to reason at the moment of asking *QE1*. The rules in the knowledgebases of the diviners at the moment of asking *QE1* are as follows:

KE1: Luke, the son of Taran, is ill.
p_{tl} := Taran's problem. In this case the illness of Luke.

KE2: Marty is going around, saying bad things (that Taran's place was Marty's fathers place).
$DO(S_m)$ where $S_m = do(saybadthings(M), c)$ and where
$saybadthings(x) := x$ says bad things,
$M :=$ Marty.

Next, I will rephrase and formalize the questions (QE1, QE2, QE3, QE4, QE5, QE6 and QE7) and answers (AE1, AE2, AE3 and AE5) of the dialogue.

QE1 (pot 1). If Luke will remain ill, choose the stick. No, if it is not finished, something has been buried, choose the stone.
$?\{\exists x DO(do(cau(nat(x), p_{tl}), c)), \exists x DO(do(cau(buriedwitchcraft(x), p_{tl}), c))\}$
where
$nat(x) := x$ is a natural disease,
Luke remaining ill means that Luke has a natural disease, which is opposed to witchcraft being the reason for his illness. Since the second answer only contains one form of witchcraft, namely buried substance, this is not a correct yes-no question.

QE2 (pot 2). If Marty is going to affect Taran's family members, then choose the stick. If it is just empty talk, then choose the stone. / If the dispute with Marty is responsible for the trouble in the house, then choose the stick. If the dispute with Marty is not connected with the trouble in the house, then choose the stone.
QE2.1: $?\{result(S_m) \wedge DO(do(trouble(family(T)), c)),$
$result(S_m) \wedge \neg DO(do(trouble(family(T)), c))\}$ where
$trouble(x) := x$ gets trouble,
$family(x) :=$ the family of x,
$T :=$ Taran.
QE2.2: $?\{result(S_m) \rightarrow p_{tl}, \exists x(result(x) \rightarrow p_{tl} \wedge x \neq S_m)\}$

QE3 (pot 3). Marty is going around saying that Taran's place was Marty's father's place. If he will do evil to Taran's compound, then choose the stick. If nothing will happen, choose the stone.[19]
$?\{result(S_m) \wedge DO(do(trouble(family(T)), c)),$
$result(S_m) \wedge \neg DO(do(trouble(family(T)), c))\}$

AE1 (pot 1). The stone has been selected. There is something in the ground, something is buried. Maybe they should look for somebody to remove buried stuff from the house.
$\exists x DO(do(cau(buriedwitchcraft(x), p_{tl}), c))$

---

[19]I have omitted the reformulation: "There is trouble coming from Marty. If it is Taran, his wife, his children, his grandchildren who will die in the future, choose the stick. No, if the trouble is for someone else, choose the stone." Although formulated differently, the question is the same.

QE4 (pot 1). If we cut *sua*, will that end it? If it will, choose the stick. No, divine further, something buried in the house, choose the stone.
$?\{result(do(sua, c)) \to \forall c' \nabla c \ end(p_{tl}, c'),$
$\exists x DO(do(cau(buriedwitchcraft(x), p_{tl}), c))\}$

AE2 (pot 2). The stone has been selected.
$AE2.1\colon result(S_m) \land \neg DO(do(trouble(family(T)), c))$
$AE2.2^{[20]}\colon \exists x(result(x) \to p_{tl} \land x \neq S_m)$

QE5 (pot 2). Marty is going around saying stuff. He is making trouble. If it is going to effect Taran's family, his children, his grandchildren, his house, if Marty is going to do evil to them, then choose the stick. No, if it is just empty talk, then choose the stone.
$?\{result(S_m) \land DO(do(trouble(family(T)), c)),$
$result(S_m) \land \neg DO(do(trouble(family(T)), c))\}$

AE3 (pot 3). One card has been flipped over, overlapping. But not obviously one way or another. It is thinking about something. The flipped over one is looking towards the stack, there is something going on. It has not chosen either the stick or the stone.

QE6 (pot 3). If I tell the chief and invite Gam Song to cut *sua* (at the chief's palace), if they will want it, choose the stick. No, not that, if I speak with Marty, I talk with him, he will not want it and he runs away so that he can do that work (witchcraft, bad thing), choose the stone.
$?\{DO(do(sua, c)) \land DO(do(coop(M), c)),$
$\neg \big(DO(do(sua, c)) \land DO(do(coop(M), c)) \big)\}$ where
$coop(x) := x$ is cooperating,

AE5 (pot 2). The stick has been selected.
$result(S_m) \land DO(do(trouble(family(T)), c))$

QE7 (pot 2). Someone (Marty) is looking for an inheritance. Someone has come to do evil tomorrow. If this person will not do it tomorrow, if it is just

---

[20]Recall that question QE2 was phrased in two ways. I believe we have to use the phrasing of the diviner just before opening the pot and finding the answer, because this is when the new knowledge enters the knowledgebase of the diviner.

empty talk choose the stick.

$?\{result(S_m) \wedge DO(do(trouble(family(T)), c)),$
$result(S_m) \wedge \neg DO(do(trouble(family(T)), c))\}$

7 Divinatory reasoning in the laboratory and in the wild

In this chapter, the logic of divination will be investigated by analyzing and comparing the sessions of Mambila spider divination and those reported by McHugh and Garfinkel. Firstly, I will compare both practices conceptually. Secondly, I will investigate what the formalizations of the previous chapters show about the reasoning of the diviners.

7.1 A conceptual comparison

In this section I will make a conceptual comparison between the reasoning of the Mambila diviners and that of McHugh's subjects.

7.1.1 Divination as dialogue

With respect to the interaction between the diviner and the oracle, the practices turn out to be surprisingly similar. Divination is seen by the Mambila as a dialogue between diviner and divination [17, p.662]. The diviners perceive divination as an entity which they 'ask questions'. When inspecting a result they utter the words "divination says..." implying that the entity takes part in a conversation. Furthermore, in the results of the recently conducted sessions[21] the verb "to say" plays a prominent role. For example, when inspecting a pot in 74A (Table 4, Appendix II), the diviner says: "It has chosen the stick, but it is also *saying* death."

The sessions that the students in McHugh's experiment have with the 'student counsellor' can be regarded as dialogues as well. Although the counsellor 'answers' a student's questions by uttering random binary answers, the student thinks that these answers are motivated by his questions. Some participants literally speak about the session using the term 'conversation' in their evaluations.

7.1.2 The authority of the oracle

However, the Mambila diviners and McHugh's participants do think differently about the entity they are 'talking' with. The divinatory dialogues of the

---

[21]Recall that session E has been conducted by Zeitlyn in September 2016, together with seven other sessions.

Mambila are dialogues between a human diviner, or several human diviners, and a non-human entity, whereas the conversational partners in McHugh's experiment are both human. In the latter case the 'oracle' is a human being instead of a divine entity. Although this human being is perceived as some kind of 'expert', its authority may be questioned more easily. Therefore it is important to take this difference into account when comparing the different dialogues.

7.1.3 Different types of questions

Let us now analyze the practices with respect to the types of questions that are asked. The subjects of the experiment perceive the answers of the counsellor as advice to their problems. Garfinkel writes that all of the subjects reported the "advice that they had been given" and addressed their appreciation and criticism to that "advice" [4, p.89]. Questions typically start with "should I do" or something equivalent. This can be seen in Dialogue A and Dialogue B of Appendix I. These dialogues contain some factual questions, but most are directly focussed on gaining advice. An example of such a question is "Should I have further discussion with Dad over this subject about dating the Gentile girl?" which can be found in dialogue B. Most of McHugh's sessions show a similar pattern. The subject of Dialogue C initially asks more factual questions about the future and about his abilities, but towards the end of the conversation his focus shifts towards advice-gaining questions. For example: "Should I go to the library on campus to do my studying?" and "[...] do you recommend that I quit school?"

Mambila spider divination is usually consulted when someone needs advice, for example in case of illness or an upcoming journey. However, as we have seen, Mambila diviners can also be asked to perform spider divination for other purposes, for example to collect evidence in a court case. To make a fair comparison with McHugh's experiment, I have chosen to focus on spider divination sessions about personal problems of clients.

It turns out to be difficult to draw any conclusion about the type of questions that is asked by the diviners. I have found that different diviners have different 'styles'. For example, the diviners of Dialogue D (Bi and Wong) ask mostly factual questions (for example: "Will *sua* end the problem?") while Table 4 of Appendix II shows that the diviners of Dialogue E (Mbollo and Taran) ask more advice-gaining questions, especially towards the end of the session. An illustrative question of the latter form is posed by Mbollo:

"If we should cut *sua*, of whatever type and whatever person, choose the stick. No, Taran should just leave it and look for medicine, choose the stone" (question 55B, Table 4 of Appendix II). Studying Dialogue E of Table 4 leaves me with the idea that Mbollo and Taran ask factual questions to get more specific information about the problem and that they ask should-questions to gain direct, clear advice. Other sessions of Mbollo[22] show a similar pattern. Most other diviners[23] have a style of questioning that is more similar to the diviners of Dialogue D. Hence, we can cautiously conclude that although there are individual differences, in general the Mambila use more factual questions than the students in the experiment.

Factual divinatory questions can be distinguished with respect to their usage: some questions are concerned with the present or past, they are used for *diagnosis*, and some questions are concerned with the future, and they are used for *prediction*. The distinction between diagnostic and predictive divinatory questions has been made by Zeitlyn [21, p.526]. Diagnostic questions are asked to find out what caused a particular situation (in the present or in the past). Predictive questions are asked to find out what will happen if the client does nothing to avoid this (usually bad) outcome. In other words, prediction is hypothetical. As Zeitlyn notices, diagnosis and prediction shade into one another. On the one hand, in order to predict the future one has to diagnose the past. On the other hand, a diagnosis may have predictive implications [21, p.526]. However, he also points out that despite this overlap, the distinction between diagnostic and predictive use of divination is heuristically useful, since these two uses have different relations to evidence. Diagnostic and predictive statements are evaluated in different ways. Human agency may change the truth value of the divinatory predictions. As Zeitlyn formulates it, "we act to change the world, making some predictions literally false but, by divinatory logic, true for all that" [21, p.528]. Since the truth value of divinatory predictions is changeable, my surmise is that a more tolerant attitude can be expected regarding contradictory answers to predictive questions than regarding contradictory answers to diagnostic questions. This may explain why divination session D continues, without abandoning the spider, even though the answers "*sua* will solve the problem" and "*sua* will not solve the problem" contradict each other. I will elaborate on this suggestion

---

[22]The data gained in September consists of eight sessions, of which three by Mbollo Pierre.

[23]Here, I am referring again to the data gained in September which contain two sessions of Suop Sylvestre, one session of Jieh from Njere and one session of Vu Paul.

later in this chapter. Let us first investigate how the distinction between diagnostic and predictive questions relates to the distinction between factual and advice-gaining questions which I made earlier.

I believe that advice-gaining questions can be seen as predictive. Predictive factual questions can be easily reformulated as should-questions. For example, "Will *sua* end the problem or do we have to divine further?" (question D2) can be reformulated as: "Should we perform *sua*?" Advice-gaining questions can also be easily reformulated as predictive factual questions. For example, "If we should cut *sua*, of whatever type and whatever person, choose the stick. No, Taran should just leave it and look for medicine, choose the stone." can be reformulated as "If *sua*, of whatever type and whatever person, will end the problem, choose the stick. No, only medicine will end the problem, choose the stone." As we have seen above, a more tolerant attitude can be expected regarding contradictory answers to predictive questions than regarding contradictory answers to diagnostic questions. Since should-questions are similar to predictive questions, these can also be expected to be treated in a more tolerant way. Before discussing this suggestion, we will study the occurrence of contradictions in both practices.

