

A demonstration-based account of (pluractional) ideophones *

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Abstract This paper develops a novel formal semantics of ideophones that can account for their meaning and compositional properties. The proposal extends recent work on iconicity in sign languages in [Davidson 2015](#), whose demonstration-based framework provides a formal foundation for the semantics of ideophones that captures the difference between descriptive meaning and depictive meaning, the kind of meaning ideophones traffic in. After providing a demonstration-based account of the basic ideophone construction in the Mayan language Tseltal, the paper then shows how the demonstration-based account can be used to analyze pluractionality in the ideophone domain. In particular, through case studies on Tseltal and Upper Necaxa Totonanc (Totonacan), I show that there are two previously unrecognized types of ideophonic pluractionality, and that their properties support the demonstration-based account.

Keywords: ideophones, pluractionality, iconicity, demonstrations, Mayan, Totonacan

1 Introduction

The term *ideophone* is used to pick out a distinguished class of words in a language that specialize in depicting sensory imagery ([Dingemanse 2011](#): p. 25; [2012](#)). While the expressions considered in this work fit the definition, ideophones are often easier to point at than define. For this reason, consider the following example of the ideophone *tsok'* in Tseltal (Mayan).

- (1) pura ch'il-bil-Ø, tsok' x-chi-Ø ta mantekat
just fried-PERF-B3 IDF:sound.start.to.fry NT-say-B3 P lard
'it just gets fried, it goes «tsok'» in the lard' ([Pérez González 2012](#): p. 162)

The literature on the formal semantics of ideophones is scarce. This is, I think,

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due to two challenges: (i) it is not at all clear how to formalize the distinction between descriptive meaning, which is at the heart of truth-conditional semantics, and depictive meaning, which ideophones seem to traffic in, and (ii) the idiosyncratic specificity of ideophone meaning and their restricted (morpho)syntactic distribution presents obstacles for doing formal lexical semantics. In particular, by avoiding modification and appearing as arguments to only a small class of verbs, it is difficult to isolate their meaning and to determine their type. The goal of this paper is to address both of these problems, and in doing so, begin to develop a formal semantics of ideophones that can account for their meaning and compositional properties.

To address the first problem, I propose an analysis of ideophones that extends recent work in Davidson 2015, which provides a novel unified account of quotation and a variety of iconic phenomena in sign language in terms of a *demonstrations*—a special type of communicative event that stands in a similarity relation with the event demonstrated. The demonstration-based framework will provide a formal foundation for the semantics of ideophones that can capture the difference between description and depiction. Addressing the second problem is more complex because it means exploring the range of ideophone meaning and making comparisons to the meanings of expressions from more well-known categories. While pluractional meaning is often idiosyncratic, many ideophones clearly have pluractional semantics (i.e., they make reference to plural events). Since the typology of pluractional meaning is fairly well understood (Hofherr & Laca 2012; Wood 2007, among many others), it provides exactly the hook into problem that we need. We can group ideophones by the variety of pluractionality they exhibit, and then provide templates that generalize over particular items to capture this aspect of ideophone meaning.

Along these lines, this paper shows through case studies on two Mesoamerican languages, Tseltal (Mayan) and Upper Necaxa Totonac (Totonacan), that there are two broad types of ideophonic pluractionality and that their form supports the demonstration-based analysis. The first, which I call “demonstration-external pluractionality”, involves a speaker using an ideophone to do a plurality of demonstrations that characterize a plurality of events. The second kind of ideophonic pluractionality, which I call a “demonstration-internal pluractionality”, is much more similar to pluractionality in the verbal domain. It involves morphology that derives ideophones that can only be used to demonstrate plural events.

2 Demonstration-based theory of quotation

When thinking about quotation, we usually think about verbatim quotation, where the act of quotation concerns the words used. For instance, suppose Mary says (2).

(2) I play guitar.

Mary can then be quoted as in (3), where words alone ensure the quotation is true.

