Bernard Sypniewski (Camden, NJ, USA) **SNAKE IN THE GRASS**

A thought experiment is performed in the paper. The author wishes to know how people's communicative behavior is likely to change due to changes in the surroundings. Three linkages are created in which the communicative behavior of one participant is held constant (with some slight exceptions) while the communicative behavior of the second participant is allowed to vary according to the changes in the environment. In accordance with the strictures of Hard Science Linguistics, the models represented in the paper will all be testable in the real world.

The author hypothesizes that any changes in one participant's communicative behavior from scenario to scenario are due to the observed changes in the surroundings modeled in the corresponding linkages and not due to the other participant's behavior that traditional linguistics might model with some concept from its grammatical theory.

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SNAKE IN THE GRASS

Introduction

In this paper, we perform a thought experiment. We wish to know how people's communicative behavior is likely to change due to changes in the surroundings. We create three linkages in which the communicative behavior of one participant is held constant (with some slight exceptions mentioned below) while the communicative behavior of the second participant is allowed to vary according to the changes in the environment. In accordance with the strictures of Hard Science Linguistics (HSL: Yngve 1996), the models created here will all be testable in the real world, although we have not conducted the tests.

We refrain from relying on traditional linguistic concepts in order to make the results of our thought experiment and any actual experiments that result from this paper acceptable using the scientific method as it is known to non-linguistic sciences (Yngve 1996). We will not model any internal states of any people involved in our linkages unless those internal states are reliably and meaningfully evidenced by some observable behavior of the people represented in the models; see (Coleman 2005). This should not be taken as saying that there are no such things as internal states.

We use the term "*stimulus*" non-technically in a theory-neutral way. We will use the words "*situation*" and "*scenario*" interchangeably and non-technically to refer to that which is modeled by a linkage. Rather than defining words of art used by HSL researchers, such as "*linkage*", "*role part*", and "*prop part*", the reader is referred to (Yngve 1996) and the papers reproduced in (Yngve & Wąsik 2004).

We set up three linkages, [field], [street], and [warehouse] to model the scenarios we postulate. The three linkages are not connected in any way; they represent three independent scenarios. Each linkage has at least two role parts [A] and [B]; [A] and [B] model the same two participants, Able and Baker, who participate in all three linkages. There will be other role parts and prop parts as needed.

Able's communicative behavior will be practically identical in all linkages. [A] has the necessary task procedures to model Able's pointing with his arm and index finger outstretched while saying "*Look!*

Язык, коммуникация и социальная среда. Воронеж: ВГУ, 2008. С. 33-54.

There is a snake in the grass!" [B] has the necessary task procedures and properties to model Baker's listening to Able, directing his gaze to the place that Able points to, and otherwise responding to Able and the surroundings modeled in the linkage. The only significant change in Able's communicative behavior over the three linkages is just what Able points at in each model. This slight change will also require some alteration in the notation for Able's behavior from linkage to linkage.

The surroundings in each linkage will vary substantially from each. What we observe is how the changes in the surroundings over the different linkages require changes in Baker's communicative behavior. We model the change in [B]'s communicative behavior by changing [B]'s properties in the corresponding linkages. Since it will prove easy to see how Able and Baker's communicative behavior can be extended beyond what is modeled in our linkages, we will also briefly discuss the likely effect of Baker's response to Able's behavior on communicative behavior not specifically modeled in this paper.

We hypothesize that any changes in Baker's communicative behavior from scenario to scenario are due to the observed changes in the surroundings modeled in the corresponding linkages and not due to Able's behavior that traditional linguistics might model with some concept from its grammatical theory.

The [field] Linkage

The [field] linkage is so named because it models the situation in which Able and Baker walk through a grassy field. Able and Baker stop abruptly. Able points to an area of grass and says "*Look! There is a snake in the grass!*" Baker looks where Able points. To model this situation, [field] has two prop parts, [grass] and [snake] that model the grass and the snake respectively. To make discussion simple, both the grass and the snake are easily visible to both Able and Baker. The prop parts both have a <visible> property. Baker hears Able's utterance (the word '*utterance'* is used in a nontechnical sense as a general term) and sees Able point at the snake. Both Able and Baker see the same snake. The linkage has a top-level task called <walk>. Our first attempt at modeling this behavior is as follows:

[field]<walk> = [A]<watch for snake> + [B]<listen to Able>
[snake]<visible/yes>
[grass]<visible/yes>

[field]<target>

[A]<watch for snake> = [grass]<visible/yes> x [snake]<visible/yes> -> <point at target> -> <say "*Look! There is a snake in the grass!*">

[B]<listen to Able> = <hear "*Look! There is a snake in the grass!*"> -> <see pointing> -> <see grass> -> <see snake>

Our preliminary model accounts for the externally observable, linguistically relevant behavior of Able and Baker. When Able points to something in the grass, he is pointing at a target of his observation. We can describe this task by:

<point at target> :: <target/snake>

where <target> is a linkage property and "snake" is the value of <target> that indicates what Able points at. If [field] were the only linkage that we describe, this task procedure might as well have been called <point at snake>. By selecting the name <point at target>, we can generalize this task procedure and use it across the three linkages. The only difference in this procedure in different linkages is the value that a linkage gives to <target>.

