

Circumventing the arbitrariness of the sign: A systematic approach to ostensive definitions with special attention to the Sakha language

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Werner, Tom & Olesova, Olga, 2015, Circumventing the arbitrariness of the sign: A systematic approach to ostensive definitions with special attention to the Sakha language. *Language, Communication, and Culture*, 65-79. Ostensive definitions are an obvious and natural way of overcoming the arbitrariness of the sign and its shadow principle, the principle of the continuum, but their effective use requires a precise understanding of what ostensive definitions are, along with certain refinements added to them. In this paper, we explore how ostensive definitions can be used in linguistic analysis, given these refinements. We then offer illustrations of this analysis with Sakha, a language spoken in northeast Asia. We explore some of the limitations of this type of analysis and how certain extensions can overcome some of these limitations. Finally, we discuss the possible theoretical significance of these extensions. (Carnegie Mellon University & North Eastern Federal University)

Key words: arbitrariness of the sign, continuum principle, ostensive definitions, kernel sentences, linguistic hierarchy, minimal sentence pairs, Sakha, Turkic languages

1. Introduction

By a principle widely accepted in linguistics, there is no necessary connection between the form of a linguistic expression and its meaning. The linguistic sign is arbitrary, and this means that language must be constituted by repeatable units. The arbitrariness principle is shadowed by a second principle, that (spoken) linguistic signals are a continuum, which means the repeatable units are not directly recoverable from the signal itself. They are only recoverable with the help of native speaker judgments on linguistic identity. Whoever is to learn a language, to use it or to analyze it, must find a way to circumvent the arbitrariness principle and its shadow. Language teachers and their students use pictures, pantomime, translations, dictionaries, paraphrases – any means available to identify basic units and give their meanings.¹ Linguists use many of the same devices in their attempt to give a full accounting of linguistic units and of the principles of their combination and interpretation. Linguistic units can be arranged along a hierarchy, and linguists have standard ways of accessing this hierarchy and analyzing units above and below the point of access. Crucial access points are where meaning and form come together—at the level of the morpheme by many traditional approaches. Comparison of minimally differing morphemes allows for the discovery of smaller units. In this paper, we propose an approach that enters the linguistic hierarchy, but at a different point of access than the individual morpheme. Our approach similarly proceeds by comparison of minimally differing forms, but these are forms whose meaning has been rendered transparent by the method of elicitation. The meaning is in the form

¹ Brown and Yule (1983), Yule (1997).

of ostensive definitions, and the attempt to make this concept explicit and practically useful leads us to bring out connections between the philosophical literature and methods of linguistic analysis. We provide samples of analysis with Sakha, a Turkic language spoken in northeastern Russia. Finally, we consider how innovations to the method to elicit more complex forms may give clues to fundamental principles of language design.

2. Linguistic analysis

2.1 Principles of language design and their consequences

Ferdinand de Saussure, whose name is famously associated with the arbitrariness principle, actually credits the American linguist William Dwight Whitney with the principle that there is no necessary connection between the form of a word in a language and its meaning. Although this principle can be challenged along the edges, for example in cases of onomatopoeia or nursery forms, it is quite robust. His reasoning on form takes one from the Sakha word /ut/ to the English translation 'dog', although one might recognize it as cognate with 'it' in Turkish or Azerbaijani ('mutt' and 'dog', respectively). The Sakha word /tiis/ does translate as 'teeth', but only by a sheer coincidence that is of no help when having to translate /uos/ as 'lips'.

Because of arbitrariness, linguistic signs have to involve repeatable units. There is no other means for users to understand each other within an arbitrary sign system. To ensure a sufficient number of basic meaningful signs, these need to be composed from smaller parts, as well as combined to form larger meaningful expressions. This arrangement leads to a hierarchy of linguistic entities. The most basic of these is the sound-type, or phone. Phones combine to form phonemes, while strings of phonemes constitute minimal meaningful units, morphemes. Sentences are made up of words, which consist of individual or combined morphemes. For our purposes, we will distinguish simple indicative sentences – kernel sentences – from more complex sentences or sentences in other moods, and place the simpler ones below the more complex ones on the hierarchy.

What might be called the principle of the continuum is behind a distinction drawn by Martin Joos (1958).