7.1.4   Dealing with contradictions

Mambila spider divination and McHugh's experiment clearly differ in the likelihood that contradictions occur. In section 6.1 we have seen that in Mambila spider divination several techniques are used to guarantee the truthfulness of the spider. For example, Mambila diviners often repeat questions in the same pot, sometimes transposing the stick and the stone. Another option is to repeat questions in different pots. Since questions are usually repeated multiple times, contradictory answers are likely to appear. According to Zeitlyn, those contradictions cause 'crises of faith' or 'changes in tack', or other breaks in the flow of dialogue between diviner and divination [17, p.663] from which we can conclude that they are recognized as a 'problem' by the diviners. Hence they are not just problematic from our analytical western perspective, but also from the perspective of the Mambila diviners. The diviners try to remove the contradictions in order to preserve the dialogue, and they do so by *reasoning.* It is this reasoning, with the purpose of solving the problems caused by contradictions, that is of special interest for my study.

Dialogue D and Dialogue E, which we have studied in the previous chapter, contain several contradictions. Let us first consider the second question

of Dialogue D:

QD2 (pot 2). Will *sua* end the problem or do we have to divine further?

The answer to this question is as follows:

AD2 (pot 2). Sua will end the problem.

Directly after obtaining this answer, the third question is asked:

QD3 (Pot 2). Will *sua* end the problem or not?

The answer to this question is as follows:

AD3 (pot 2). Sua will not end the problem.

The contradiction that has arisen leads the diviners to ask the following question:

QD4 (pot 2). Is there a male witch involved or is there a female witch involved?

In other words, the contradiction can be seen as a sign that the problem is more complicated and that another, more precise, question needs to be asked. Zeitlyn suggests that contradiction can be seen as a rhetorical device used by the divination to make the diviner "cast the net of his questions more widely" [17, p.663]. However, before drawing any conclusion, let us first study the treatment of contradictions in Dialogue E.

In Dialogue E, the second question is as follows:

QE2 (pot 2). If Marty is going to affect Taran's family members, then choose the stick. If it is just empty talk, then choose the stone. / If the dispute with Marty is responsible for the trouble in the house, then choose the stick. If the dispute with Marty is not connected with the trouble in the house, then choose the stone.

The answer to the question is clear:

AE2 (pot 2). The stone has been selected.

This means that Marty's talk is "empty", hence it is not going to affect Taran's family members / the dispute with Marty is not responsible for the trouble in the house (depending on the reading of the question). After receiving this answer, the question is asked again, as a consistency check:

> *QE5 (pot 2).* Marty is going around saying stuff. He is making trouble. If it is going to effect Taran's family, his children, his grandchildren, his house, if Marty is going to do evil to them, then choose the stick. No, if it is just empty talk, then choose the stone.

However, this time the opposite answer is obtained:

> *AE5 (pot 2).* The stick has been selected.

This answer implies that Marty will do evil to Taran's family. It is in contradiction with *AE2*, which stated that Marty's talk was harmless. As a reaction to this contradiction, the question is asked once more:

> *QE7 (pot 2).* Someone (Marty) is looking for an inheritance. Someone has come to do evil tomorrow. If this person will not do it tomorrow, if it is just empty talk choose the stick.

By accident, the subsequent inspection of pot 2 has not been recorded.[24] Hence, unfortunately we don't know in which way divination has answered QE7, let alone when this answer was obtained. This is why the formalization of Dialogue E does not continue after QE7. This gap in the data makes it hard to draw any conclusion about the divinatory reasoning after obtaining the previously mentioned contradiction. However, we know at least that the diviner's first reaction after obtaining the contradiction was to repeat the question once more. Furthermore, we know that in the rest of the session the diviners do not discuss Marty anymore. Instead, they discuss different possible causes of Luke's illness and possible treatments. It seems that the answer to QE7 has caused the diviners to believe that Marty's talk is empty and that the dispute with Marty is not related to the trouble of Luke. Therefore, I think it is likely that divination has chosen the stone in response to QE7, and that this has been taken to confirm AE2. Answer AE5, which contradicts AE2, might subsequently have been dismissed. I will elaborate on this idea

---

[24]The next time the same pot is used is in clip 55A, which is the inspection of another question. This must be the question that was asked after obtaining the answer to QE7.

about the "dismissing" of answers in the next section when comparing the formalizations.

We will now explore my suggestion that a more tolerant attitude could be expected regarding contradictory answers to predictive questions than regarding contradictory answers to diagnostic questions. Taking into account the conceptual distinction between diagnosis and prediction, what can we tell about the contradictions we have found in the data? The contradiction we found in Dialogue D has arisen when receiving the answers of two clearly predictive questions: "Will *sua* end the problem or not?" and "Will *sua* end the problem or do we have to divine further?" The contradiction that arises after receiving both answers, is taken as a sign that the problem is more complicated and that another, more precise, question needs to be asked. The contradiction we found in Dialogue E has arisen from the answers to the following questions:

1. "If Marty is going to affect Taran's family members, then choose the stick. If it is just empty talk, then choose the stone." / "If the dispute with Marty is responsible for the trouble in the house, then choose the stick. If the dispute with Marty is not connected with the trouble in the house, then choose the stone."

2. "Marty is going around saying stuff. He is making trouble. If it is going to effect Taran's family, his children, his grandchildren, his house, if Marty is going to do evil to them, then choose the stick. No, if it is just empty talk, then choose the stone."

Question 1 is phrased in two different ways. When posing the question for the first time, it is phrased in a predictive way: "Will Marty cause trouble?" When inspecting the pot, the question is repeated in a different way, as a diagnostic question: "Is Marty the responsible for the trouble in the house?" Divination chooses the stone, and for the diviners this means that Marty is not responsible for the trouble in the house. I use the diagnostic reading, because this is the phrasing of the diviner just before opening the pot and finding the answer. Hence, I suggest that we have one diagnostic answer to begin with: the dispute with Marty is not connected with the trouble in the house. Question 2 is phrased in a predictive way: "is Marty going to do evil to Taran's family?" The answer, AE5, comes down to: yes, Marty is going to do evil. Because the question is predictive, I believe that from the diviner's perspective the answer is easier to dismiss. This could explain the

repetition of the same question in QE7: "Someone (Marty) is looking for an inheritance. Someone has come to do evil tomorrow. If this person will not do it tomorrow, if it is just empty talk choose the stick." And the answer to QE7 (assuming it was positive) combined with the diagnostic answer AE2 could have been enough to dismiss AE5. To better understand the idea of dismissing predictive answers yet fully believing in the divination, let us make a comparison with economics, like Zeitlyn does in the following quote:

> "Mambila people are great cynics: they scoff at promises made by politicians and are deeply suspicious of diviners who use techniques that are clearly open to manipulation. However, I have not yet heard anyone express doubts about spider/ crab divination. In Mambila, it seems that cynicism has its limits. In economics, we act on the basis of predictions made by experts. If the actions of politicians and bankers make those predictions come true or become false, do we have more or fewer grounds for ceasing to trust them?" [21, p.537]

Economic predictions may be successful in a way that they change the world so the predicted statement of fact does not occur. This is why they are treated differently from diagnostic historical statements. It is likely that the Mambila treat predictive and diagnostic answers from divination in a similar way.

The data we have seen, seem to support my idea that a more tolerant attitude could be expected regarding contradictory answers to predictive questions than regarding contradictory answers to diagnostic questions. However, so far I have not found cases of 'diagnostic contradictions' and therefore it is not yet possible to draw a conclusion on this topic.

In the beginning of this section I stated that Mambila spider divination differs from McHugh's experiment in the likelihood that contradictions occur. This difference stems from a difference in the diviners' behaviour in the two practices. Contrary to the Mambila diviners, the participants of McHugh do not use special techniques to guarantee the truthfulness of 'divination' (such as repeating the exact same question) and therefore less contradictions occur in their sessions. Many dialogues are orderly, like Dialogue A, which is written down in full in Appendix I. To the participant, every answer makes sense, and the flow of the conversation never gets broken. In the end, when he evaluates the session, he writes:

This is interesting. I didn't realize loaning money could be so easy once everything's planned out. First, don't go to banks or insurance companies. Go to relatives. Then plan it out so the other guy gets the idea. I really feel I've been helped, psychiatrists know something.

In other words, the participant summarizes the 'advice' and concludes that the counsellor has helped him. He does not have any reason to question the counsellor.

Dialogue B, which can also be found in Appendix I, does contain contradictions according to classical logic, but nevertheless the order of the dialogue does not get disrupted. Let us consider the following part of the dialogue, of which the first half has been studied in Chapter 5.

S: My question is, do you feel under the present circumstances that I should continue or stop dating this girl? Let me put that in a positive way. Do you feel that I should continue dating this girl?

E: My answer is no.

S: No. Well, that is kind of interesting. I kinda feel that there is really no great animosity between Dad and I but, well, perhaps he feels that greater dislike will grow out of this. I suppose or maybe it is easier for an outsider to see certain things that I am blind to at this moment.

I would like to ask my second question now.

E: Okay.

S: Do you feel that I should have a further discussion with Dad about this situation or not? Should I have further discussion with Dad over this subject about dating the Gentile girl?

E: My answer is yes.

S: Well I feel that is reasonable but I really don't know what to say to him. I mean he seems to be not really too understanding. In other words he seems to be afraid really to discuss the situation. I mean at least it appears that way to me so far. But I guess if it is worthwhile to me, if I really want to continue to date her that I will go on and have this discussion with Dad. I really don't know what to say because I mean I am dating her. I am not in love with her or anything but I really never know what is going to come out. I guess we should have a discussion based on what the

future possibilities might be and how he would feel about that. He may not be too strongly opposed now because we are only dating, but perhaps he sees future complications that he would really like to get off his chest at the moment. I am ready for my third question now.

If after having my conversation with Dad and he says to continue dating her, but at the same time he gives me an impression that he is really not, he really does not want me to date her, but he is only doing it because he wants to be a good Dad, should under these conditions, should I still date the girl?

E: My answer is yes.

S: Well I am actually surprised at the answer. I expected a no answer on that. Perhaps this is because you are not quite aware of my dad and his reactions and he seems to be the type of person that is sensitive and therefore he is very careful in the way that he will handle things. Even though he might have said go ahead and date her I perhaps would feel guilty in knowing that he really did not want me to continue to date her. Though I don't know that it would actually help the situation any. I am ready for the fourth question now.

If after having this discussion with Dad and getting a positive answer from him but at the same time felt that this was not his honest opinion do you think that it would be proper for me to have my mother have a serious talk with him and therefore try and get a truer reaction to Dad's opinion to the situation?

E: My answer is yes.

S: Well this seems fair to me. I feel perhaps that he would be honester with Mother about the situation.

Let us consider the counsellor's answer to the student's first question, which is the advice not to continue dating the Gentile girl. As Widlok and Stenning notice, this answer is 'culturally congruent'; it is in accordance with our stereotypical understanding of attitudes of Jewish parents with respect to their children's partner choice and with our stereotypical view on counsellors as siding with the parental view [13, p.7-8]. Hence the answer does not come as a surprise. Next, the student asks whether or not he should have a further discussion with his father about the subject. This shows that he does not take the previously gained advice, namely the advice not to continue dating

the girl, as fixed. He seems to account for the possibility of exceptions to the advice that he has just been given; maybe, under certain circumstances, he *can* continue dating the Gentile girl. The counsellor affirms that the student should have a further discussion with his father about the subject. This answer is culturally congruent as well, since counsellors usually support clients to discuss family problems with the family members concerned. Next, the student asks whether he should date the girl if his father *says* that it is fine but the student has the impression that he actually does *not* want it. To the student's surprise, the counsellor answers that he should still date the girl. Despite of his suprise, the student reasons to an interpretation of the situation: he suggests that counsellor is not aware of the personality of his father and that this lack of knowledge has led to the 'wrong' answer. Hence, although according to classical logic a contradiction has just been occurred, the order of the dialogue does not get disrupted. Subsequently the student asks whether it is a proper idea to let his mother have a serious talk with his father to try and discover his father's real opinion to the situation. Hence, the student clearly does not accept the answer (still date the girl) as a piece of advice, but instead he seems to use it to cast the net of his questions more widely, similar to the Mambila in treatment of contradictions.