In a situation as simple as the one presented here, the procedures <point at target> and <say "*Look! There is a snake in the grass!*"> might occur either simultaneously, in the order presented above, or in a reverse order. For our description, the order of occurrence does not matter. The reader should consider that Baker's responses to these events will probably be nearly simultaneous. [B]'s task procedure descriptions below are somewhat arbitrary because of they do not capture the flavor of this potential simultaneity. What is important is not whether the response is modeled by this or that order of procedures but whether the response is properly modeled.

Upon hearing the utterance "*Look! There is a snake in the grass!*" and seeing Able's pointing, Baker expects to see a snake. The expectation arises from Baker's looking at the surroundings as he and Able walk through the field and hearing the utterance. Even if he and Able were talking, Baker would still see the surroundings, albeit in a peripheral way, to avoid collisions, prevent his tripping, etc. Borrowing some language from computer science, we note that when a human being is awake, his or her senses are active and a stream of sensations is input into the person's brain. While the person might not be imme-

diately alert to all of the happenings in the surroundings, the input data is nonetheless being processed ('*processed*' is not used here in any technical sense) in case something interesting or potentially dangerous might occur. This processing happens below the attention level of the person unless the person is actively scanning the surroundings and not doing anything else. Able's utterance, together with this sub-attention processing sets up an expectation in Baker that a snake was seen by Able and that he, Baker, might also be able to see and should look for the snake. In short, "seeing" for HSL is an active process that can have a direct effect on communicative behavior even before the communicative behavior actually occurs. In the real world, Baker's expectation may be seen from his behavior such as commenting about snakes or asking for more information about snakes (as opposed to some other object) once he reacts to Able's behavior.

The <see pointing>, <see grass>, and <see snake> procedures model what (Coleman 2004 and 2005) refers to as "directed gaze". Seeing Able pointing, Baker turns his head and eyes, as necessary, toward the grass and the snake. Because it will be important for subsequent communicative behavior, we must show that Baker has seen the object and knows that it is a snake. Baker does more than merely see some elongated or coiled animal on the ground but "understands" that what he sees is a snake and not something else. For our purposes, we say that this is an "observation", by which we mean a sensing (and not just seeing because other senses, such as hearing, might provide some assistance) accompanied by an expectation that something (in this case, the snake) was able to be sensed and an "understanding" of what was sensed. Here, "understanding" has its common meaning and is not used in any technical way. Apprehending the existence of the snake in the grass changes a property in [B]. We model [B]'s apprehension of [snake] by <obs snake> and [B]'s apprehension of [grass] by <obs grass>. We point to those changes in Baker which cause him to be alert to the snake and the grass, including sweating (he might be afraid of snakes or allergic to grass), other bodily movements (or lack thereof; his response to the snake may be to stand still), changes in breathing, or the making of sounds, as support for including <obs grass> and <obs snake>. The procedure <see grass> can be defined as <see grass> :: <obs grass/yes> and the procedure <see snake> as <see snake> :: <obs snake/yes>. We initially set these properties negatively: <obs grass/no> and <obs snake/no>. We will not consider the situa-

tion in which Baker may see some object or animal but not be able to identify it without assistance. If this thought experiment were to be carried out in the real world, the researcher may need to consider such a possibility.

Above, we treated the utterance "*Look! There is a snake in the grass!*" as a unit. It is appropriate to refine our model. If we think of the prosodic pattern of the phrase, the "*Look!*" portion is likely to be said more sharply though not necessarily more loudly than the remainder of the utterance. There might even be a perceptible pause between segments. The prosodic features send a particular message from Able to Baker. This message is not what traditional linguistics refers to as "meaning". That aspect of the sound which is marked in the text by an exclamation point is intended to draw Baker's attention to something. Together with perceiving the outstretched arm and finger, the perception of the sound heightens Baker's visual acuity. The perception of the sound "*Look!*" indicates to Baker that there is something that he should see; Baker expects that there will be something to see. If the situation were slightly different, Able might have said "*Listen!*" to indicate that Baker might hear something. The pointing shows Baker where that something is, at least in terms of direction if not exact location.

The sharpness with which Able speaks the phrase raises an alarm in Baker. "Alarm" should not be taken to suggest that Baker necessarily perceives some potential danger. "*Alarm*" here means that the person alarmed shifts his or her attention from the current behavior to some new behavior in the belief that the second behavior is, at least momentarily, more important than the first. The particular stimulus of the sound alerts Baker that he should concentrate his visual sense to something to which Able points. Able's pointing directs Baker's gaze to a limited area. We say that [B]'s task procedure <hear "*Look! There is a snake in the grass!*"> sets a property value. Let us call this property <alert>.

We can say that part of the description of [B]'s task procedure is as follows:

<hear "*Look! There is a snake in the grass!*"> = <hear "Look!"> -> <hear "*There is a snake in the grass!*">

The first subtask can be partially described as follows:

<hear "*Look!*"> :: <alert/vision>

where *'vision'* is a property value that indicates what sense is alerted. This can be tested in the real world. People who are alerted to some potential problem or item of interest often manifest physical changes such as sweating, smiling, muscle tension, or, in the case of being visually alert, a change in pupil size or eye or head movement. This observable change in Baker justifies our inserting <alert> in [B] in order to model an internal state in Baker.