(While) physicists describe speech with a continuous mathematics...linguists describe language with a discontinuous or discrete mathematics called 'linguistics'.²

Physicists deal with language in its physical manifestation, while linguists deal with it as it is understood by its users, as a system with discrete units. This second principle shadows the first, because while arbitrariness necessitates signs that repeat, the acoustic continuum contains no discrete units. The question is how discrete units are to be discovered on the basis of the phonetic properties which actually constitute the physical string. There are implications here for how the linguistic hierarchy is to be approached in analyzing a particular language. The linguist cannot simply start at the bottom of the hierarchy and from there work up to more complex forms. The definition of units in physical terms can only be discovered by finding the significance of phonetic features and of their combinations to the users of the

language. This typically involves portions of the continuum large enough to carry isolable meanings, because it is with respect to meanings that speaker judgments about linguistic identity are most accessible.

2.2 Traditional approaches to linguistic analysis

It will be helpful to consider how linguists have actually proposed going about the task. We take remarks from Bloomfield (1942), Harris (1951), and Ladefoged (2003) as representative. To begin, Bloomfield (1942) urges analysts to start with morphemes and then move on to simple sentences.

At the first session, begin by getting the informant to name some concrete objects, such as 'house', 'tree', 'dog', 'sun'.³

As soon as one has some little footing in phonetics, it is well to get short phrases, such as 'I am hungry', 'I don't understand what you are saying', 'My brother will come tomorrow'.⁴

Comparison between simple sentences leads to the discovery of morphemes.

...if in French one had recorded *il a le livre* 'he has the book', *tyama plym* 'thou hast my pen', *marilavy* 'Mary has seen it', one may finally peel out the form (in nearly every respect it deserves to be called a word) *a* corresponding fairly well to the meaning of the English *has*.⁵

The morpheme /a/ is peeled out, Bloomfield's term, as the overlapping portion of these three sentences which also share the meaning of *has* in their translations.

Next, Harris (1951) urges substituting similar sounds within an utterance, to see if native speaker accept these as repetitions. Alternatively, instead of fashioning a substitution oneself, one may just be patient.

We may wait to hear some informant pronouncing *Cameras cost too much* with a segment identical to our ears with the original [k^h].⁶

Sounds that are found to be intersubstitutable are then described phonetically. The basis of this analysis, according to Harris, is what a speaker of the language accepts as a repetition.

The test of segment substitutability is the action of the native speaker: his use of it, or his acceptance of our use of it.⁷

The identity of these phonetic units therefore derives ultimately from speaker judgments.

Finally, Ladefoged (2003) suggests word lists, even consulting dictionaries. The analysis proceeds from here.

³ Bloomfield (1942:10).

⁴ Bloomfield (1942:11).

⁵ Bloomfield (1942:13).

⁶ Harris (1951:30-31).

It is important to have a set of words that are as near minimal contrasts as possible.⁸

These contrasts will reveal phonemic relations in a language.

Stepping back, we see commonalities in all three approaches. They all rely on, as an entry point to the linguistic hierarchy, meaningful segments. These meaningful segments may be morphemes or words, or, as in examples provided by Bloomfield and Harris, simple sentences. From these points of entry, each analysis uses comparison as a way to work down the hierarchy. Bloomfield compares sentences to find commonalities that can be considered words, or perhaps morphemes, in a process he refers to as *peeling out*. Harris compares sentences to find repetitions of phones. Ladefoged compares minimally different words to find contrasting sounds or phonemes. All approaches can be seen as starting midway along the hierarchy and then comparing complex forms to discover simpler components. One other point in common is that all three approaches appear to rely on translation—from speakers who are able to translate from the target language into the language of the linguist. There is no provision in the passages cited here for the discovery of meaning except through translation.

3. Ostensive definitions

3.1 Accessing the hierarchy

There is a way to associate forms with meanings that does not involve translation, and that is through what can be called *ostensive definitions*. Ostensive definitions facilitate entry onto the linguistic hierarchy at a particular access point. This access point will allow for the discovery of smaller meaningful parts through the method of minimal comparison, once the concept of ostensive definitions is better analyzed and refined. As a first step in this refinement, we cite two discussions of ostensive definitions from the philosophical literature.