(3) Mary was like “I play guitar”.

While this is maybe the most salient situation, it is well known that *be like*-quotation can be felicitously used to replicate a variety of aspects of an event (Clark & Gerrig 1990; Davidson 2015, among others). For instance, words can be used to “quote” an agent’s behavior or inner monologue, even if those particular words are not used, as shown in (4) where the quotative sentence is judged true even though the cat never uttered the quoted words.

(4) My cat meows loudly and paces around its food bowl.

a. My cat was like “feed me!” (Davidson 2015: ex. 21)

Davidson’s 2015 proposal, following earlier work by Clark & Gerrig (1990), is to say that verbatim quotation is merely a special case of what we see in (4). The theory that unites them says that all quotation involves the performance or demonstration of an event. One can demonstrate or perform an event by performing the words that occur in it—i.e., verbatim quotation—but one can also perform all sorts of aspects of the event, including intonations, facial expressions, thoughts, etc. The downside to this kind of theory is that, as we will see, we have to radically underspecify the truth conditions for quotative sentences. But, this might just be a bullet we have to bite.

The core idea in Davidson 2015 is that there is a distinguished subset of events, namely a class of events with communicative intent she calls *demonstrations*.¹ Davidson (2015) gives demonstrations their own type δ , and while not formalized, the intended interpretation is that δ is a subtype of ε —the type of events.² To implement this, the backdrop for the account is lax many-sorted type logic. Lax just means that (i) we do not require domains for sorts to be disjoint, and (ii) equality (and only equality) is type agnostic—e.g., $\sigma = \sigma'$ is a formula even if σ and σ' are terms with different types. Below are the highlights of the setup that are necessary for understanding the analysis.

The domain of individuals of type e is the powerset of a designated set of entities IN minus the empty set: $D_e = \wp^+(IN) = \wp(IN) \setminus \emptyset$. In addition to the domain of individuals, I additionally assume, following Hinrichs 1985; Bach 1986; Link 1998,

¹ Note that while this section is heavily based on Davidson’s work, I have altered some things and made assumptions about the domains of events, demonstrations, and linguistic expressions that she might not agree with. When it’s clear that I have diverged from her work, I note it in the text.

² This could be implemented in some variety of lambda calculus with subtyping, like $F_{<}$ (see Retoré 2014) or TCL (see Asher 2011). I do not take this route because I do not need all the power these systems provide, and the resulting models become fairly complicated. I will instead work with a more familiar many-sorted type logic. The trade off, of course, is that I will need additional quantifiers, relations, etc. over new types, but I believe that the result is manageable.

structured domains of events and times. The domain of events of type ε is the powerset of a designated set of events EV minus the empty set: $D_\varepsilon = \wp^+(EV) = \wp(EV) \setminus \emptyset$. The domain of times of type τ is the powerset of a designated set of times TM minus the empty set, and is additionally partially ordered by \prec (temporal precedence): $D_\tau = \wp^+(TM) = \wp(TM) \setminus \emptyset$. Finally, following Davidson 2015, we add the novel domain of demonstrations of type δ , which is powerset of a designated set $DM \subset EV$ minus the empty set: $D_\delta = \wp^+(DM) = \wp(DM) \setminus \emptyset$. Note that the domain of demonstrations is a subset of the domain of events. I want to think of demonstrations as events of communication under a particular guise that allows certain constructions, like *be like*-quotatives or ideophone constructions, to extract their communicative intent.

Atomic individuals and atomic events are the singleton sets in $\wp^+(IN)$, $\wp^+(EV)$, $\wp^+(DM)$ respectively; they are identified by a predicate $ATOM$ (which I'll apply to individuals, events, and demonstrations disambiguated by context). The "part of" relation \leq over individuals / events / times / demonstrations (disambiguated context) is set inclusion over $\wp^+(IN) / \wp^+(EV) / \wp^+(TM) / \wp^+(DM)$: $a \leq b$ iff $a \subseteq b$. Finally, sum operation \oplus (disambiguated by context) is set union over $\wp^+(IN) / \wp^+(EV) / \wp^+(TM) / \wp^+(DM)$: $a \oplus b := a \cup b$.