In the end, when the student evaluates the session, he writes:

> [...] The conversation and the answers given I believe had a lot of meaning to me. I mean it was perhaps what I would have expected from someone who fully understood the situation. And I feel that it had a lot of sense to me and made a lot of sense. Well I felt that the questions that I asked were very pertinent and did help in understanding the situation on both sides, that is myself and the answerer and my reaction to the answers like I have stated before were mostly in agreement. At times I was surprised but understood that because he is not fully aware of the situation and the personalities involved.

Thus the dialogue has remained orderly despite of the student being 'surprised' at times. The surprising answers are explained away by saying that the counsellor was not fully aware of the situation. The reasoning of the student after obtaining the contradiction seems to be similar to the reasoning of the Mambila. The contradiction is not ignored, but instead taken as a signal that things have to be sorted out more. As I have written above,

I believe that advice-gaining questions can be seen as predictive since predictive factual questions can be easily reformulated as should-questions. In this case, "Should I continue dating this girl?" could be rephrased as: "Will it be better for me to continue dating this girl?" or "Will continue dating this girl not cause big problems?" The fact that the order of the dialogue did not get disrupted might have to do with the predictive aspect. A prediction or an advice is given on the basis of certain knowledge. Once more knowledge comes available, the prediction or advice may have to be changed accordingly.

Dialogue C, which is also written down in full in Appendix I, does also contain a contradiction according to classical logic. We will consider the part of the dialogue studied in Chapter 5 below.

> **S:** Do you think I could get a degree in physics on the basis of this knowledge that I must take Physics 124?
> **E:** My answer is yes.
> **S:** He says yes. I don't see how I can. I am not that good of a theorist. My study habits are horrible. My reading speed is bad, and I don't spend enough time in studying.
> Do you think that I could successfully improve my study habits?
> **E:** My answer is yes.
> **S:** He says that I can successfully improve my study habits. I have been preached to all along on how to study properly, but I don't study properly. I don't have sufficient incentive to go through physics or do I?
> Do you think I have sufficient incentive to get a degree in physics?
> **E:** My answer is yes.
> ...
> **S:** Do you think I can develop sufficiently good study habits and incentive to actually achieve developing those habits such that I wouldn't have to stay up late at night and not get the work done in the first place?
> **E:** My answer is no.
> **S:** He says no. I can't develop the study habits properly to be able to pull myself through. If you don't think that I can develop the proper study habits and carry them through to reach my goal do you on the basis of this still believe that I can get a degree in physics?

E: My answer is no.

The answers "yes" to the question "Do you think I could get a degree in physics on the basis of this knowledge that I must take Physics 124?" and "no" to the question "If you don't think that I can develop the proper study habits and carry them through to reach my goal do you on the basis of this still believe that I can get a degree in physics?" do, according to classical logic, contradict each other. However, from the data it is clear that during the 'conversation' new information comes available, namely that the student is not able to stay up late at night for studying. This information was not available when the student asked for the first time whether he could get a degree in physics. The answer to that first question can be read abnormality-sensitive, namely as follows: "Yes, you could get a degree in physics on the basis of the fact that you must take Physics 124 and assuming that nothing abnormal is the case". The fact that the student is not able to stay up late at night for studying can be seen as an abnormality.

When the student, in the end, evaluates the session, he writes:

> Well, as far as what I got from the conversation, it is rather foolish for me to pursue my work any further as far as getting a degree in anything. Actually I have felt all along that the type of work I am interested in which is inventing is not something that requires a degree necessarily. It requires a certain knowledge of math and physics but it doesn't require a degree to do inventing. From the conversation I gather that I should just quit school and go ahead and get my commission but how I don't know. But it would be awfully nice to have a degree. That degree would be able to get me into other schools. Otherwise I will have the statement that I went through college but I never got out. I also get the impression that my study habits will never improve as much as I would like them anyway. I will not get a degree. I will get a commission and it is fruitless for me to study either at home or at school. Especially in the evening. I wonder if I should do any studying at all, or if I should learn to do all my studying at school. What to do? I have the feeling that my parents would be very unhappy and also my wife's parents would be very unhappy if I never did get a degree or at least especially right now. I have the feeling that this past conversation is based on what one should have learned to do years ago, that is, as a growing child. To ask

65

themselves questions and give himself an answer of some type, yes or no, and to think out reasons why either yes or no holds or might hold and upon the validity or the anticipation of the validity of that answer what one should do accomplish his goal or just exist. I personally think I can do better in math than I can in physics. But I won't know until the end of the summer.

The student does, just like the subject of Dialogue B, not follow the 'advice' of the counsellor blindly. He uses it to form his own opinion. However, he does take the counsellor seriously and the order of the dialogue never gets disrupted. This time the questions that lead to a contradiction are not advice-gaining questions but factual could-questions. The student asks if he is *able* to get his degree. Still, these questions are clearly predictive and this could explain why the order does not get disrupted.

However, in seventeen of the thirty interviews that McHugh conducted, the order of the dialogue *does* get disrupted at some point. In seven cases, the subject feels "powerless" in the sense that although he does attribute meaning to the answers of the counsellor, he thinks that they are not affected by his questions. For example, one subject says "It doesn't matter what I think, he is going ahead with his advice" [8, p.74]. In two of these seven cases of "powerlessness", the subject regained his confidence in the counsellor later on in the dialogue. In five of the thirty dialogues of McHugh, the subject cannot interpret the answers meaningfully and utters sentences like "I don't know what to say" or "I don't understand" [8, p.75]. In three of these five cases, this state of "meaninglessness" is temporal; after some time the dialogue continues in an orderly way. In five of the thirty dialogues a state of "innovation" occurs; the subject states that he only continues to answer in order to finish the experiment. One subject says "I don't care what he's up to. I'll just go along and ask the same question over again" [8, p.75].

I believe that the order of many dialogues gets disrupted because of a lack of authority of the oracle. The oracle is not a divine entity like in Mambila spider divination, but instead a human being. Some students are very skeptical, and quickly start to ask meta-questions like: "are you a real counsellor?" Furthermore, we have seen that McHugh's participants are provided different answer-patterns: some get fifty-fifty splits and others get only yeses or only noes. The students who get only yeses or only noes are very likely to question the authority of the oracle. If we study one dialogue in which the student gets only noes [8, pp.93-98], we see that this causes skepticism. He

makes several comments about the fact that the counsellor only says "no", and asks questions like: "Do you say no regardless?" [8, p.97]. In the end, he calls the counsellor "a poor psychiatrist" [8, p.98]. I have chosen not to focus on these kind of dialogues, because I believe that in order to compare divinatory reasoning by the university students to divinatory reasoning in the Mambila community, it is important to choose experimental sessions that resemble the dialogues of Mambila spider divination. However, there are also a few dialogues in which the order gets disrupted only after some time. The student seems to take the counsellor seriously, up to a certain point. Let me present a fragement of such a dialogue, quoted from HcHugh [8, pp.101-102]:

Q1. I have a scattered record so far, but I would like to go on to graduate school. Should I?

A1. No

C1. Well, yes, I suppose not. Though it does seem a bit too certain to flatly ignore the possibility that I have the ability, even if not the personality, to do the kind of work that graduate school requires. The A's are evidence that I *could* do the work.

Q2. I have several A's on my record, and shouldn't that recommend my ability to do graduate work?

A2. Yes

C2. I have the ability, but I do not study. It is too soon to discount the possibility of graduate school. I am only a junior, so there is quite enough time to improve my study habits this year and next. Then, if I do so, my prospects would be quite good. At least one would have to say they would be quite good.

Q3. If I improve my study habits to the point where I bring up my grades, should I then go on to graduate school?

A3. No.

C3. My. Let's see. Scattered record, I shouldn't go on. No, wait a minute. Good grades, I have the ability to go on. There, that takes care of it. Not that I should go on - that I have the ability. Then I shouldn't go on anyway, even with the ability. I guess he's against graduate school. It is a long haul, and often leads to eunuchism.

Q4. I gather you are not for graduate school? Just a minute. Rather, are you in favor of graduate school?

A4. Yes.

C4. My. That's strange. I am being put on notice here. It is hardly clear.

I shouldn't go on, even though I have the grades, and yet he is for graduate schools in principle. It must be something else. Something particular. Perhaps me. But it is difficult to understand just what. My personality? That is not supposed to be a criterion. Though it does enter in, I suppose. Falstaff would only have done well so long as no one saw him. Or hear him.

Q5. Is it my personality that makes you advise against graduate school?

A5. No.

C5. (*25-second silence*) This is obscure. Don't go to graduate school, though by any criterion I should. I want to, I truly do, I am the kind of person who could accomplish it, and I have the capacity. I find it hard to understand just what this advice is intended to convey. Perhaps he was mistaken in an earlier answer.

Q6. Have any of your earlier answers been mistaken? Would you like to change any of your previous answers?

A6. No.

C6. My God. This is utterly impossible. (*37-second silence*) Perhaps he is not a psychiatrist. Yes, I'll bet he isn't. Cruel. One can hardly expect this advice to be heeded. Heedless. The tender psyche an accessory to science. Worthless. I just don't know what to do.

Q7. Do you think your advice is worthwhile?

A7. No.

Several interesting things can be said about this fragment. The dialogue is similar to Dialogue C. First, the student asks if he should go to graduate school and the experimenter answers "no", contrary to the student's expectations. Next, the student asks whether he has the ability to go to graduate school, and gets a positive answer. Then, the student adds an extra condition to his original question: he will improve his study habits. He asks again if he should go to graduate school. Still the answer is negative. This contradicts with answers A2 and the student's knowledge that with the ability and good study habits, one is capable of doing graduate school. The student suspects that the counsellor is against graduate school, which can be seen as an abnormality. He asks: "Are you in favor of graduate school?" Contrary to the student's expectation, A4 says that the counsellor is in favor of graduate school, and not against. The student is puzzled: "My. That's strange. I am being put on notice here. It is hardly clear. I shouldn't go on, even though I have the grades, and yet he is for graduate schools in principle." He comes up with another possibility for an abnormality: "It must be some-

thing else. Something particular. Perhaps me." Question Q5 explores this abnormality: "Is it my personality that makes you advise against graduate school?" Once the second possible abnormality is rejected, the student starts to ask more meta-questions. After asking the question "Do you think your advice is worthwhile?" and receiving the answer "no", the dialogue becomes "meaningless".

If we look at this and other disrupted dialogues conducted by McHugh, the posing of meta-questions plays a central role. Once the cousellor contradicts himself regarding his own beliefs, the student looses his faith. In Mambila spider divination, the posing of meta-questions is less common. However, as we have seen in section 6.1 a Mambila diviner sometimes asks a spider whether any witchcraft is attempting to interfere with him. Similar to such meta-questions are test-questions like the following, which Mbollo Pierre asks in, respectively, clips 63A and 63B of Dialogue E:

> "If there are three of us here, choose the stick. No, if I am alone, choose the stone." (53B, Table 4, Appendix II)

> "If I will eat fufu today, choose the stick. No, if there is nothing in the house, choose the stone." (63B)

These test-questions are asked to check the truthfulness of the spider. As we have seen in Chapter 6, a spider that turns out to be untruthful is not consulted anymore for a day. The test-questions of the Mambila can be compared to the meta-questions of the students. Although I have chosen not to focus on this type of questions, it is at least interesting to notice that 'wrongly answered' meta-questions in McHugh's experiment often lead to disruption and loss of faith of the student, while 'wrongly answered' test-questions in spider divination only lead to the exclusion of the concerned spider. However, the faith in spider divination does not get affected. This difference can be explained by recalling the difference in authority of the oracle.