The first discussion to be cited is from Ludwig Wittgenstein (1958).

Suppose I teach someone the use of the word 'yellow' by repeatedly pointing to a yellow patch and pronouncing the word.⁹

This kind of teaching is explicitly described by Wittgenstein as involving the use of "ostensive definition".¹⁰ Such definitions involve gesturing at objects in the world, or colors or properties, while uttering an expression that refers to the object or property. Ostensive definitions could also involve uttering an applicable expression in the presence of a scene or a salient aspect of a scene. Notice that Wittgenstein's example goes from linguistic expression to meaning. The teacher, in intending to teach the word 'yellow', first utters the word and then gestures to what it means. It also should be noticed that although Wittgenstein talks in terms of the meaning of the single word 'yellow', he is using 'yellow' as a complete utterance, an indicative sentence. This is shown by the fact that an utterance 'yellow' could be deemed true

or false depending on whether the speaker correctly indicates a patch of yellow or not.

The next discussion we cite is from W. V. O. Quine (1960).

A rabbit scurries by, the native says 'Gavagai', and the linguist notes down the sentence 'Rabbit' (or 'Lo, a rabbit') as tentative translation, subject to testing in further cases.¹¹

Quine does talk about the single linguistic form, 'gavagai' (or 'rabbit'), as a sentence. A more recognizable sentence form might be (in English), 'that is a rabbit'. For the translation of 'gavagai' as 'rabbit', the demonstrative, the copula, and the indefinite article are elided.

Quine's procedure, unlike the procedure described by Wittgenstein, comes close to an elicitation, in which a stimulus would be provided, by the linguist, and an appropriate utterance requested. Ostensive definitions can be used in both directions, from expression to referent or from referent to expression, and this bi-directionality will be something we exploit. Quine takes the procedure a step further, with the ostensive definition leading ultimately to a translation into the language of the analyst.

Quine in fact conceives of translation as one of the primary tasks of the linguist but his interest, like ours, is to get where he is going without the services of a translator.

The recovery of a man's current language from his currently observed responses is the task of the linguist who, unaided by an interpreter, is out to penetrate and translate a language hitherto unknown. All the objective data he has to go on are the forces that he sees impinging on the native's surfaces and the observable behavior, vocal and otherwise, of the native. Such data evince native 'meanings' only of the most objectively empirical or stimulus-linked variety. And yet the linguist apparently ends up with native 'meanings' in some unrestricted sense; purported translations, anyway, of all possible native sentences.¹²

Quine suggests that without a bilingual translator, the linguist can only make inferences based on information the native speaker has available (presumably information shared by the linguist) and on speaker behavior. The information the speaker has available, the stimulus that prompts the utterance, is the ostensive definition of that utterance. This information gives access to a point along the linguistic hierarchy, and our next task is to identify this point.¹³

For Quine, sentences elicited in this fashion are observation sentences. Here we take observation sentences to be a subclass of kernel sentences, sentences that involve little more than a predicate with its argument positions filled in with referential or quantified noun phrases. In keeping with their minimal status, we expect these sentences to be in an unmarked tense, which would be present tense in

⁸ Ladefoged (2003:4).

⁹ Wittgenstein (1958:11).

¹⁰ Wittgenstein (1958:12).

¹¹ Quine (1960:29).

¹² Quine (1960:28).

¹³ An anonymous reviewer points out that Kenneth L. Pike is the 'linguist perhaps most famous as a virtuoso of monolingual elicitation.' The authors were unaware of Pike's reputation in this regard, and are grateful for the reference. Quine (1960:28) does in fact cite Pike in a footnote.

English. The following are examples of what we would take to be kernel sentences in English.

- (1) a. A ball is under a table.
b. The ball is under the table.
c. The ball is under a table.
d. A ball is under the table.
e. There is a ball under a table.
f. There is a ball under the table.