[B] has a task <see pointing> which we can partially describe as follows assuming that gazing, i.e., directed vision, is a property. Gazing involves eye and head positioning as well as, in this instance, concentration, all physical features of Baker.

<see pointing> :: <gaze/direction of pointing> x <expect snake/yes>

We say that the expectation is set when both the pointing is seen and the utterance is heard. Because we have elected to model the perception of the pointing as occurring after the hearing, we have placed the setting of the expectation in <see pointing>. The reader should understand this to mean not that it is this specific procedure which does the setting of the expectation but that the setting of the expectation occurs after both the seeing and hearing are accomplished. In short, the order of hearing and seeing is not necessarily meant to be sequential and should not be taken to be a prediction that such will be the case. Had we elected to model the hearing after the seeing (recall our previous comment that these two tasks might occur simultaneously), we could have just as easily set the expectation in <hear "*Look! There is a snake in the grass!*">. What is important is that the expectation is set by the combination. The remainder of the utterance creates the expectation that Baker will see a snake. We model this with two expectations, one to show that there is an expectation of seeing ***something*** and a second that the ***something*** to be seen is a snake. The <alert/vision> property value pair takes care of the first expectation; <expect snake/yes> takes care of the second.

The remainder of the second segment cues Baker to what to look for. Alerting someone without giving a subject cue for the alert may not be as effective as an alert with a subject cue. Merely pointing may not be sufficient if the area pointed at is "noisy" in the information

theoretic sense. Providing an additional cue to identify the subject of the alert may make the perception of the item of interest quicker and more accurate. In any event, the cues, along with Baker's perception of the surroundings during his walk with Able, create the expectation modeled above. Let us rewrite <hear "*Look! There is a snake in the grass!*">:

<hear "*Look! There is a snake in the grass!*"> = <hear "*Look!*"> -> <hear "*There is a snake in the grass!*"> -> <see pointing> -> <look for snake>

We merged the task <see pointing> into a larger task. Within the <hear "*Look! There is a snake in the grass!*"> task we divided the response to the sound into two parts and followed their execution by the subtask <see pointing>. The task reordering is a convenience. Hearing the sound "*Look!*" and reacting to it are likely to be quick, nearly simultaneous. Some of the reaction depends on the order in which Able performs his tasks. If he points first, the pointing will likely be perceived before the sound is heard. For our purposes, the order of these events makes no difference. We split the task <hear "*Look! There is a snake in the grass!*"> into two tasks to indicate that the different parts of the utterance may have different effects. If we think of "*There is a snake in the grass!*" as cueing Baker's vision system to look for something specific, we may model it by giving [B] a <cue> property. A <cue> property will initially have no value since there is nothing in Able's communicative behavior to cue Baker to anything. In fact, there are two cues, a cue for what to look for (the snake as opposed to, say, a bluebird) and a cue for where to look (in the grass rather than, say, on a rock). We model this with two properties, <cue1> and <cue2>. The <hear "*There is a snake in the grass!*"> task looks like this:

<hear "*There is a snake in the grass!*"> :: <cue1/snake> x <cue2/in the grass>

The cues will produce observable changes in Baker. Most obviously, responding to the cues will cause Baker to move his head and/or eyes so that he can more easily see that area of the field that Able pointed at (modeled more specifically by the <look for snake> task mentioned below) especially after he notices Able's pointing (modeled by <see

pointing>). Baker uses these cues to help him direct his gaze if the snake is not immediately apparent. If he has to scan an area, the cues provide him with a limited area for his scanning. If the environment has patches of grass as well as areas of rock, trees, or bushes (areas that are not grass), Baker's scanning will probably start at an area of grass. Once Baker sees the snake, he stops scanning the environment. The cues fix Baker's starting and stopping behavior. If asked what he is looking for, Baker will no doubt answer "*a snake*" and if asked where the snake is, he would answer "*in the grass*". In short, the cues might also have some effect on his communicative behavior subsequent to Able's utterance if it is desired. The expectation in [B] is not caused by Able's mentioning the area and object of interest. It is the result of Baker's actively seeing the surroundings and Able's claiming that there is something of interest in a particular portion of the surroundings.

The remaining task <look for snake> models Baker's scanning the grass until he sees the snake. Perhaps, when he sees the snake, Baker makes some acknowledgement of that fact. The acknowledgement may be an utterance such as "I see it", "Oh, yeah", or something else such as a head nod. The acknowledgement is behavior by which Baker communicates his apprehension of the snake to Able. We create a subtask called <acknowledge> which we will not describe in detail. We assume that the <acknowledge> subtask includes any necessary subtasks and properties for the modeling of Baker's communicating that he has actually perceived the snake. If we wish to expand Able's model, we could include the appropriate tasks and properties needed to acknowledge (at least to himself) Baker's apprehension of the snake. The <look for snake> task may be described as follows:

<look for snake> = [grass]<visible/yes> x [snake]<visible/yes> x <obs grass/yes> x <obs snake/yes> -> <acknowledge>

It is not necessary that Baker acknowledge seeing the snake in any specific way. Perhaps he will begin to discuss the snake with Able. Such a discussion is a "tacit" acknowledgement, i.e., a discussion in which no specific phrase of acknowledgement is used. If this thought experiment was to be carried out in the real world and Baker did not see the snake, <acknowledgement> would fail. The linkage would have to be modified to provide the code necessary for [B] to indicate that he did not see the snake. Perhaps after additional communicative

behavior by Able, Baker might see the snake. The modifications will be due to actual, observed behavior in the real world not to theory. Flexibility of this sort is one of the hallmarks of HSL.