7.2 Analyzing the formalizations

In this section I will analyze and compare the formalizations of Chapters 5 and 6, and research what those, together with the conceptual analysis of the previous section, tell us about the logic of divinatory reasoning. However, first of all it is important to understand to which extent logic can help us in investigating divinatory reasoning.

7.2.1 The value of formalizing

Logic is traditionally taken to be normative. Psychologists like Wason [12] assume that results obtained in the psychology of reasoning tell us something about the (absence of) rationality in human reasoning. This view neglects the stage of reasoning *to an interpretation* and therefore undermines the value of logic in studying reasoning. As Stenning and Van Lambalgen have pointed out, norms apply to reasoning only after the interpretative process. Furthermore, logic does not provide absolutely valid norms but norms valid relative to a particular domain. Which logic can be seen as 'natural' depends on the result of the stage of reasoning to an interpretation.

There are several ways in which formalizations contribute to our investigation of the logic of divinatory reasoning, or the logic that is natural in the domain of divination. First of all, formalizations provide a conceptual clarification. As we can see in the appendices, the divinatory dialogues look a little messy. The diviners often think out loud and say many non-relevant things. They use lots of metaphors, and ask questions in many different ways, even though they sometimes mean exactly the same. Formalizing the dialogues is a way to pay attention to what diviners really mean. By using logic to abstract the natural language data, conceptual distinctions become clear. For example, after formalizing the divinatory dialogues I was able to make an insightful conceptual distinction between different types of questions. Furthermore, by formalizing the dialogues I have found contradictions and cases of abnormality-sensitive reasoning. Secondly, formalizations help us to abstract and clarify the reasoning. By modelling divinatory questions and answers in a suitable language, we are able to perform a logical analysis with Inferential Erotetic Logic. This way we learn about several characteristics of the reasoning. For example, we can deduce which questions are 'evoked'. Moreover, by abstracting and performing a logical analysis on different dialogues with IEL, we are able to *compare* them.

It is, however, important to be aware of the limitations of the language $\mathscr{L}*$ and therefore of the formalizations. Using this language, we are not able to express all nuances of actual performance; it idealizes and simplifies actual performance. For example, type-token distinctions cannot be expressed well. In the formalization of Dialogue D, the problem of Wong is not seen as a token of a type, namely the Malaria disease, but as an isolated problem. Furthermore, the formalizations of Dialogues D and E are unable to relate witchcraft as a type, for example in QD5 ("Will *sua* end the problem or is there other witchcraft to be dealt with?"), to tokens of witchcraft like "buried witchcraft". The same holds for the word "trouble", which is used in QE2.2 for referring to a specific problem (illness of Luke), and in QE5 for all sort of problems. Furthermore, the fact that the "divine further" option always comes with the stone alternative, cannot be represented, as well as the meta-questions which were found in several student dialogues. However, despite of the limitations of $\mathscr{L}*$, the formalizations are of great value for the investigation of divinatory reasoning. As I have stated above, firstly they serve to abstract from the messy data and lead to the discovery of conceptual distinctions. The previous section illustrates this feature. Secondly, they help to abstract and clarify the reasoning. This second feature of formalization will be illustrated in the rest of this section, where I will analyze and compare the formalizations of Chapter 5 and Chapter 6.

7.2.2 Analyzing the formalizations with IEL

Table 2 shows my comparison of the formalizations of both Mambila spider divination and the 'laboratory' divination, using IEL. The table shows what type of binary question is being asked (simple yes-no, conditional yes-no, focussed yes-no or other[25]) and if the question is evoked i.e. satisfies both clauses of evocation.

Question	Simple-Q	Cond-Q	Focus-Q	Other	Evoked i	Evoked ii	Evoked
QA1	1				1	1	1
QA2	1				1	1	1
QA3			1		0	1	0
QB1		1			1	1	1
QB2	1				1	0	0
QC1	1				1	1	1

[25]This means that the question is not a yes-no question.

QC2	1				1	1	1
QC3	1				1	1	1
QC4		1			1	1	1
QC5		1			1	0	0
QD1	1				1	1	1
QD2.1	1				1	1	1
QD2.2				1	0	1	0
QD3	1				1	0	0
QD4	1				(1)	(1)	(1)
QD5				1	(0)	(1)	(0)
QD6				1	(0)	(1)	(0)
QE1				1	0	1	0
QE2.1		1			1	1	1
QE2.2			1		1	1	1
QE3		1			1	1	1
QE4				1	0	0	0
QE5		1			1	1	1
QE6	1				1	1	1
QE7		1			(1)	(1)	(1)

Table 2: Analysis of Dialogues A, B and C of Chapter 5 and Dialogues D and E of Chapter 6, using Inferential Erotetic Logic

$QA1$ and $QA2$ are both simple yes-no questions in which the individual direct answers are not mc-entailed by the knowledgebase plus the previous answer. $QA3$ also looks like a simple yes-no question but the context shows that the student is actually asking which friend or family member he has to ask for a loan. His father is just the first one that comes to his mind. In this light, $QA3$ is a focussed yes-no question. This is not an evoked question since there are other possible ways to loan money (for example, from the company where he works).

$QB1$ is a conditional yes-no question. Since we know from the knowledgebase that the father is unhappy, this question is sound and evoked. The context of $QB2$ shows that the student is not satisfied with the first answer (not continue dating). He is looking for a way around by proposing to have a discussion with his father in order to convince him and continue dating the girl. Since the answer "not continue dating" is already in his knowledgebase,

this simple yes-no question is not evoked.

Questions $QC1$, $QC2$ and $QC3$ are all simple yes-no questions in which the individual direct answers are not mc-entailed by the knowledgebase plus the previous answer(s). $QC4$ is a conditional yes-no question in which the condition "improve study habits" is already known to be true (answer of $QC2$) thus this question is also evoked. Question $QC5$ is also a conditional question, but in this case the condition "improve study habits while not staying up late" is known to be false ($AC4$) so this question is not evoked.

Question $QD1$ is the most asked question during Mambila spider divination. *Sua* is the default solution to almost any problem, so this question is asked first to check whether *sua* is sufficient or the problem is more complicated. The question can be asked as a simple yes-no question but it can also appear as a focussed yes-no question or even as a question lacking a yes-no structure. In the case of $QD1$ it is a simple yes-no question which is evoked. $QD2.1$ is a repetition of $QD1$ but $QD2.2$ is not a sound question (since there are other solutions for this problem) and hence not evoked. $QD3$ is clearly not evoked since the previous answer already answers this question. Because $AD3$ contradicts $AD2$ we cannot speak about evocation anymore since the knowledgebase no longer consists of only declarative well-formed formulas. However, if we would dismiss these two contradictory answers, we could continue to look for evocation for the remaining questions of this dialogue. In the table, the results of this investigation are shown between brackets, to make clear that they only hold when the previous contradictory answers are dismissed. $QD4$ is a simple yes-no question which is also evoked. $QD5$ does not have a yes-no structure and furthermore is not sound for there is also the possibility that the problem is caused by nature ("the supreme god"). With the same reasoning, $QD6$ also lacks a yes-no structure and is not evoked.

In the chosen fragment of Dialogue E two issues are being discussed and even intertwined. On the one hand there is the illness of Luke and on the other hand there is the quarrel with Marty. It starts with the non-evoked question *QE1* for there are other possibilities that can cause the illness. Questions *QE2.1* and *QE2.2* look similar, but differ in two ways. *QE2.1* is a conditional yes-no question in which the condition "Marty is saying bad things" is given in the knowledgebase. It is not yet clear if this quarrel is going to cause (future) problems for Taran's family, hence this is an evoked question. *QE2.2* is a focussed yes-no question in which the diviner asks if it is this quarrel with Marty that is causing Luke's illness. Since it is known that there is a quarrel and that Luke is ill, this is also an evoked question. *QE3*

is just a repetition of *QE2.1* and thus evoked. *QE4* is clearly not evoked since one of the direct answers is previously given in *AE1*. Depending on the reading of *AE2*, *QE5* could be evoked or non-evoked. If *AE2* is explained as "the dispute is not going to affect Taran" then *QE5* is not evoked since the answer is already known. If *AE2* is explained as "something else is causing the illness" then *QE5* is evoked since it asks about future problems instead of the current illness of Luke. *QE6* is a simple yes-no question which is evoked. *QE7* is not evoked because *AE5* is one of the direct answers.

7.2.3   The logic of divinatory reasoning

While formalizing, I discovered several characteristics of the logic of mechanical divination with binary questions. First of all, I believe that the limitation to binary questions has an essential influence on the reasoning. The counsellor, or diviner, can ask nothing but binary questions, but the client nevertheless wants to discuss complex problems. It is not easy to analyze complex problems via binary questions.

Let me present a thought experiment. Suppose you are an all-knowing oracle and you can only answer "yes" or "no". Your client is lactose intolerant; she lacks the enzyme lactase and therefore she cannot eat milk products. Somewhere she has found a bowl of soup, but she does not know if it contains any lactose. She asks you: "Will I stay fit and healthy if I eat this soup?" You know that the soup contains lactose, but since it is just a small amount, you also know that when the client takes a pill that contains the lactase enzyme, she can eat the soup without problems. However, you can only answer "yes" or "no". This limitation would probably cause you to answer "no", because in case you answer yes, the client will eat the soup without further thinking and will suffer from it. The "no" answer seems to be the only sensible option. Typically it will cause the client to ask further questions such as: "If I take a lactase-pill, will I be able to eat this soup and stay healthy?"

This simple thought experiment reveals the essence of binary divination: "no" possibly means: "no, unless". That is why the Mambila diviners usually say: "No, not that, divine further, pick the stone".[26] The "divine further" option is essential. That contradictions are a sign that "no" meant "no, unless" is, by now, clear. However, also 'surprising answers' have a similar

---

[26] And if the Mambila diviners do not utter "diviner further", it is implicit.

effect. For example, when the Jewish boy asks the counsellor if he can continue dating a Gentile girl, the answer "no" means "no, unless". The answer "no" is in contradiction with the expectation of the diviner, or student, and can be called a 'surprising answer'. It causes the student to find the conditions under which he can continue dating the girl. Since in divinatory logic, "no" possibly means "no, unless", it is essentially non-classical. This is why, when we use classical logic, some divinatory questions are not evoked even though the reasoning makes perfect sense. It is the limitation to the binary questions that shapes divinatory logic.

Related to this, I believe that we can fruitfully continue to use IEL for studying binary divination if we allow the diviners to dismiss contradictory answers from their knowledgebases. We have seen in the formalized dialogues that, once the diviner encounters a contradiction, he takes this as a sign to cast the net of his questions more widely. Because of the formerly discussed limitation to binary questions, this makes perfect sense. The oracle is in fact *telling* the diviner that he needs to reformulate his questions, or take some other things into account before he continues. We have seen this happening in the student dialogues as well as in the Mambila dialogues. No essential difference has been found between the two practices, despite of the fact that the university students have the tendency to be more skeptical and ask more meta-questions.

8 Conclusion and further research

8.1 Conclusion

For many decades, scholars have been interested in the reasoning of illiterate people. Lévy-Bruhl believed that "primitive cultures" do not subscribe to universal laws of logic, including the principle of non-contradiction. Both Luria and Scribner have found that illiterates have problems with reasoning 'logically' in syllogistic-style tasks. Counihan suggests that the difficulties that subjects experience, stem from interpretation problems which are not necessarily connected with illiteracy. The aim of this thesis was to study the logic of divinatory reasoning, both in "the wild" and in "the laboratory". I have focussed on Mambila spider divination, a divinatory practice that is deeply embedded in the Mambila society in southern Cameroon. It is a specific form of mechanical divination, in which a diviner asks binary questions. These questions are the result of the diviner's knowledge, and can be seen as conclusions of a reasoning process. Moreover, I have studied the results of an experiment with university students, conducted by McHugh and reanalyzed by Garfinkel, that resembles Mambila spider divination. I have formalized several dialogues of both practices, using Inferential Erotetic Logic.