The predicate here is *is-under*. The argument places for this predicate are for theme and location. The articles *a* and *the* bestow reference or quantificational force to their containing noun phrases. The sentences are in present tense. They are all indicative. By our assumptions, kernel sentences have a place in the linguistic hierarchy above words and below more complex sentences which can be said to be derived from kernel sentences.¹⁴

3.2 Introducing safeguards

We have mentioned that ostensive definitions can be used to elicit sentences from a target language. It turns out that for this elicitation to be reliable, certain safeguards must be built in. Quine himself alluded to the importance of such safeguards, raising the possibility that a target language might contain three distinct sentences,

...translatable respectively as 'Animal', 'White', and 'Rabbit'.¹⁵

Following up on Quine's point, it stands to reason that any of these sentences might be uttered in response to a white rabbit scurrying by. The linguist will not know which sentence 'gavagai' actually is. Nothing in the context tells the linguist that 'gavagai' means 'rabbit' instead of 'white', or instead of 'animal', and safeguards are therefore needed to prevent specious interpretations to the utterance. These assignments either involve irrelevant descriptions of the scene ('white'), or non-truth functionally equivalent entailments ('animal'). There are other possibilities than those mentioned by Quine as well. 'Gavagai' might be thought to refer to the manner of moving, translatable as 'hopping', an irrelevant assignment. 'Gavagai' might be thought to mean 'thing', a non-truth functionally equivalent entailment of 'rabbit'.

The first safeguard against irrelevant readings would be a whole set of scenes of rabbits. Some of these rabbits might still be white and some might be hopping, but other rabbits would be non-white or not hopping at all. If the native speaker assents to 'gavagai' for all these scenes, or consistently utters 'gavagai' in the presence of these scenes, there will be no temptation to take it to mean 'white' or 'hopping'. If scenes of white snowmen or hopping robots do not elicit assent or an uttering of 'gavagai', this will be additional evidence against these interpretations. The linguistic principle behind this safeguard is the notion that an indicative sentence denotes a set of worlds¹⁶ or a set of scenes or situations.¹⁷ Every member of the denotation of 'gavagai' should contain at least one rabbit.

¹⁴ Harris (1956).

¹⁵ Quine (1960:29).

¹⁶ Stalnaker (1999).

On the basis of these safeguards, however, the linguist will not be able to rule out 'animal' as a possible translation. 'Rabbit' as a sentence ('there is a rabbit') entails 'animal' ('there is an animal'). The set of scenes containing rabbits is a subset of the set of scenes containing animals. The entailment is one-way however, since not every scene containing an animal is included in the set of scenes containing at least one rabbit. The sentences are not truth-functionally equivalent. But 'animal' will not apply to scenes of snowmen or hopping robots either, because the complement set of 'animal' (the set of scenes that do not contain any animals) is a subset of the complement set of 'rabbit' (the set of scenes that do not contain any rabbits).

To remedy this situation, we include as a safeguard various scenes that do hold true of 'animal' but do not hold true of 'rabbit'. In practical terms, we must be prepared to add scenes that do hold of any non-truth functionally equivalent entailment of 'rabbit' but which do not hold of 'rabbit' and this is how we rule out these interpretations. A scene of a turtle (without a rabbit) will not elicit assent for 'gavagai', and this fact rules out 'animal' as a possible interpretation of the utterance. A scene of a mailbox (without a rabbit) will not elicit assent for 'gavagai', and this fact rules out 'thing' as a possible interpretation.

Sets of scenes denoted by an indicative sentence are potentially unlimited, as are non-truth functionally equivalent entailments of any such sentence. It follows that we can never give a complete ostensive definition for a kernel sentence. Typically, we will add just enough scenes to get what we want, and there will be a hierarchy of completeness for ostensive definitions. At the bottom of the hierarchy will be a single scene that the sentence applies to. As we work our way up, we put more and more safeguarding scenes into play. The decision of how far to go up is a practical one, and often a single scene stands in with sufficient reliability for an ostensive definition. This will especially be true when we deal with pairs of sentences, a topic we take up directly below. One more limitation to the elicitation method should be mentioned first, however. Truth-functionally equivalent entailments cannot be distinguished, no matter how far one goes in filling out an ostensive definition. Whether or not 'gavagai' is better translated as 'bunny' over 'rabbit' will not be revealed by any safeguards we have yet introduced.