THE [STREET] LINKAGE

This linkage models Able and Baker walking down a typical urban street. There is no grass to be seen. There are no snakes (in the zoological sense) to be seen. Able and Baker both abruptly stop. Able points to a third person (whom we call Charlie) and says "*Look! There is a snake in the grass!*"

In [street],[A] has almost the same tasks and properties as [A] did in [field]. Able does not point to a snake but at Charlie so <point at target> must be modified:

<point at target> :: <target/Charlie>

[B] has the same properties and similar procedures as the [B] role parts in [field]. We set the <cue1> and <cue2>properties to their default null values. Initially, [grass]<visible/no>, [snake]<visible/no>, <obs grass/no> and <obs snake/no> are set. In this linkage, [B] will not see either grass or a snake but the fact that there is no grass or snake to be seen is important. The [street] linkage contains neither grass nor an actual snake. We include a third role part [C] to model Charlie, the person whom Able points at. Charlie is, in our model, merely the target of Able's pointing and, unless we wish to develop the communicative behavior modeled by this linkage in more detail, he will not interact with either Able or Baker. At the most, [C] will have a <visible> property, like [grass] and [snake]. The [C] role part might as well be a prop part.

A scan of the surroundings would not suggest to Baker that a snake might lurk nearby. If Able had pointed to a weedy lot, even in an urban setting, it is possible that Baker might have an expectation that there was a snake in the weeds somewhere. There is no requirement that an expectation be reasonable to a disinterested observer. We have not modeled such a situation but, in an actual experiment, the researcher must be alert to this possibility. [B]'s <see pointing> task in [street] looks like this:

<see pointing> :: <gaze/direction of pointing> x <expect snake/no>

However, there is another possibility. If Baker were not paying particular attention to the surroundings, he might "instinctively" react to Able and look for an actual snake. In this case, there would be an expectation of seeing a snake, however briefly that expectation might last. This might briefly set <cue1> and <cue2>. In such a case in the real world, we might notice that Baker acted confused, embarrassed or, in some way, unsettled when he realized that there was no actual snake to be seen. This would cause <cue1> and <cue2> to be reset to their default null values. Such behavior would be a strong indication that an expectation was not satisfied. If this sort of behavior was observed, <expect snake> would have a positive value.

We re-examine [B]'s last task in [field], <look for snake> in light of the new situation. It is clear that there is neither a zoological snake nor grass. We create a selection procedure. The selection procedure depends on the values of the <visible> property of [grass] and [snake], especially [snake]. We show the <look for snake> subtask from [field] for the sake of completeness:

<look for snake> = [grass]<visible/yes> x [snake]<visible/yes> x <obs grass/yes> x <obs snake/yes> -> <acknowledge>

and rewrite it for [street] as <look for target>:

<look for target> = [grass]<visible/no> v [snake]<visible/no> x [C]<visible/yes> -> <see Charlie> -> <query Able>

The <see Charlie> subtask models Baker's failure to see an actual snake. Instead, he sees Charlie. <see Charlie> replaces the <see pointing> subtask that was part of the <look for snake> subroutine in [field]. A fully developed description of <see Charlie> would include the subtasks and properties necessary to model the physical actions involved in [B]'s directed gaze; aside from these subtasks and properties, <see Charlie> needs to set only one additional property:

<see Charlie> :: <obs Charlie/yes>

where <obs Charlie/yes> models Baker's apprehension of Charlie. In this case, "apprehension" does not necessarily mean that Baker is

aware that the person pointed at by Able is named Charlie. For our purposes, all that is needed is for Baker to be aware that Able points at a specific human being rather than a species of snake. We also note that <obs grass> and <obs snake> are initially given negative values in this linkage and, unlike in the [field] linkage, <look for target> does not change their values. We should not observe Baker indicating that he has apprehended a snake or grass because there is none in this linkage.

The <query Able> task models Baker's reaction to his inability to observe an actual snake. He sees Charlie instead. It will not be described in detail (unnecessary in this paper) but if it was fleshed out, it might contain subtasks to model Baker's asking Able what he meant by "snake". This model is naive by assuming that Baker does not recognize Able's utterance to be a metaphor. However, even if we wished to model Baker's recognition that Able's utterance was a metaphor, we might wish to consider whether Baker understood Able's reason for using the metaphor. In such a case, <query Able> becomes a selection procedure with the appropriate subtasks and branch points.

In the case where <expect snake> was set positive, the <query Able> subtask resets this property to <expect snake/no> to model Baker's expectation not to see an actual snake.