We have seen that in both practices, the divination sessions can be regarded as dialogues between a diviner and an oracle, or divination. We have also seen that the practices differ with regard to the authority of the oracle; in Mambila spider divination, the oracle is divine, while the oracle in the experiment is a human being (a student counsellor). This difference explains why the student dialogues get disrupted more often, and why the university students are more inclined to ask meta-questions than the Mambila diviners.

Different types of questions have been distinguished. First of all, we have made a distinction between advice-gaining and factual questions. Qualitative analysis has shown that the Mambila use more factual questions than the students in the experiment. Furthermore, we have distinguished diagnostic from predictive questions, and I have suggested that contradictory answers to predictive questions cause less difficulties for diviners than contradictory answers to diagnostic questions.

In the student dialogues I have found predictive factual questions, predictive advice-gaining questions and meta-questions. Contradictory answers to meta-questions seem to be the only ones that disrupt the order. In the Mambila dialogues I have found predictive factual questions, predictive advice-

gaining questions, diagnostic factual questions and meta-questions. Here, contradictions to meta-questions (test-questions) also disrupt the order, but to a lesser extent; the spider is simply not used anymore for a day, but the session continues. Somehow I have not yet managed to find contradictions to diagnostic factual questions. My surmise is that those would disrupt the order as well, and that therefore the Mambila diviners (maybe unintentionally) avoid such contradictions. Diagnostic questions seem to be repeated less often than predictive questions, which explains why 'diagnostic contradictions' do not occur often.

We have used IEL to analyse the dialogues of both practices. From the formalizations as well as from my conceptual analysis, we can conclude that the limitation to the binary questions shapes divinatory logic. The formalized dialogues confirm Zeitlyn's observation that once the diviner faces a contradiction, he takes this as a sign to cast the net of his questions more widely. The oracle is *telling* the diviner that he needs to reformulate his questions or think differently. We have seen examples of this in the student dialogues as well as in the Mambila sessions. This result negates Lévy-Bruhl conclusion that the primitive mind does not address contradictions.

In binary mechanical divination, "no" possibly means "no, unless". This is why divinatory logic is essentially non-classical. And this is why, when we use classical logic, some divinatory questions are not evoked even though the reasoning makes perfect sense. However, if we would allow the diviners to dismiss contradictory predictive answers from their knowledgebase, we still can fruitfully use Inferential Erotetic logic to study binary divination.

8.2   Further research

Firstly, I will philosophize about the question whether we can link my study of the logic in divinatory reasoning to the research that has been done on the reasoning of illiterates in reasoning tasks. As we have seen in Chapter 2, Luria and Scribner have classified the responses of illiterate subjects to the syllogistic-style reasoning tasks into two categories. The first category of responses involves a denial to answer the question due to the lack of personal knowledge of the premises. The second category involves a specific formulation of the premises in order to align them with personal knowledge or conventional wisdom. Counihan suggests that subjects without school-trained eyes interpret the question in a epistemically asymmetric way, meaning that the experimenter wants information from them that he does not have him-

self. However, the syllogistic-style task lacks epistemic asymmetry, and this is why the illiterate subjects have difficulties reasoning to the 'desired interpretation' of the experimenters. As Counihan has shown us, suppression-effect task materials provoke a much more similar response between literate and illiterate subjects than syllogistic-task materials. Those literate and illiterate subjects that seem to deny to answer the question in the suppression task, interpret the conditional as including an abnormality clause. They reason to an interpretation of the conditional "If A then B" in the following way: "If A, *and nothing abnormal is the case*, then B". Counihan argues that the subjects of which Luria would say that they adopt a 'specific formulation of premises', seem to interpret conditional premises as being temporally-bound. Interestingly, the data of Mambila divination as well as the data of McHugh confirm the abnormality-sensitive and temporally-bound nature of knowledgebase conditionals. The formalizations clearly show that knowledgebase rules allow for exceptions. For example, the answer *AE3* of Dialogue E states that "Divination has not made a decision, but the card that has been flipped over, shows that something is going on." I believe that, for the Mambila, this is a sign that something may be abnormal. This reading would explain the posing of the next question, *QE6*: "If I tell the chief and invite Gam Song to cut *sua* (at the chief's palace), if they will want it, choose the stick. No, not that, if I speak with Marty, I talk with him, he will not want it and he runs away so that he can do that work (witchcraft, bad thing), choose the stone." With this question the diviner asks whether Marty will cooperate or run away (to avoid *sua* being cut). Marty running away could be the abnormality that divination hinted at with *AE3*. It could be seen as an abnormality to the knowledgebase rule *KD1*, which stated that "If a problem is caused by witchcraft and the witch is identified, and nothing is abnormal, *sua* will end this problem". An example of an abnormality-sensitive knowledgebase rule in a student dialogue, is *KC1*: "If someone is a student with a deficit in grade points but with sufficient incentive and the ability to improve his study habits, and nothing is abnormal, he could get a degree."

In order to examine performance of reasoning with syllogisms, my proposal is to develop a simulated divination session. The simulation includes a simulated diviner, who asks questions and receives and interprets answers similar to real spider divination. Experienced Mambila diviners, the subjects, would be asked to review the (simulated) diviner's performance by commenting on each question and inspection. At some point in the divination session, a violated syllogism is inserted, along the lines of the following example:

Q: "If the bad weather has destroyed all roads in the East, choose the stick. If no, there are still some roads intact, choose the stone."
A: "Divination clearly has chosen the stick, so all roads in the East are destroyed by the weather."
Q: "My family member Amanda is coming to the village by car from the East. If the road she takes has been destroyed, choose the stick. It it will be intact, choose the stone."
A: "Divination clearly has chosen the stone, so the road will be intact."
The participants' reaction to the second question and to the second answer may provide new insights on the logic of the reasoning of the Mambila diviners with regard to syllogisms. Furthermore, the purpose of such an experiment is not only to test the reasoning with syllogisms, but also to check for abnormality-sensitivity and temporally-boundness of conditionals.

The proposed simulation could also help to check whether it is true that diviners are more tolerant regarding contradictory answers to predictive questions than regarding contradictory answers to diagnostic questions. Although the data seem to support this surmise, I have not yet found cases of contradictions to diagnostic questions. To check the surmise, we need to find such cases. A complicating factor is that the students do not ask diagnostic questions at all, and diagnostic contradictions seem to be extremely rare in Mambila spider divination. By inserting different types of contradictions[27] in the simulation, we could check whether my surmise is true.

Another, less experimental, idea for further research is to add an extra rule to Inferential Erotetic Logic for studying mechanical binary divination. If two (predictive) contradictory answers are obtained, they are deleted from the knowledgebase, which makes studying evocation of follow-up questions still possible. However, this does not fully do justice to divinatory reasoning. We have seen that a contradiction is taken as a sign that a different, more precise, question needs to be asked.[28] It indicates that instead of a plain "no", there is a "no, unless" involved. Hence, contradictions implicate that a special type of question needs to be asked in order to investigate the conditions under which "no" does not hold. Just dismissing contradictory answers would not reflect the logic of divinatory reasoning, since this would ignore the need for a special follow-up question. Further studies could update the divinatory

---

[27]Contradictory answers to predictive questions, contradictory answer to diagnostic questions and contradictory answers to meta-questions could be inserted.

[28]The same holds for 'surprising' answers, which we have shortly discussed at the end of Chapter 7.

version of IEL by not only deleting (predictive) contradictory answers from the knowledgebase, but also evaluating the follow-up question in a special way.

We have seen in Chapter 2 that the Azande perform a similar type of mechanical binary divination. Instead of spiders, they use fowls and a poison oracle. It would be interesting to apply my method of investigation on Evans-Prichard's results [3]. Since the Azande perform regular consistency checks, like the Mambila, contradictions arise during the divination sessions. It would be interesting to formalize the Azande sessions with IEL, paying special attention to the contradictions.

Lastly, further research could focus on formalizing divinatory dialogues by using Logic Programming, like Widlok and Stenning [13] proposed, or by using other logics.

9 Appendix I: data of McHugh's experiment

Dialogue A [8, pp.84-88]

My problem's financing certain investments. I have some stocks, but not much, and I need insurance and a car. But I'll have to get a loan to cover all this, and face it, I'm a student. I'm not too sure how to go about it all. My father knows about this sort of thing, and I plan on getting advice from my bank manager in this regard. I'm not too sure they'll go for everything: car, stocks, and insurance. That's pretty much although it could be managed, because I work now and during the summers in a pretty good paying job. The stocks are always there, of course, so it's not spending money alone, but making it too. The car and the insurance are different. The car will depreciate and the insurance may not be necessary, except the insurance on the car. Anyway, that's my problem.

Q1. I have a problem financing certain investments in stocks, insurance, a loan and a car. I plan to get some advice from my father and my bank manager. Do you think this is a wise approach to my problem?

A1. Yes.

C1. I infer from your answer that you agree with my plan of action, getting advice from my father and bank manager, In a situation like this, it isn't smart to go ahead and commit yourself without talking it over with somebody more experienced and more objective. I mean there could be reverberations that are full of trouble if things don't work out and I can't see it the way another more experienced person would, so better not take a chance on that. I suppose anybody would do it that way.

Q2. Would you use the same general approach?

A2. Yes.

C2. If you had the same problem, you'd follow a similar course of action. You're saying anyone could do this and make sense, regardless of experience. Just like you told me it was the best approach, you'd use it too, because it's always a good method to use regardless, to get somebody else's opinion. You *should* get another idea, no matter how experienced. Two heads are better than one. Of course, there's still the problem. I can do a lot of things: loans, installments, that sort of thing. What should I do?

Q3. Do you think a bank loan is a wise course of action?

A3. No.

C3. I assume you're opposed to debt or loaning money from banks. I might

assume you're opposed to my loaning from a bank. Banks really collect the interest, and they make money on you. I agree with that; by the time the interest is paid off, you've spent a lot of money. It's a good idea to be leery of banks. Get somebody else's opinion but watch out for banks. But where to get the money? It has to come from somewhere. Maybe the insurance companies.

Q4. What about an insurance company? Would that be wise?

A4. No.

C4. Hmm. Not an insurance company, huh? Well, I don't know what to say. No bank, no insurance company. What's the reasoning here? He says no bank loan and then doesn't think insurance companies are good either. Maybe he's the kind of person who doesn't believe in loans. Loans aren't too smart sometimes, since no matter where you get the money there's going to be interest. Unless a friend gives it to you without asking for any extra. If I could get that kind of bargain—maybe from my father.

Q5. Do you think I should approach my father about the loan?

A5. Yes.

C5. That's it, you think I should approach my father about it because a relative wouldn't ask for a loan with interest if he had the money to begin with. This way it would be possible to have more for the same amount of money. I could get more stockts or a better car. Or I could have the same thing for less money. I shouldn't get the money from banks or insurance companies, but from a relative because you get more that way. The trouble is it might put a dent in my father's expenses, he's not real well of. I don't know if I should ask him.

Q6. Do you think I should ask my father even if it might be hard for him to raise it?

A6. Yes.

C6. You're telling me to go ahead, my father would want me to do it this way because he would know it was better, and if worse came to worse we could always get a loan then, so it'd be the same difference anyway. I wonder, though, if it's okay to put your father on the spot that way, just come right out and ask him for it even if he'd find it tight. A few dollars, maybe, but not enough for a car or stocks. I should at least get his ideas on it first.

Q7. Should I come right out and ask for it, without getting his ideas first?

A7. No.

C7. I didn't think so. If I ask him for advice on the matter, he might come to see it would be best for him to loan the money himself instead of giving all

that interest to the banks. That way, wouldn't pay interest but it wouldn't put him on the spot either. But he might not see it either. What would I do then, if he doesn't see it this way? Should I bring it up then, or what?

Q8. If he doesn't see it that way himself, should I come right out and ask him anyway?

A8. Yes.