3.3 Working down the hierarchy

The methods of analysis that we examined from our representative linguists involved entering the linguistic hierarchy at some point, this entry facilitated by some grasp of meaning, and then working down the hierarchy on the basis of minimal comparisons. This is the procedure we follow as well, with certain critical differences. As with Bloomfield and Harris, we enter the hierarchy at the level of the kernel sentence. What facilitates our entry, however, is the ostensive definition of the kernel sentence, rather than a translation. As with Bloomfield, we use comparisons between kernel sentences to discover morphemes. However, we endeavor to find sentences that are minimally different, so that the only difference between them is the minimal semantic unit. It follows that we need to demonstrate how ostensive definitions can be used to elicit minimal sentence pairs in a target language.

The difficulty in eliciting minimal pairs in a target language is that the identification of a minimal pair requires a level of analysis which is not given in

¹⁷ Barwise and Perry (1983).

advance. It might seem that we could elicit minimal sentence pairs in the target language using prompts or stimuli that are minimally different. Practically speaking, this will in fact work in many cases. However, while it may seem that a pair of scenes could be minimally different, closer examination reveals difficulties with this view. Suppose we have a ball on a chair in one scene and the same ball under the same chair in another. Are these scenes minimally different? Not necessarily. The ball may cast a shadow in each scene, and the shadow would then be in different places in the two scenes. The ball may have a mottled surface which has a different orientation in one scene than in the other. The notion of minimal differences seems to apply to pairs of linguistic items rather than pairs of scenes or situations.

To avoid these difficulties, we distinguish between a source language and a target language, and build ostensive definitions as a bridge between these. The source language is one already understood by the analyst. Minimal sentence pairs can therefore be identified in this language. For example, *the ball is in the chair* and *the ball is under the chair* are minimal sentence pairs by a standard analysis of English, differing only in their prepositions. Ostensive definitions can be developed for each sentence from this minimal pair in the source language. These ostensive definitions will be considered minimal pairs with respect to the source language. The ostensive definitions are then be used to elicit sentences from a target language. The elicited sentences have an increased likelihood of being a minimal pair themselves than two randomly chosen sentences.

Several caveats need to be mentioned here. First of all, while the mapping from a sentence to an ostensive definition is one-one, the mapping from an ostensive definition to a sentence may be one-many. As was already pointed out, ostensive definitions do not distinguish between sentences that are truth-functionally equivalent. As a consequence, a pair of target language sentences elicited in this way may not be a minimal pair, even though such a minimal pair is available. Second, there is no guarantee that there will be any mapping from the ostensive definition of a source language sentence to a sentence in a target language. The target language might simply not contain a sentence which describes a particular set of scenes or situations. Finally, target language sentences elicited on the basis of a minimal pair of ostensive definitions for a source language may not be minimally different because there is no minimal pair of sentences with the required meaning in that language.

None of these difficulties have so far proved to be a problem in practical terms. We have found that target language sentence pairs elicited using even minimally complete ostensive definition pairs for a source language have tended to be minimal pairs as well. When they are not, it has often been possible to get the required minimal pairs from other speakers. In other cases, the failure to elicit minimal pairs is instructive. In some cases, a synonym or a loan has replaced a word from one sentence other than the targeted difference. In other cases, a single morpheme in one sentence corresponds to an entire phrase in another sentence, rendering the pair non-minimal. Finally, a shift in word order through such processes as fronting or passivization may obliterate a minimal pair. In our experience, all such cases have been transparent and relatively easy to accommodate. Furthermore, they provide for interesting discoveries about synonyms, loan words, morpheme complexity, and word order. Future experiments may yet reveal cases where the mapping problem is insurmountable, but so far we have found that ostensive definitions provide a highly reliable bridge from minimal sentence pairs in one language to minimal sentence pairs in another language.