The [warehouse] linkage

This linkage models Able and Baker being alone in a completely empty, undecorated warehouse. The lights are on, light comes in through the windows, or, for some other reason, everything inside the warehouse is or could be visible to Able and Baker. Able points at some undefined spot in the warehouse and says "*Look! There is a snake in the grass!*" The situation modeled in [warehouse] is unusual. An empty warehouse was selected as an easy way to suggest that there are no clues in the surroundings to indicate what Able points to or wishes to alert Baker to. There are only two role parts in this linkage, [A] and [B]. There are no new prop parts unless we wish to model the empty warehouse as a prop. Since there is no [grass] or [snake], we set [grass]<visible/no> or [snake]<visible/no>. There are no references to Charlie in [warehouse]. All tasks from [street] that we wish to reuse must be modified to remove such references if they are to be recycled for [warehouse]. For example, <see pointing> needs to be changed to a setting procedure:

<see pointing> :: <obs grass/no> x <obs snake/no> x <expect snake/no>

to model the fact that Baker not only does not see grass or a snake but does not expect either grass or snake is present in the warehouse (the motivation for not having any prop parts in this linkage). Baker did not expect to see a snake and his observations confirmed that no snake was present in the warehouse.

We may reuse the description of [street] for [warehouse] with the exceptions just mentioned. We can see that in this linkage the <query Able> subtask will be executed. In the real world, Baker will undoubtedly be confused by Able's utterance and pointing. If we model <query Able> as a selection procedure, we give [B] a property called <confused> which is set to <confused/yes> in <see pointing>:

<see pointing> :: <obs grass/no> x <obs snake/no> x <expect snake/no> x <confused/yes>

This property could be used in a fuller description of <query Able> to select the proper question for Baker to ask Able to clarify the situation. Confusion is usually easy to observe. This property could also be called <concern> if we wished to model Able's behavior as being the product of some mental illness or state such as drunkenness and Baker's awareness of that condition or state.

Discussion

Our three linkages in the thought experiment show us several things. First, Baker's response to Able's utterance differs from situation to situation. Although we have not conducted the experiments, the described behaviors are all plausible and are predictive of the kinds of behaviors that would occur if the experiment is conducted. In the [field] linkage, [B] expects to see a real world object (the snake) pointed out and cued by [A]. Property values in [B] change accordingly since we see evidence for changes in Baker or we could if tests of these models were performed. In [street], [B] also reacts to [A]'s communicative behavior but not in the same way. While there is a real world object (Charlie) for Baker to respond to, Able's utterance does not stimulate Baker's response to the object in the same way as it did in the situation modeled by [field] because two of the objects (props)

in the situation modeled by [field] (grass and snake) do not occur in the situation modeled by [street]. Baker shifts his attention from a non-present real world object to a real object described metaphorically because the cues and the pointing, together with Baker's observations of the scene do not match. Different property values change.

That there are two possibilities: one which creates no expectation that a snake would be seen and one that such an expectation would fleetingly occur but would then not be satisfied. Both scenarios have the same ending as far as expectations are concerned: eventually, Baker will not expect to see an actual snake. In the situation modeled by [warehouse], [B] reacts similarly to his reaction in [street] because he is not able to see the real world objects that were cued by Able but [B]'s continued reaction is substantially different from either his reaction in the situations modeled by [field] or [street]. In the situation modeled by [street], Baker shifts his attention from an unperceived real object (the snake) to a perceived real object (Charlie) either by being aware that Able was speaking metaphorically or by asking Able to clarify his utterance or by responding more strongly to the pointing than to the verbal cues. There is no real world object of any kind for Baker to react to in the situation modeled by [warehouse]. If Baker reacts to anything, it is the absence of a real world object, i. e., the mismatch between the cues and the pointing.

Baker may be confused by Able's cuing and his (Baker's) inability to see what Able was pointing at. There is a subtle difference between Able's behavior in [street] and [warehouse]. In [street], Able cues non-existing objects but points to a real world object (Charlie). In [warehouse], Able also cues non-existing real world objects but points at nothing, i. e., an absence of real world objects. If anything permits Baker to assume that Able speaks metaphorically in scenario modeled by [street], it is Able's pointing at a real world object. Baker cannot assume that Able speaks metaphorically in the scenario modeled by [warehouse] because there is no real-world object to which Able points. We may, preliminarily, say that for there to be a model of metaphorical behavior, there must be a real-world object that is the "subject" of the metaphor or, at the very least, there must be the perception that there could be such an object. The metaphor occurs because the perceived real-world object is claimed to have different properties than it actually does. We will not discuss this further.

We have not used "meaning" to describe any aspect of the communication between Able and Baker in any of the three scenarios and specifically stated that the exclamation "*Look!*" transmitted a signal that should not be considered as a meaning in the traditional semantic sense. We have accounted for the communication and its effects without resort to any traditional semantic theory. In this respect, the current paper follows the path forged by (Coleman 2005a). It may be argued that in [B]'s tasks in the three linkages there is an additional, unstated task of extracting "meaning" from [A]'s utterance and that there is an additional, unstated task in [A]'s role part of somehow inserting "meaning" into the utterance. Anyone who makes such arguments must demonstrate what "meaning" is, in HSL terms, and how "meaning" is "inserted" into or "extracted" from an utterance. We make no such argument. While the utterance in the situation modeled by [field], taken by itself, may be subject to various traditional semantic analyses, the traditional analyses can only be made by removing the utterance from the surroundings of the utterance. To put it another way, the tradition discounts an effects of the surroundings on Able or Baker as modeled by [A] and [B]. We may define "abstraction" as the intentional or unintentional refusal to consider the effects that the linguistically relevant portions of the real world other than the sonic or written representation of an utterance might have on the observed communicating individuals.