C8. Well, I don't know. That's interesting. I don't know what to make of that. I'm supposed to go ahead and ask him anyway. Because he won't see what I'm driving at? In case he doesn't realize it would be better not to pay interest, I should bring it up. Fathers are like that sometimes, they don't really listen because their children seem like kids even after they're mature, so I guess I should be careful to look out for this. If he doesn't come up with the idea, go ahead and ask him, because he may not be paying attention, so I'd lose out on the best way of obtaining the loan if I let it pass. That's a good idea, a good way to make sure everything has a change to work out and not pay any interest. That makes sense. You usually are making sense.

Q9. Do you think my father won't get the idea, so I'll have to bring it up myself?

A9. No.

C9. All that won't be necessary, my father will catch on even though it's good to take care of all possibilities in these things beforehand, just in case. Everything has a change to work, all the angles, if it is thought over carefully beforehand. Let's see, it's still possible he'll get the idea but won't like it.

Q10. When he gets the idea, will he like it and want to loan me the money?

A10. Yes.

C10. So it's all settled, he'll not only get the idea himself, he'll decide that it's the wisest course because there'll be no interest. I'm supposed to let him bring it up, that's better than asking for it directly, and he'll think it's the best way. He definitely won't skip over it.

My investments can be financed, but not through banks or insurance companies. They charge interest that's too high and you end up paying them a long time before everything is paid up. When I ask my father for advice, he'll realize this and suggest that it'd be a wiser course to let him advance the money without interest. This is interesting. I didn't realize loaning money could be so easy once everything's planned out. First, don't go to banks or insurance companies. Go to relatives. Then plan it out so the other guy gets the idea. I really feel I've been helped, psychiatrists know something. Talking things over makes you learn something about your situations. It's

not that fathers don't want to help out, that's not why you ask anyway. You ask them anyway because they may not be listening closely, even when they do want to help.

Dialogue B [4, pp.80-85]

Subject: Ok, this is the situation that I am presented with. I happen to be of the Jewish faith and I have been dating a Gentile girl now for about two months. My dad is not directly opposed to this situation, but I feel at the same time that he is not exactly pleased with it. Mother feels that as long as Dad is not directly opposed to this situation that I should go ahead and continue dating until he makes some direct statement to the contrary. My reason for feeling why he is not too pleased with this is that he has never said don't date her, but at the same time he will come up with digs and sayings that make me feel very ill at ease about dating the girl. My question is, do you feel under the present circumstances that I should continue or stop dating this girl? Let me put that in a positive way. Do you feel that I should continue dating this girl?
Experimenter: My answer is no.
Subject: No. Well, that is kind of interesting. I kinda feel that there is really no great animosity between Dad and I but, well, perhaps he feels that greater dislike will grow out of this. I suppose or maybe it is easier for an outsider to see certain things that I am blind to at this moment.
I would like to ask my second question now.
Experimenter: Okay.
Subject: Do you feel that I should have a further discussion with Dad about this situation or not? Should I have further discussion with Dad over this subject about dating the Gentile girl?
Experimenter: My answer is yes.
Subject: Well I feel that is reasonable but I really don't know what to say to him. I mean he seems to be not really too understanding. In other words he seems to be afraid really to discuss the situation. I mean at least it appears that way to me so far. But I guess if it is worthwhile to me, if I really want to continue to date her that I will go on and have this discussion with Dad. I really don't know what to say because I mean I am dating her. I am not in love with her or anything but I really never know what is going to come out. I guess we should have a discussion based on what the future possibilities might be and how he would feel about that. He may not be too

84

strongly opposed now because we are only dating, but perhaps he sees future complications that he would really like to get off his chest at the moment. I am ready for my third question now.

If after having my conversation with Dad and he says to continue dating her, but at the same time he gives me an impression that he is really not, he really does not want me to date her, but he is only doing it because he wants to be a good Dad, should under these conditions, should I still date the girl?

Experimenter: My answer is yes.

Subject: Well I am actually surprised at the answer. I expected a no answer on that. Perhaps this is because you are not quite aware of my dad and his reactions and he seems to be the type of person that is sensitive and therefore he is very careful in the way that he will handle things. Even though he might have said go ahead and date her I perhaps would feel guilty in knowing that he really did not want me to continue to date her. Though I don't know that it would actually help the situation any. So, well, perhaps we will look into this further and that is another question. I am ready for the fourth question now.

If after having this discussion with Dad and getting a positive answer from him but at the same time felt that this was not his honest opinion do you think that it would be proper for me to have my mother have a serious talk with him and therefore try and get a truer reaction to Dad's opinion to the situation?

Experimenter: My answer is yes.

Subject: Well this seems fair to me. I feel perhaps that he would be honester with Mother about the situation. Of course that might present a problem. Would Mother come back and be completely honest with me? She seems to be more liberal than Dad, not to say that Mother would lie about it, but she would be a little more liberal about things like this and perhaps in her course of conversation with Dad she would try and present my side to him and therefore once again I get two answers. If I look at it that way I don't think that I am going to get to first base anyay, but at least I feel that we are moving along some way. I am ready for my fifth question now.

Do you think that I should tell this Gentile girl who I am dating, the problem that I am having with my folks at home or should I wait until, well that is another question. Do you feel that I should tell the girl that I am dating, the problems that I am having at home over her religion?

Experimenter: My answer is no.

Subject: Well once again I am surprised. Of course, that might depend on

how much you care for the girl and how much longer I feel that I am going to be dating her. But I personally feel that it is only right to tell her for if she is perhaps thinking more serious than I am, she might, it might be best for us to understand the full situation and if she feels that this will be a block then I feel that perhaps I am going to show this in different ways and she will be unaware of what the real situation is and perhaps react back to be in a certain way spoiling our dating and everything else like that. I am ready for my sixth question.

If I was to fall in love with this girl and want to make plans for marriage do you feel that is fair that I should ask her to change her religion over to my belief?

Experimenter: My answer is no.

Subject: Well, no. Well, this has me stymied. No. Well, I honestly feel that I have been brought up in a certain way and I believe that she has too, and I feel pretty strong about the way that I believe. Not that I am completely orthodox or anything, but of course there is always family pressure and things like that. And I am quite sure that she feels, unfortunately I have never seen a family with a split in religion that really has been able to make a succes out of it. So I don't know. I think that perhaps I would be tempted to ask her to change. I don't think that I would be able to really. I am ready for number seven.

Do you feel that it would be a better situation if we were to get married and neither one of us were willing to talk about the religious difference or to give in on either one side, that we bring our children up in a neutral regligion other than the two that we believe in?

Experimenter: My answer is yes.

Subject: Well, perhaps this would be a solution. If we could find a religion that would incorporate our two beliefs to a certain extent. I realize that perhaps this might be literally impossible to do. Perhaps in a sense this neutral religion might be something almost made up by ourselves because I honestly feel that religious training no matter which belief it is if not carried to extremes is good, for everyone should have a certain amount of religious training along these lines. Perhaps this might be a solution to the problem. I guess I should follow this along a little bit further and see exactly what happens. I am ready for number eight.

If we were to get married would it be best for us to live in a new community where we will not be in contact with our parents if we were getting a lot of family pressure over religious differences?

Experimenter: My answer is no.

Subject: Well, I kinda tend to agree with this answer. I feel that you wouldn't be accomplishing too much by running away from the issue and that perhaps it would be one of those things in life that eventually you would just be willing to accept it and that the families and we would get along harmoniously together. At least I hope it would work out if that situation comes about. I think it would be best for both families together that we are not going to work it out if we run away from our problem. So we best remain there and try and work it out. I am ready for number nine.

If we did get married and were to raise our children do you think that we should explain and tell our children that we once had this religious difference or would we just bring them up in this new religion, that is their religion, that we talked about, and let them believe that that is what we originally believed in?

Experimenter: My answer is no.

Subject: Once again I kinda agree with this. I think they should be told because undoubtedly they will find out. And if they did find out that there was this difference that we once had they would feel that we were sneaking or trying to hide something from them and this would not be the best situation either. So I believe this would be the best situation. I am ready for number ten.

Do you feel that our children, if there were any, would have any religious problems themselves because of us the parents and our difficulties?

Experimenter: My answer is no.

Subject: Well I really don't know if I agree with that or not. Perhaps they would have trouble if confusion set in and they were to feel that they did not know which is right and which is wrong or what side to pick if they did not want to stick with their religion. But I kinda feel that if their religion was a wholesome one which supplied the needs of a religion and that which a religion does supply that there would not be any problems with them. But I suppose that only time will tell if such problems ould come about. I am finished with my comments now.

Experimenter: Okay, I will be right in.

The experimenter appeared in the room with the subject, handed him a list of points that he might comment on, and left the room. The subject commented as follows.

Subject: Well, the conversation seemed to be one-sided because I was doing it all. But, I feel that it was extremely difficult for Mr. McHugh to answer these questions fully without having a complete understanding of the personalities of the different people involved and exactly how involved the situation was itself. The answers I received I must say that the majority of them were answered perhaps in the same way that I would answer them to myself knowing the differences in types of people. One or two of them did come as a surprise to me and I felt that the reason perhaps he answered these questions the way he did is for the reason that he is not aware of the personalities involved and how they are reacting or would react to a certain situation. The answers that I received were most of them I felt that he was for the most part aware of the situation as we moved along in that I was interpreting his answers even though they were yes or no answers as fully meditating over these situations that I presented to him and they had a lot of meaning to me. I felt that his answers as a whole were helpful and that he was looking out for the benefit to the situation for the most part and not to curtail it or cut it short in any means. I heard what I wanted to hear in most of the situations presented at the time. Perhaps I did not hear what I really wanted to hear but perhaps from an objective standpoint they were the best answers because someone involved in a situation is blinded to a certain degree and cannot take this objective viewpoint. And therefore these answers may differ from the person who is involved in the situation and the person who is outside and can take an objective viewpoint. I honestly believe that the answers that he gave me, that he was completely aware of the situation at hand. Perhaps I guess that should be qualified. Perhaps when I said should I talk to Dad for instance he was not positive. When I said should I talk to Dad for instance he was not positive what I was going to talk to Dad about. In a full capacity. He knew the general topic but he is not aware how close I am to Dad or how involved the conversation might get. And if his saying "do talk" in knowing that Dad will not listen, well this perhaps isn't best, or if Dad is very willing to listen he says it may not help. Or don't talk. Well this once again is bringing in personalities which he is not aware of. The conversation and the answers given I believe had a lot of meaning to me. I mean it was perhaps what I would have expected from someone who fully understood the situation. And I feel that it had a lot of sense to me and made a lot of sense. Well I felt that the questions that I asked were very pertinent and did help in understanding the situation on both sides, that is myself and the answerer and my reaction to the answers

like I have stated before were mostly in agreement. At times I was surprised but understood that because he is not fully aware of the situation and the personalities involved.

Dialogue C [4, pp.85-88]

Subject: I would like to know whether or not I should change my major at the present time. I have a physics major with quite a deficit in grade points to bring up to get my C average in physics. I would like to switch over to mathematics. I have a little difficulty in it, but I think maybe I could handle it. I have failed several math courses here at U.C.L.A., but I have always repeated them and had C's. I have come close to getting a B in math in one specific course because I studied a little more than in others but my question is still should I change my major?

Experimenter: My answer is no.

Subject: Well he says no. And if I don't then I will have to make up my deficit in grade points which will be awfully difficult because I am not doing too well this semester. If I pull through this semester with seven units of A then I can count on possibly going on to get my degree in physics in February, but then I have this stigma of nuclear physics facing me. I thoroughly dislike the study of nuclear physics. Nuclear Physics 124 will be one of my required courses to get a degree in physics.

Do you think I could get a degree in physics on the basis of this knowledge that I must take Physics 124?

Experimenter: My answer is yes.

Subject: He says yes. I don't see how I can. I am not that good of a theorist. My study habits are horrible. My reading speed is bad, and I don't spend enough time in studying.