Once minimal sentence pairs are discovered, the minimal differences are easy to discover. In Bloomfield's example, the analyst has to discover that *ilalaliv*,

tyamaplym, and *marilavy* all had the morpheme /a/ in common, and this is far from obvious. With the minimal sentence pair we cited just previously, it is clear that the difference is between *on* and *under*. Admittedly, the difference in the target language can be hard to fully make out at first for a non-native speaker, but that there is a difference will be apparent and can even be detected by a comparison of spectrograms. An appreciation of the full difference in the morphemes may take time and repeated exposures, but practical experience shows us it is possible. While experimental validation of its significance is ultimately needed, we have found that discovering differences between minimal sentences in this way is highly engaging, and this suggests to us that very natural and fundamental language learning processes are involved. This is a point that was not lost on Bloomfield either, who remarked,

The discovery of these structural features, such as words and components of words, always affords interest and even excitement, and this, of course, helps one to retain the forms.¹⁸

Once again, experimental validation is the ultimate arbitrator, but by our experience there does seem to be good reason to take the suggestion seriously that this method of discovery aids in acquiring forms in a language.

4. Applying the method with Sakha

4.1 Accessing the hierarchy

The Sakha language, also known as Yakut, is spoken in the Sakha Republic in the Russian Federation. Sakha is a Turkic language, with agglutinating morphology and exhibiting phonological processes quite unlike English.¹⁹ Historically and geographically, Sakha is also unrelated to English, and therefore using English as a source language and Sakha as a target language makes a good test case of how well ostensive definitions can be used as a bridge between minimal pairs in two unrelated languages. In our experience so far, the method has worked well, and we present several illustrative examples here.

We start with the following source language sentence.

- (2) The clock is on the chair.

Suppose we provide as a partial ostensive definition of this sentence a scene or picture of a red clock on a green chair. As Table 1 shows, however, this single scene also counts as a partial ostensive definition of both sentence (3) and sentence (4), even though the redness of the clock in the picture is irrelevant to the meaning of sentence (2), as is the greenness of the chair.

¹⁸ Bloomfield (1942:13).

¹⁹ Stahowsik and Menz (1998).

Table 1. Initial ostensive definition of sentence (2)

Pictures↓	(2) The clock is on the chair.	(3) There's a red clock.	(4) There's a green chair
Red clock on green chair.	✓	✓	✓

In the table, pictures or scenes appear leftmost in each row after the first. Source language sentences head each column. A check means the sentence is to apply to the scene or picture in that row. A cross means the sentence is not to apply to the scene.

The ostensive definition supplied in Table 1 does not distinguish these sentences. Because of this failure, we add in as a safeguard two more scenes or pictures, with the results shown in Table 2.

Table 2. Partial ostensive definition of sentence (2)

Pictures↓	(2) The clock is on the chair.	(3) There's a red clock.	(4) There's a green chair.
Red clock on green chair.	✓	✓	✓
Red clock on non-green chair.	✓	✓	×
Non-red clock on green chair.	✓	×	✓

This further completion of the ostensive definition for sentence (2) no longer serves as an ostensive definition for either sentence (3) or sentence (4) because these sentences do not hold for every member of the set thereby constructed. The added safeguards effectively eliminate two irrelevant interpretations. When a native speaker of Sakha supplies a sentence that conforms to the first column of the table, we are more confident that the sentence is a translation of (2) and not a translation of (3) or (4).

The following string was in fact elicited from a native speaker of Sakha. We deliberately hold off providing a gloss or even parsing individual words at this point in order to demonstrate the discovery process.

(5) /ʃahuołoppoſyrdygerbaar/

4.2 Minimal sentence pairs

Table 3 gives partial ostensive definitions for source language sentences (2) and (6). (7) and (8) are included as non-truth functionally equivalent entailments of both sentences.

(6) The clock is under the chair.

(7) There's a clock.

(8) There's a chair.

Table 3. Partial ostensive definitions of sentences (2) and (6), with entailments (7) and (8)

Pictures↓	(2)	(6)	(7)	(8)
Clock on chair	✓	×	✓	✓
Clock under chair	×	✓	✓	✓
Clock	×	×	✓	×
Chair	×	×	×	✓

The following strings were elicited in Sakha for columns (6), (7), and (8), respectively, for which we once again hold off offering a gloss or a parse.

(9) /ʃahuołoppoſannugarbaar/

(10) /buʃahuu/

(11) /buołoppoſ/

Comparing (5) and (9), we find the minimal difference /yrdyger/ and /annugar/. Comparing (10) to the two previous sentences, we find /ʃahuu/ is common with all three. Comparing (11) to the same two sentences, we find /ołoppoſ/ in common to all three. We find /baar/ in both (5) and (9), and /bu/ in both (10) and (11). With a certain amount of guesswork, the following glosses are arrived at.