If a traditional semantic analysis claims that there is some sort of "information" content in the utterance in the situation modeled by [field], the same cannot be said for the semantic content of the utterance in the situations modeled by [street] and, especially, [warehouse] without torturing the notion of "information" into meaninglessness. The [field] linkage presents us with a typical linguistic example in which there are minimal traditional problems for grammatical or semantic analysis. The [street] linkage presents us with a situation in which the utterance cannot be taken "at face value", i. e., that it describes an actual, physical reality. The [warehouse] linkage models a situation in which the same utterance is unrelated to ***anything*** in the surroundings. For convenience, we may refer to these as "factual", "metaphorical", and "imaginary" scenarios, situations or linkages, respectively. In all three scenarios, Able's behavior is exactly the same. Able's utterances are exactly the same. Why, then, might Baker react differently in each case?

Traditionally, linguists have claimed that meaning is transmitted from one person to another via words which are "meaning bearers", i. e., sonic or written containers for "meaning". If we consider the notion of "meaning bearer" to apply to either words, phrases, sentences, or the other things that the tradition has chosen to be the situs of "meaning", we would have to say that, in our three scenarios, "meaning" comes from Able's brain, is transmitted to Baker's ears via sound waves, and is extracted from the received sound by Baker's brain. When this is accomplished, Able and Baker have more or less the same "brain states" as each other. "Meaning" is roughly the same as "information"; "language" is a transmission mechanism for "meaning" / "information". If this is so, then what is the purpose of the segment "*Look!*" and the physical act of pointing? Pointing, many linguists would argue, is not part of language. The "meaning" or "information" content of "*Look!*" is, at best, marginal, yet there they are. The examples are not unusual (except for [warehouse] which is an unusual situation not unusual behavior); they are not difficult to understand. It is not difficult to believe that people like Baker and Able would do the things described above in the situations described. Their behavior is subject to observation. We can set up experimental situations very similar if not identical to those in our examples to see what an experimental subject who plays Baker's role would gather from what someone playing Able's role does. We can even predict that in an experimental situation like the situation modeled by [field], the subject would perceive a snake, in the situation modeled by [street] situation, the subject would either understand the metaphor and/or ask for a clarification or more information based on the metaphor, and in the situation modeled by [warehouse], the subject would be confused and/or ask the person playing Able for a clarification.

Although we have previously said that the second cue is very useful, that should not be taken to suggest that without it saying "*Look!*" and pointing is always futile. Some situations are sufficiently obvious and "unnoisy" in an information theoretic sense to obviate the need for an explicit second cue. In such a case, traditional linguists might be tempted to say that the remaining utterance had little or no information content or was, at best, redundant. However, if Baker turned his attention to the snake without further prompting, it would be difficult to say that Able's communication was unsuccessful. In this case, both Able and Baker take advantage of the information provided

by the surroundings to supplement Able's communication. Furthermore, the use of the exact word "*look*" is unnecessary, even if Able wished to make some sound. "*Hey!*" or something similar might serve just as well. Admitting that this is so is an admission that the "meaning" of "*look*" is only marginally important, if at all, to Baker's response to Able's communicative behavior. However, it would require little if any change in our model. The only change might be to the value of <alert>. If the situation modeled in [field] were particularly "unnoisy", i. e., if the snake were in a particularly obvious place, Able might not have to (or want to) say anything. He might only have to point for Baker to direct his gaze and perceive the snake. If this situation is compared to that modeled in [field] above, we once again must ask the traditionally-minded linguist what information Able's utterance contains. The information is, in some circumstances, not necessary while, in others, it might be. This is not simply a matter of Able's preference. Able's communicative behavior is determined by the surroundings assuming that he does not act randomly.

People don't communicate in the abstract, of course. In the three linkages in the thought experiment when only two people briefly communicated and we allowed the real world to intrude into our considerations in minimal ways, the communicative behavior of Able and Baker cannot be successfully analyzed by examining the utterance alone. If we accept the traditional linguistic position that words or accumulations of words are meaning bearers, i.e., if we accept the need to abstract the communicative behavior in the above three scenarios from the real world, we need to answer the question: do Able's utterances in all three scenarios have the same meanings or do they differ in meanings?

Either answer gives traditional linguists problems. To say that the meanings of the three utterances are the same suggests what we may call the "one size fits all" view of meaning. Words equal meaning; the same words have the same meaning regardless of the surroundings. Word forms (sonic or graphic) are merely indices to some mental list of meanings. This extreme position ignores other claims of traditional linguistics, like polysemy, as well as the common experience of human beings. We reject it out of hand. If a traditional linguist who claims that words or accumulations of words are meaning bearers says that Able's three utterances have different meanings or meanings differing by degree in the three scenarios, the linguist will have to postulate the

mechanism for creating and apprehending the differences. In short, if Able's meanings differ from scenario to scenario, how does Baker know that they differ and know what the difference is by hearing only the words? Traditionally, the answer relies on some arcane philosophy or, recently, on an appeal to neuroscience, a reliance more on the authority of neuroscience (neuroscientists are really smart people with expensive gadgets) rather than on the evidence neuroscience provides.