Do you think that I could successfully improve my study habits?

Experimenter: My answer is yes.

Subject: He says that I can successfully improve my study habits. I have been preached to all along on how to study properly, but I don't study properly. I don't have sufficient incentive to go through physics or do I?

Do you think I have sufficient incentive to get a degree in physics?

Experimenter: My answer is yes.

Subject: He says my answer is yes. I think possibly so if I didn't have a bad scholastic record behind me to follow me up. It would be awfully difficult to get that degree.

Do you think I could successfully do my studying while trying to keep happy relations at home with my wife and still get my work done? I don't do my studying well at school and I don't have much incentive to study when I am at home. But when my wife comes home, I like to study. Yet this keeps us from doing things, and whenever she doesn't do things, it gets on my nerves because there is all this work piling up. Do you think I could successfully do my studying at home?

Experimenter: My answer is no.

Subject: He says not. I don't think so either.
Should I come to school every night after supper and do my studying?

Experimenter: My answer is no.

Subject: He says I shouldn't come to school and study. Where should I go? Should I go to the library on campus to do my studying?

Experimenter: My answer is yes.

Subject: He says I should go to the library to do my studying. Which library? They may not have all the references there that I may need but that is not always necessary. I need at least three more questions. Do you think I can develop sufficiently good study habits and incentive to actually achieve developing those habits such that I wouldn't have to stay up late at night and not get the work done in the first place?

Experimenter: My answer is no.

Subject: He says no. I can't develop the study habits properly to be able to pull myself through. If you don't think that I can develop the proper study habits and carry them through to reach my goal do you on the basis of this still believe that I can get a degree in physics?

Experimenter: My answer is no.

Subject: According to that I won't get a degree. What should I do? Are you still there?

Experimenter: Yes, I am.

Subject: If you don't think I will make the ... achieve the necessary goal of improving my study habits and getting a degree in physics do you recommend that I quit school?

Experimenter: My answer is yes.

Subject: He says that I should quit school. Are you still there?

Experimenter: Yes.

Subject: I have one more question. I would like to get a commission in the Air Force. I have completed the Air Force R.O.T.C. training program but to get a commission I need a degree. If I don't get the degree the chances

are very strong that I may not get the commission although there are in's and out's that there is still some possibility that I may still get a commission without a degree, although this is not desirable. The question is, will I get a commission in the Air Force?

Experimenter: My answer is yes.

Subject: He says I will get a commission in the Air Force and that is what I am looking forward to, but will I ever get a degree? If I get a commission without a degree will I ever get a degree in anything?

Experimenter: My answer is no.

Subject: This leaves me somewhat unhappy although I don't really need a degree in the type of work that I desire to do. Are you there? Come back in.

The subject commented as follows.

Well, as far as what I got from the conversation, it is rather foolish for me to pursue my work any further as far as getting a degree in anything. Actually I have felt all along that the type of work I am interested in which is inventing is not something that requires a degree necessarily. It requires a certain knowledge of math and physics but it doesn't require a degree to do inventing. From the conversation I gather that I should just quit school and go ahead and get my commission but how I don't know. But it would be awfully nice to have a degree. That degree would be able to get me into other schools. Otherwise I will have the statement that I went through college but I never got out. I also get the impression that my study habits will never improve as much as I would like them anyway. I will not get a degree. I will get a commission and it is fruitless for me to study either at home or at school. Especially in the evening. I wonder if I should do any studying at all, or if I should learn to do all my studying at school. What to do? I have the feeling that my parents would be very unhappy and also my wife's parents would be very unhappy if I never did get a degree or at least especially right now. I have the feeling that this past conversation is based on what one should have learned to do years ago, that is, as a growing child. To ask themselves questions and give himself an answer of some type, yes or no, and to think out reasons why either yes or no holds or might hold and upon the validity or the anticipation of the validity of that answer what one should do accomplish his goal or just exist. I personally think I can do better in math than I can in physics. But I won't know until the end of the summer.

10 Appendix II: data of Mambila spider divination

Dialogue D

	Q33	Q34	Q35	Q36	Q37	Q38
Pot 1	*sua* will end it vs. *sua* will not end it					Something buried vs. *sua* will end it
Pot 2		*sua* will end it vs. divine further / cut kare	*sua* will end it vs. *sua* will not end it	male witch vs. female witch	*sua* will end it vs. witchcraft continues	

Table 3: Dialogue D, fragment of a session of Mambila spider divination, diviners Wajiri Bi and Wong Israel, January 1987 [17, p.661]

Dialogue E

Clip	Time	Question	Answer	Pot	Notes
43	8:59	Taran: divination, if we should go down the road of *sua*, choose the stick. No, something has been buried in the house, we should search for that, choose the stone. Mbollo: or something else (alternative to buried)! Mbollo: this man here, his child is sick in Banyo. If we should do *sua* blessing (for adultery), then choose the stick. No, if there is something buried in the house, or something else, you should choose the stone. Taran's correction: we will go to remove it.		3.1	Taran poses the binary alternative. Mbollo says: not good. Mbollo knocking. Mbollo asks again. Taran corrects him. Question never got answered.
44	9:03	Question of 47A is being posed.		2.3	Question gets answered in 47A.

45	9:09	(Mbollo starts, halfway the stick alternative, Taran takes over.) Marty is going around, saying bad things. If it is going to affect the family, family members, then choose the stick. If not, if it is just loose, empty, lazy talk, then choose the stone.		2.5	First, Mbollo asks Taran: who are we talking about? Taran says: Marty. Gets answered in 48A.
46	9:17	"We will ask about Banyo, and we will do it in duplicate." Marty is going around saying that Taran's place was Marty's father's place. So tomorrow will he do evil to my compound? If he will, choose the stick. If tomorrow comes and passes, choose the stone.		3.2	Taran is doing the speaking. Preferred option is the stone. Gets answered in 49A.
47A	9:37	Now my child is in Banyo. If he will stay there, choose the stick. No, it is not finished, choose the stone. Mbollo prompted him: maybe something is buried. Taran: yes, maybe something has been buried. He adds the buried stuff to the stone alternative.	The stone has been selected. One leaf is on the stone. One leaf is on the side: there is something in the ground, something is buried. Maybe they should look for somebody to remove buried stuff from the house.	2.3	Taran speaks.
47B	1:09 into the clip	Taran is here, his son is in hospital in Banyo. If we cut *sua*, will that end it? If it will, choose the stick. No, divine further, something buried in the house, choose the stone.		2.3	Mbollo poses the question. Question gets answered in 52A.
48A	9:42	If the dispute with Marty is responsible for the trouble in the house, choose the stick. If he is just talking with his mouth (the dispute with Marty is not connected with the troube in the house), choose the stone.	Stone has been selected. Both leaves on the stone.	2.5	Taran is speaking.

93

48B	2:00 into the clip	There is trouble. Marty is going around saying stuff. He is making trouble. If it is going to effect Taran's family, his children, his grandchildren, his house, if Marty is going to do evil to them, then choose the stick. No, if it is just empty talk, then choose the stone.		2.5	Mbollo Pierre talking on behalf of Taran. Taran says that Marty says that Marty is going to kill Taran with *sua*. Question answered in 50A?
49A	9:50	Divination, (if there is trouble coming from) the path to my older brother (Marty), if it is me, my wife, my children, my grandchildren who will die in the future, choose the stick. No, if the trouble is for someone else, choose the stone.	One card has been flipped over, overlapping. But not obviously one way or another. It is thinking about something. The flipped over one is looking towards the stack, there is something going on. It has not chosen either the stick or the stone.	3.2	Taran is doing the summary.
49B	1:49 into the clip	If I tell the chief and invite Gam Song to cut *sua* (at the chief's palace), if they will want it, choose the stick. No, not that, if I speak with Marty, I talk with him, he will not want it and he runs away so that he can do that work (witchcraft, bad thing), choose the stone.		3.2	Mbollo speaking again. Before posing the question, he swapped stick and stone over. "Ba son": cards stacked up against each other. Means "argument". In order to avoid *sua* being cut, Marty will run away with an excuse to go to work. Question gets answered in 58A.
50A	9:59		The stick has been selected.	2.5	Taran does the reformulation. After receiving the answer, they put medicine in the pot.
50B	2:17 into the clip	Someone is looking for an inheritance. Someone has come to do evil tomorrow. If this person will not do it tomorrow, if it is just empty talk, choose the stick.		2.5	Answer of the question (between 50B and 55A) is missing.
51A	10:27	If there are three people here, choose the stick. If I am on my own, choose the stone.	It has chosen the stick.	3.3	This is the result of a test question for a new pot (original not recorded).
51B	0:30	If there are three people here, choose the stick. If I am on my own, choose the stone.		3.3	First stick and stone are swapped over. Question gets answered in 56A.

52A	10:29	We've already cut *sua*, and that's the end of it, choose the stick. If there is something buried in the house, which we must remove, choose the stone.	Closer to the stick, but pointing at the stone, so stone is selected (pattern in divination of Mbollo. Pointing overrules except when cards are really over.)	2.3	
52B	1:30	Something is buried in the house. Who should remove it? If Troki, Yamba man at Mambon, should remove it, choose the stick. No, not him, find someone else, choose the stone.		2.3	Inspection of this answer seems to be missing.
53A	10:42	If we are with the three of us, choose the stick. If I am alone, choose the stone.	It chooses the stick.	2.4	This is the result of a test question for a new pot (original not recorded).
53B	00:31 into the clip	If we are with the three of us, choose the stick. If I am alone, choose the stone.		2.4	Before posing the question, stick and stone are swapped over. Question gets answered in 59A.
55A	10:48	Gam Song should cut *sua*. If Gam Song cuts *sua*, and then the future will be good, choose the stick. No, Gam Song cutting *sua* will not solve the problem, choose the stone.	It has chosen the stone, so we should leave it.	2.5	Seems like the posing of this question is missing.
55B	1:35 into the clip	If we should cut *sua*, of whatever type and whatever person, choose the stick. No, Taran should just leave it and look for medicine, choose the stone.		2.5	Question gets answered in 61A.
56A	10:51	If there are three of us present, choose the stick. No, if I am alone, choose the stone.	It chooses the stick. (DZ cannot see it well. Stack is on the right side, maybe that's why the leaves are taken to be closer to the stick. But maybe also preferences play a role.) Leaf is pointing to the hole, so we are going to hear bad news in the future.	3.3	Answer to question of 51B.

56B	1:18 into the clip	Divine for the man who came to see the diviner yesterday (17-09). A man from Tong, his wife has pregnancy problems. If it is the work of god, you choose the stick. No, if we should look further into it, including should we cook traditional medicine, choose the stone.		3.3	Person from Tong is at Luo. Before posing the question, the diviner breaks a grass. Person came yesterday to divine about his head, because his wife keeps getting miscarriages. Question gets answered in 60A.
57	10:56	No setting in video. Too late!		3.4	Missing posing of question. Question answered in 63A?
58A	11:06	(DZ doesn't really understand the question.) Marty? Those will small names and his (xxx) children choose stick, no they will not find the road choose the stone.	It has chosen the stone.	3.2	Answer of 49B.
	11:00	Not videoed. Inspection of a test question. Mbolo asked Taran how to interpret.			Photograph of missing inspection of test: Stick had been moved to near hole. Leaves on it, but on the stone side. One leaf partly in hole, so we will hear something bad.
58B	00:50 into the clip	If they should cut *sua*, choose the stick. No, if they should do traditional medicine, choose the stone.		3.2	Question gets answered in 62A.
59A	11:11	Question not recorded.	One card has been pulled down into the hole, which is bad. Taran in the background says that someone will die. Diviner says someone will enter the ground tomorrow.	2.4	Answer of 53B.
59B	00:45 into the clip	The person in the ground, is it someone from the village, yes choose the stick. No, if it is someone outside the village, choose the stone.		2.4	Mbollo breaks grass and starts. Halfway the posing of the question, Taran interrupts him. Mbollo breaks grass again. Question gets answered in 66A.