- (12) a. /ʃahuu ołoppoſ yrdyger baar/ for (5)
clock chair atop there-is
'The clock is on the chair.'
b. /ʃahuu ołoppoſ annugar baar/ for (9)
clock chair under there-is
'The clock is under the chair.'
c. /bu ʃahuu/ for (10)
this clock
'This is a clock.'
d. /bu ołoppoſ/ for (11)
this chair
'This is a chair.'

These hypotheses have all been confirmed by native speakers of Sakha. The chart demonstrates how it is possible to rule out certain non-truth functionally equivalent entailments. Neither (5) nor (9) mean 'this is a clock', and neither sentence means 'this is a chair.'

In our elicitations, we did encounter a truth functionally equivalent entailment for sentence (9). For column (6) above, we elicited the following sentence.

- (13) /fjahu kireslo annugar baar/
clock chair under there-is
'The clock is under the chair.'

/kireslo/ (кресло) is a Russian loan for 'chair', partially synonymous at least with /oloppos/. Paired with (5), (13) is not minimally different. The analyst is confronted with the strings /olopposyrdyger/ and /kiresloannugar/ as the differences between the pair. With nothing else to go on, there is no certain way to parse these segments or to discover their meanings. (11) suggests that /oloppos/ is its own morpheme, and this would ideally lead to the discovery of the remaining three morphemes. The example does point to the extra challenges involved when synonymous terms get substituted into what might otherwise be a minimal sentence pair in the target language.

4.3 Working up the hierarchy

Such minimal pairs can be extracted, using the approach described here, and a number of morphemes isolated. Potentially, sufficient numbers of pairs of morphemes that themselves are minimally different, or close to it, can be discovered, making an analysis of the phonemes of the language possible. But what about in the other direction along the hierarchy, from kernel sentences to more complex forms?

Consider the following sentence from the source language.

- (14) The book or the pillow is on the table.

Assuming that the basic morphemes for 'book', 'pillow', 'table', and 'on' in Sakha have been discovered, how is a target language sentence equivalent to (14) to be elicited? The problem is that (14) is disjunctive and a disjunctive concept is not easy to represent pictorially or as a scene. In actual practice, we were able to elicit the desired sentence, given in (15), but how we went about it may point to an important linguistic fact. (Q below is the gloss we use for what we assume is an interrogative particle.)

- (15) /ostul yrdyger kinige duu sutttuk duu/
table on book Q pillow Q
'The book or the pillow is on the table.'

We couldn't create a picture showing the disjunction, but we were able to take a picture of an object on a table and block out the image of the object with a colored square. We then supplied a picture of a book and a picture of a pillow beside the main picture. These smaller pictures were meant to show candidates for the object occluded by the colored square. When the general set-up was explained to the native speaker consultant, the sentence in (15) was elicited, along with other similar sentences in response to similarly doctored photographs. Other examples elicited in this way involved negation, conditionals, and modality.²⁰ None of the concepts

²⁰ See Guttenplan (1986) for an approach to representing modality with modified pictures.

associated with these grammatical forms was directly representable with a picture, but we were able to superimpose some contrived notation over pictures of some basic scene and elicit the desired forms, once we were able to explain what it is we wanted.

We think this method of elicitation might point to an important linguistic fact. Ontologically, there seems to be a difference between basic scenes and scenes that are abstracted from these. Scenes abstracted from basic scenes are not representable with pictures, but the extra layer of abstraction can to some extent be represented by appropriate conventional notation. These conventions have to be explained to speakers, precisely because they do not involve naturally given meanings. But the striking observation is that linguistically, it is kernel sentences that apply to basic scenes, and non-kernel sentences that apply to derived scenes.

The discovery here was made in pursuit of a purely practical goal – eliciting sentences that were more complex than the basic ones we had been eliciting. There may be an implication for syntactic theory, however. In early versions of transformational grammar, such as Harris (1956), complex sentences are derived from kernel sentences.²¹ The two kinds of sentences have distinct linguistic status, and the transformations relating them therefore have linguistic reality. These theories have given way to theories in which all sentences are derived from minimal parts and features.²² By these later theories, the kernel sentence no longer has a distinct linguistic status. All sentences are derived in the same fashion. But the elicitation method we have been developing here suggests that kernel sentences are real linguistic units, and that they correspond to something basic in the structure of reality, or at least in our perception of it.