We claim that the communicative behavior in the three scenarios cannot adequately be analyzed without a thorough appreciation of the surroundings and the effect they have on Baker's apprehension of each situation. In short, we contend that there can be no proper analysis of the three situations (whether by HSL researchers or by traditional linguists) by abstracting the utterances from the surroundings and examining them as though they were complete entities. No communicative behavior is complete in the abstract. The surroundings of the communicative behavior must always be considered. HSL admonishes us to study people communicating in the real world. We cannot afford to neglect the surroundings in our models because the surroundings, together with the other elements of a linkage, model the real world.

In the factual scenario, Baker hears Able and sees an actual snake in actual grass. If we examine the other two scenarios, Baker may not know what Able is talking about when he does not see the snake. In fact, if he doesn't see the snake and questions Able about it, Able may look again. If Able doesn't see the snake again (it may have slithered off into the grass), he may even question the accuracy of his own observation. This presents a very different problem for the traditional notion of meaning than does the factual scenario presented here. "*Look! There is a snake in the grass!*" does not mean the same as "*Look! I think I see a snake in the grass!*" or "*Look! I saw a snake in the grass!*" which are ways that a traditional linguist might wish to rewrite Able's initial utterance (if Able later questions the accuracy of his observation) in order to make a traditional "meaning" analysis less problematic. The original utterance is an existence statement not a claim that Able thinks he might have observed something or saw something some time in the past.

Even this little discussion shows us that there are three components to the communicative behavior as exemplified by our three scenarios: Able's communicative behavior, Baker's response, and

the surroundings. In the traditional view of communication, the hearer is passive. Saussure provides us with an example of this claim:

> *"Suppose, then, we have two people, A and B, talking to each other… The starting point of the circuit is in the brain of one individual, for instance A, where facts of consciousness which we call concepts are associated with representations of linguistic signs or sound patterns by means of which they may be expressed. Let us suppose that a given concept triggers in the brain a corresponding sound pattern. This is an entirely psychological phenomenon, followed in turn by a physiological process: the brain transmits to the organs of phonation an impulse corresponding to the pattern. Then sound waves are sent from A's mouth to B's ear: a purely physical process. Next, the circuit continues in B in the opposite order: from ear to brain, the physiological transmission of the sound pattern; in the brain, the psychological association of this pattern with the corresponding concept. If B speaks in turn, this new act will pursue – from his brain to A's – exactly the same course as the first, passing through the same successive phases…"* (Saussure 1986: 11-12).

What the quote makes clear, however, is that Saussure (as do most traditional linguists) does not think that the surroundings are at all important. As Saussure clearly states, communicative behavior is, for him, a purely mental phenomenon, divorced from the real world. The closest that the real world gets to being involved for Saussure is as the source of "concepts" but note that it is not the real world per se that gets involved in A and B's discussion, it is some aspect of the real world that has already been reduced to a concept. Saussure, like most linguists, limits the data for linguistic study to expressions whether linguistically correct or elegant or whether oral or written. While he claims as data "all manifestations of human language", (Saussure 1986: 6), in his *COURS*, he only uses utterances as examples.

The quote from Saussure demonstrates another pervasive abstraction in traditional linguistics. All communications are assumed to be flawless. Saussure's A always manages to duplicate his state of mind in Saussure's B every time. Our common experience tells us that this is not so. Abstractions such as this, by eliminating "distracting details", are supposed to make observations easier and thought processes clearer. By eliminating important details, our observations are made harder and our thought processes cloudier. If traditional

linguistics had given up the untenable notion that communication is always flawless, linguists would observe that words are not meaning bearers by noting the requests for clarification or for more information that frequently accompany conversations or the explanatory material that often accompanies written texts. These additional behaviors would not be necessary if communication were always flawless, i. e., if Saussure's A were always able to communicate his precise meaning with precisely the right words to Saussure's B who always apprehended A's meaning by always matching A's carefully chosen words with precise "concepts" already in B's brain or mind.

For HSL, the listener is active. The listener perceives the world around him not just the speaker. The listener is not the tabula rasa of traditional linguistics but has senses and experience. In the situation modeled in [field], it would be perfectly plausible to model Baker responding to Able by saying something like "*Yes, indeed, that is a Blue Googli Snake*" (insert the name of a real snake in place of '*Blue Googli Snake*' if you wish). Baker might very well know more about snakes than Able and might tell Able about the snake by simply looking at it and speaking. The [B] role part and the [snake] prop part would have a different set of properties from the ones we've modeled. [snake] would have whatever properties a "*Blue Googli Snake*" had in the real world, or, at least, those which Baker needed to recognize the snake as the dreaded Blue Googli. [B] would at least have an <obs Blue Googli Snake/yes> property in addition to the <obs snake/yes> property, which could factor into a task that modeled Baker's telling Able about the snake. Baker "constructs meaning" (if you wish to use the traditional linguistic term) beyond anything that the tradition might say was conveyed by Able's utterance because he, Baker, observed an object in the real world. For HSL, Baker does not "convey meaning" to Able and Able does not convey meaning to Baker. When the two communicate, properties in the models change value as the result of their interaction with each other and with the real world.