60A	11:15	About someone with pregnancy problems. If it is from god, choose the stick. No, look further into it, if there is something else, perhaps we should cook traditional medicine, choose the stone.	It selects the stone.	3.3	
60B	00:49 into the clip	Divination, there is something there. If we should cook traditional medicines, choose the stick. If we should cut *sua*, choose the stone.		3.3	Before posing the question he swapped stick and stone over. Question gets answered in 73A.
61A	11:17	Taran is divining about someone is his house (the person sleeping in his house). If they should cut *sua*, choose the stick. If they should do traditional medicine, choose the stone.	It chooses the stone.	2.5	After receiving the answer, diviner breaks grass. New stick because of topic change.
61B	1:00 into the clip	Luke is ill in Banyo. If there is something remaining that he hasn't spoken about, choose the stick. No, not that, is there something buried in the house or should we look for another path/alternative, choose the stone.		2.5	Question gets answered in 64A.
62A	11:28	Taran (Luke's father) should find someone to cut *sua*, choose the stick. No, if he should go for medicine, choose the stone.	It chooses the stone. (Main response.) But a second card has been pushed into the pile. This means: A boy (a male child) will be ill at his house.	3.2	Comments on the consistency: "it is like the one over there." He breaks grass, says: it is the end, we are going to do something new.
62B	1:05 into the clip	Luke is ill in Banyo. They have done blessing *sua*. If he still has something to say, choose the stick. No, should we look for something different, like there is something buried in the house, pursue another path, choose the stone.		3.2	Question gets answered in 67A.
63A	11:32	If there are three of us here, choose the stick. No, if I am alone, choose the stone.	It went both ways. One card one way, one card other way.	3.4	The diviner probably means: more of us versus alone.

63B	0:39 into the clip	If I will eat fufu today, choose the stick. No, if there is nothing in the house, choose the stone.		3.4	Question gets answered in 68.
64A	11:34	Luke is ill in Banyo now (place where he is in hospital). If there is something he hasn't said, choose the stick (adultery, violence, witchcraft. But adultery most default assumption.) No, if it is not that, if there is something buried in the house that we must remove, choose the stone.	On the stick side, but both leaves are pointing towards the stone. The directionality is overruling the position. Conclusion: he is very ill.	2.5	
64B	00:52 into the clip	If it is him, him himself, and he has something to admit (confess), then choose the stick. No, if there is something buried in the house, then choose the stone.		2.5	Question gets answered in 69A.
65	11:35	Diviner explains the different options for Luke: For Luke, we already have done blessing *sua* (particular form of *sua* for adultery), also we have done the divorce. However, if there is still trouble within him, it is the stick alternative. Other possibility, there is something in the house. Some weird result. Maybe there is something he still has to admit. Have to bless again. Maybe he has performed adultery himself. No, not that, something buried in the house, choose the stone.			
66A	11:42	The bad news, if it is from the central village, choose the stick. No, if we hear news from far away, from outside, choose the stone.	The stick has been chosen. The answer is inside the village.	2.4	Taran says: leave it. Diviner leaves the trace of questioning by cutting a grass.

66B	1:00 into the clip	Luke, he is ill. Although they have removed witchcraft grasses (medicine), if he still has something to say, if it is about him, choose the stick. No, if it is not that, if there is something hidden/buried in the house, choose the stone.		2.4	Question gets answered in 71A.
67A	11:51	Luke is ill. If they have already removed grasses from him (medicine), choose stick. No, if there is something hidden, something has been buried in the house, choose the stone.	Two cards propped up against each other. Diviner says: there is something going on here which we need to sort out. We have to isolate the causes.	3.2	
67B	1:00 into the clip	Divination, if this trouble has to do with him, with things he said, his mouth, choose the stick. No, if you say ... (recording stops, inferred from 75A: Not that, something has been hidden in the house, choose the stone.)		3.2	Before posing the question, the diviner swaps stick and stone over. Question gets answered in 75A.
68	11:56	If you will eat fufu today choose the stick. If you won't, choose the stone.	Two leaf cards pulled down in the hole, which means that we will hear bad news. Bad news. Bad news.	3.4	"We will leave it" Diviner puts cards on top of the pot. Spider is so concerned with bad news, that it cannot concentrate. (That's also why you cannot do divination after death).
69A	11:57	About Luke's illness. If it ends with him (if it is just him, individual) choose the stick. If not, there is something in the house, divine further, choose the stone.	It chose the stone.	2.5	
69B	00:27 into the clip	Divination, you say there is something in the house. If we have to remove it, we should go with (pause) Troki, choose the stick. If it is Alim at Mokwam who should remove it, choose the stone.		2.5	Before asking the question, the diviner swaps the stone and stick over. Question gets answered in 72A.
70A	12:08	Luke is ill, but they have given the divorce chicken, and if that ends it, choose the stick. No, if something has been buried in the house, choose the stone.	Leaves propped up against each other (in the air) but one is over the hole. Bad sign.	2.3	Missing the posing of this question between 52 and now.

70B	00:57 into the clipp	If something bad has been buried in the house, should Troki from Mambon remove it, choose the stick. Should it be Alim from Mokwam, choose the stone.		2.3	Question never got answered.
71A	12:20	If there is something inside him (Luke), choose the stick. If there is something in the house, choose the stone. (Doesn't say buried/hidden. Not necessarily witchcraft.)	It has chosen both.	2.4	After the answer the diviner breaks a grass: we leave it. Let the spider take a fresh look at the question.
71B	1:15 into the clip	If we should cook medicine, choose stick. If we should cut *sua*, choose the stone.		2.4	Before posing the question, the diviner says that he will change the subject. Question gets answered in 74A.
72A	12:23	If Troki (Yamba man from Mambon) should remove the buried witchcraft medicine in the house of Luke, choose the stick. If Alim (Nigerian Mambila from Mokwan) should remove the buried witchcraft medicine in the house of Luke, choose the stone.	It is on the stick, Troki should cut *sua* for Luke.	2.5	Another topic. Divining about Luke's house. Who should cut *sua* for him.
72B	00:45	Person from Tong, his wife is pregnant, should they cook medicine choose the stick. Should they squeeze medicine, choose the stone.		2.5	Question gets answered in 76A.
73A	12:25	No question recorded.	It has chosen the stick.	3.3	
73B	00:15	A person from Tong (hamlet). If they should cook traditional medicine, choose the stick. If they should squeeze traditional medicine, or something else, choose the stone.		3.3	Before asking the question, the diviner swaps over the stone and stick. Halfway through stone-alternative, he pauses for a long time, and then he starts again. He reposes the question stating that the alternative for cooking is not squeezing but there are other methods. Question never got answered.
74A	12:37	Divination, this man's wife keeps having miscarriages. If they should cook medicine, choose the stick. No, they should cut *sua*, choose the stone.	It has chosen the stick, but it is also saying death.	2.4	After the answer, the diviner breaks a grass and says: forget all that.

74B	1:10 into the clip	False start after correction of senior bystander, at 1:45 we have: if we should cook traditional medicine, choose the stick. If we should cut *sua*, of whatever type, choose the stone.		2.4	Question never got answered.
75A	12:40	There is something he has to say, choose the stick. We should come with him, he has something to say, he should say it, it is "ne le" (something stays with him), choose the stick. Not that, something has been hidden in the house, choose the stone.	It has chosen the stone.	3.2	
75B	0:35 into the clip	Should Troki (the Yamba-man at Mambon) remove the buried witchcraft medicine in the house of Luke, choose the stick. Should Alim at Mokwam remove the buried witchcraft medicine in the house of Luke, choose the stone.		3.2	Before posing the question diviner has swapped the stick and the stone. Question gets answered in 77.
76A	12:45	Somebody whose wife has had miscarriages in the past / is threatening a miscarriage. If she should cook traditional medicine for her, choose the stick. If we should squeeze traditional medicine for her, choose the stone.	Stick.	2.5	
76B	0:35 into the clip	The client is from a place called Luo. If they should cook medicine at Luo, choose the stick. If they should cut *sua*, of whatever type, choose the stone.		2.5	Before posing the question, diviner swaps over the stone and stick. Question gets answered in 78.
77	12:57	(Question not recorded.)	This is bad. Tomorrow there will be bad news. Death! This illness is serious.	3.2	Answer to 75B.
78	12:59	Do traditional medicine at Luo, choose the stick. Cut *sua*, whatever type, choose the stone.	It has chosen the stick.	2.5	

Table 4: Whole divination session Dialogue E, diviners Mbollo Pierre and Taran, date 18-09-2016

References

[1] R. Byrne. Suppressing valid inferences with conditionals. *Cognition*, 31:61–83, 1989.

[2] M. Counihan. *Looking for logic in all the wrong places: an investigation of language, literacy and logic in reasoning.* PhD thesis, University of Amsterdam, the Netherlands, 2007. ILLC Dissertation Series DS-2008-10.

[3] E.E. Evans-Pritchard. *Witchcraft, Oracles and Magic Among the Azande.* Oxford University Press, Oxford, 1937.

[4] H. Garfinkel. Commonsense knowledge of social structures: the documentary method of interpretation in lay and professional fact finding. In *Studies in ethnomethodology*, pages 76–103. Polity Press, Cambridge, 1984.

[5] L. Lévy-Bruhl. *How Natives Think.* Princeton University Press, New York, 1910.

[6] L. Lévy-Bruhl. *Primitive Mentality.* George Allen & Unwin, London, 1922/1923.

[7] A. Luria. *Cognitive Development: its cultural and social foundations.* Harvard University Press, Cambridge (MA), 1976.

[8] P. McHugh. *Defining the Situation: the organisation of meaning in social interaction.* Bobbs-Merrill, Indianapolis, 1968.

[9] R. Reiter. *Knowledge in Action: Logical Foundations for Specifying and Implementing Dynamical Systems.* MIT Press, Cambridge (MA), 2001.

[10] S. Scribner. *Mind and Social Practice: selected writings of Sylvia Scribner.* Cambridge University Press, Cambridge, 1997.

[11] K. Stenning and M. van Lambalgen. *Human Reasoning and Cognitive Science.* MIT Press, Cambridge (MA), 2008.

[12] P.C. Wason. Reasoning. In B.M. Foss, editor, *New Horizons in Psychology.* Penguin, Harmondsworth, 1966.

[13] T. Widlok and K. Stenning. Seeking common cause between Cognitive Science and Ethnography: a role for a nonmonotonic logic of cooperative interpretation. 2018.

[14] A. Wiśniewski. *The posing of questions: Logical Foundations of Erotetic Inferences.* Springer, Dordrecht, 1995.

[15] A. Wiśniewski. The logic of questions as a theory of erotetic arguments. *Synthese*, 109:1–25, 1996.

[16] D. Zeitlyn. Mambila divination. *Cambridge Antropology*, 12:21–51, 1987.

[17] D. Zeitlyn. Professor Garfinkel visits the soothsayers: ethnomethodology and Mambila divination. *Man (N.S.)*, 25:654–666, 1990.

[18] D. Zeitlyn. Spiders in and out of Court, or, 'The Long Legs of the Law': Styles of Spider Divination in Their Sociological Contexts. *Africa*, 63:219–240, 1993.

[19] D. Zeitlyn. Divination as dialogue: negotiation of meaning with random responses. In E. Goody, editor, *Social Intelligence and Interaction: Expressions and Implications of the Social Bias in Human Intelligence*, pages 189–205. Camebridge University Press, Cambridge, 1995.

[20] D. Zeitlyn. *Sua in Somié: Mambila traditional religion.* privately published, Oxford, 2007. revised edition of 1990 Cambridge Ph.D. thesis 'Mambila traditional religion: Sua in Somié'.

[21] D. Zeitlyn. Divinatory Logics: Diagnoses and Predictions Mediating Outcomes. *Current Anthropology*, 53:525–546, 2012.