Expanding on this last point, sentences (16a) and (16b) might be considered transforms of each other. This follows the approach in Harris (1956), since these sentences share the collocation *Fido-drink-water*, and since many other similar collocations can be found that fit into the structure of both sentences.

- (16) a. Fido drinks water.
b. Fido does not drink water.

Harris (1956) provides a bidirectional arrow between transforms, but he also selects certain sentences as base forms and uses these to construct a set of kernel sentences, as well as the more complex sentences in the language.

The language structure then consists of a set of kernel sentence forms (or sentences) and a set of transformations. All sentences of the language are obtained by applying one or more transformations to one or more kernel sentences...²³

(16a) might be counted as a base form, or very nearly one, (or a kernel, by the identity transformation) and we can use a unidirectional arrow to show that (16b) is derived from this same base form. On the semantic side, one might posit that the situation of not drinking water is derivative on the situation of drinking water. This view receives support from the fact that we can easily picture a dog drinking water,

²¹ Technically, all sentences are derived from base sentences, but kernel sentences are derived from base sentences by the identity transform.

²² Chomsky (1995).

²³ Harris (1956:388).

and we can easily picture a dog doing other things that preclude its drinking water, but we cannot so easily picture a dog not drinking water. The picture will always be of the dog doing something else. We might go so far as to say that while kernel sentences denote situations or types of situations, derived sentences such as negation sentences denote something more abstract, not directly to be found in the actual world of things, states, and events. But such an ontological relationship would support a view of grammar such as that of Harris (1956) which divides sentences into separate groups of kernel and non-kernel sentences.²⁴ Of course, not all kernel sentences denote pictureable scenes, but some do, while non-kernel sentences (negations, disjunctions, modal sentences, questions, imperatives) typically do not. Any such parallel between language and reality as we are suggesting receives no support from theories in which positive and negative sentences, for example, are derived independently from each other.

5. Conclusion

In this paper, we have worked out further the logic of the ostensive definition of simple sentences in natural language, building on discussions found in Wittgenstein and Quine. We propose that ostensive definitions give us access to the linguistic hierarchy which is otherwise inaccessible without translation, due to the arbitrariness of the sign and the nature of the acoustic string as a continuum. Ostensive definitions require safeguards, to prevent elicitation when going from a source to a target language of sentences that are irrelevant or which involve non-truth functionally equivalent entailments. But once these safeguards are in place, ostensive definitions provide a fairly reliable bridge between languages. In particular, they provide a way to elicit minimal sentence pairs in a target language, starting with minimal sentence pairs in a source language. These can then be used to discover the morphemes of a language, and perhaps the phonemes. In the other direction on the linguistic hierarchy, notational conventions superimposed on scenes, a component of ostensive definitions, can be used to elicit sentences of more complex structure. This result points to the possibility that the kernel sentence versus transformed sentence distinction of earlier versions of syntactic theory may have been on the right track. This is a topic for future research.

Other areas of research include expanding the coverage of the method, even at the level of the kernel sentence. We have concentrated largely on visual scenes, and have elicited language used to describe spatial relations. Can other kinds of basic sentences be elicited, using charts and diagrams, for example? We have, for example, already started to investigate the possibility using kinship diagrams.

There are interesting cross-linguistic questions as well. Is it an accident that minimal sentence pairs in English could be the starting point for minimal sentences pairs in Sakha, a language with no known or plausible connections to English? Provisional work has already been done in eliciting minimal sentence pairs from Korean, Japanese, Turkish, Dutch, Frisian, and Iranian Azerbaijani. So far, there is no indication that languages differ fundamentally in the encoding of minimal differences between scenes or sets of scenes, although there is variation in the details, of course. As the scope of the project expands, it will be interesting to discover the extent of the variations, and whether there are practical consequences to this variety.

²⁴ Chomsky (1957) explicitly proposes a transformation T_{int} of the kind that would derive (16b) from (16a).

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