A traditional linguist might argue that any "information" which Baker acquired about the snake using his senses is not a matter for linguistic concern. He might argue that the "meaning" of the "word" "*snake*" used by both Able and Baker was constant. That may be so in the traditional linguistic world divorced from reality but HSL insists on the obvious: we live in the real world. What Able may see as a "*snake*", Baker may see as a "*Blue Googli*". Do they see the same "ob-

ject"? Certainly. Does Baker know more about it than Able? Certainly. The reason to insist on the correctness of a theory which hides this fact is difficult to comprehend. The tradition insists that the word "*snake*" conveys just what Able "means" it to convey and nothing more. The tradition insists that Baker receives just what Able "means" and no more. It is odd that this is so. Snakes don't exist in the real world. Blue Googlis, rattlesnakes, black racers, and the like do. "*Snake*" is a convenience of categorization or a generalization for those who do not know or care about the differences between a rattlesnake and a boa constrictor. People communicate, properly and effectively by all accounts, by using either generalizations like "*snake*" or specific terms like "*Blue Googli*" depending on their experience not on their fidelity to a linguistic theory. Experience is given short shrift by the tradition. Experience is an intimate part of HSL. Expectations are unique to HSL[1] and are based on the experience, either slight or considerable, of a communicating individual with the real world. In his discussion of metaphor, (Yngve 1996: 291ff), Yngve discusses the role that expectations play in the modeling of metaphorical communication. This has obvious application for the situation modeled by [street]. We can appreciate that the term "experience" as used in this paper involves and requires a considerable amount of explication if we wished to make our models more fine-grained than we have done here.

The factual linkage obviously includes aspects of the real world which Baker uses in his reaction to Able's behavior. In the metaphorical linkage, Baker also uses aspects of the real world to help him sort out Able's behavior which, although only slightly different than in the factual linkage, is not as straight forward as it is in the factual linkage. However, no such assistance is available to Baker in [warehouse]. This linkage might as well abstract Able's behaviors from the real world much as traditional linguists do with their examples. Baker has a harder time in properly reacting to Able and, if this thought experiment were carried out, might not be able to deal with it at all. If this experiment were carried out, we could predict that the activities that stem from [warehouse] would show the most variety in individual (Baker) behavior.

[1] Expectations and expectation procedures are currently matters of intense interest and research in the HSL community. They may have more explanatory power than at first thought.

However, abstracting linguistic evidence from the real world is exactly what traditional linguistics does. Our third linkage provides us with graphic evidence that abstracting linguistically relevant data from the real world is a fundamental mistake. We note from the first two linkages that we might be able to predict Baker's behavior within reasonably close margins. We may not be able to predict Baker's behavior in [warehouse] to the same degree because of the abstraction. Seen by itself, [warehouse] presents us with strong evidence of the difficulty that a lack or contextual information can cause for communicating individuals. When seen together with the factual and metaphorical scenarios, [warehouse] tells us that its scenario is unlikely to occur naturally. People communicate in a world rich in contextual clues and use them all the time. Removing those clues from our consideration and analyses distorts the normal process of communicating and gains us little or nothing.

What data might verify or falsify the hypothesis that Baker's reactions are based on contextual rather than grammatical clues? If we accept that Baker assumes Able's utterance in each scenario initially to be factual, we must see that there are fewer contextual clues to support that assumption as Baker moves from [field] to [street] to [warehouse]. The data we collect will be Baker's reactions in each scenario, especially his questions, if any, for Able. Assuming, as we have presented it, that the snake in the [field] scenario is visible to Baker (or that ***a*** snake is visible to him) without further assistance from Able, Baker may have no questions or questions about the type of snake or something "general". If Baker does not immediately see the snake (because the snake is obscured or perhaps has moved on[1]), Baker's reactions might be to ask questions are most likely to be about the location of the snake or to say something general (like Baker's dislike of snakes, for example). In the [street] scenario, omitting the unlikely experimental circumstance in which both persons playing the Able and Baker roles know each other and Able actually does have a specific antipathy towards the person playing the Charlie role which is known to the person playing the Baker role, we can expect a wider variety of reaction on Baker's part depending whether the research subject understood the metaphor or not. Even if Baker understood the

[1] HSL insists on studying how people communicate in the real world. Not only do people react to the real world but the real world reacts to them, too.

metaphor, he might not recognize the target of Able's pointing because there might be other people in the area, i. e., the local environment might be noisy. If Baker understood the metaphor, he might ask questions about the reasons behind the use of the metaphor. If he did not immediately understand that Able was using a metaphor, Baker might ask for more information about the location of the snake or he might seek further information or make comments about the setting in such a way as to indicate that he assumed that Able pointed to a real snake. He might also indicate some confusion about the situation. In the third scenario, the person playing the Baker role will most likely express confusion but may ask some questions about the location of a real snake. Further discussion with Able might confirm the Baker that there is no real snake.

The data to be collected is Baker's reaction to Able and the immediate context. We believe that the lack of contextual clues in [warehouse] and the ambiguity of contextual clues in [street] will cause Baker to communicate differently than he would in [field]. The types of responses to Able's pointing in each scenario can be quantified and examined statistically. We restate our hypothesis: there will be a correlation between the type of Baker's reaction to a given scenario and the type of contextual clues, if any, offered by the scenario. We believe that the hypothesis is sound and has been demonstrated, theoretically, to be correct. What is needed is for some researcher to perform the necessary real-world tests to determine whether what we believe to be correct, in theory, is correct, in fact.

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Получено 02.02.2008

Сыпневский, Бернард (Bernard Sypniewski) – профессор кафедры компьютерных наук университета Роуэна (отделение в Кэмдене), г. Кэмден (Нью-Джерси), США.