As is common, events are connected to the domains of individuals and times via θ -role and trace functions. θ -roles are partial functions from the domain of individuals to the domain of events, that is, functions of type εe . The fact that we have a special type for the domain of demonstrations means that we need θ -role functions to take demonstrations to their participants, namely functions of type δe . Because the domain of demonstrations is a subset of the domain of events, for each role θ of type εe , I assume there is a role θ' of type δe that agrees with θ on all demonstration events. More formally, I impose the requirement that for all x_ε, y_δ , and θ , if $x_\varepsilon = y_\delta$, then $\theta_{\varepsilon e}(x_\varepsilon) = \theta_{\delta e}(y_\delta)$.³ The only trace function I will be using is the temporal trace function τ , which is a sum-homomorphism from events to times. I assume that all theta-role functions are cumulatively closed by default, suppressing the common $*$ -notation.

While the inclusion of a special subset of demonstration events is a new idea, it is not much of a conceptual leap. The last domain of entities we need in order to analyze *be like*-quotation and ideophones is a domain of linguistic entities, which more challenging. Essentially, we want to be able to say that the quoted words in a verbatim *be like*-quotation and the the ideophone in an ideophone construction are actually expressions that denote linguistic objects, objects that might themselves have a denotation, syntactic category, phonological form, etc. In particular, I follow Potts 2007 by including a domain (disjoint from all others) of linguistic entities of

³ Recall that equality is type agnostic, unlike all other object-language relations and functions.

type μ . Potts 2007 takes linguistic entities to be triples, but for simplicity's sake, I treat linguistic objects as pairs— $\langle \text{string}, \text{SEMANTIC REPRESENTATION} \rangle$. We can think of this as reifying in the model the translation function mapping natural language expressions (here strings) to their semantic representations. Thus, while the natural language expression *woman* is translated to a lambda term denoting the particular function in (5), the quoted natural language expression “*woman*” is translated as a logical constant of type μ whose denotation is the pair of the unquoted string and its denotation, as shown in (6). Note that I write expressions of type μ in sans serif.

- (5) a. $\text{woman} \rightsquigarrow \lambda x_e[\text{WOMAN}(x)]$
 b. $\llbracket \lambda x_e[\text{WOMAN}(x)] \rrbracket^g = \text{the function } F \text{ with domain } D_e \text{ such that for all } d \in D_e, F(d) = \llbracket \text{WOMAN}(x) \rrbracket^{g[d/x]}$
- (6) a. “*woman*” $\rightsquigarrow \text{woman}_\mu$
 b. $\llbracket \text{woman}_\mu \rrbracket = \langle \text{woman}, \lambda x_e[\text{WOMAN}(x)] \rangle$

I use $_ \perp$ bottom corners $_ \perp$ in the object language to access the semantic content of a linguistic object via the meaning postulate in (7), which requires of all admissible models that the interpretation of $_ \perp M _ \perp$, for any expression M of type μ , be the interpretation of the second projection of the interpretation of M .

- (7) For all expressions M of type μ and N of any type,
 $\llbracket _ \perp M _ \perp \rrbracket = \llbracket N \rrbracket \Leftrightarrow \pi_2(\llbracket M \rrbracket) = N$

The interpretation of $_ \perp \text{woman}_\mu _ \perp$ in (8) illustrates how the biconditional in (7), is used to extract the semantic representation of a linguistic object.

- (8) $\llbracket _ \perp \text{woman}_\mu _ \perp \rrbracket = \llbracket \lambda x_e[\text{WOMAN}(x)] \rrbracket \Leftrightarrow$
 $\pi_2(\llbracket \text{woman}_\mu \rrbracket) = \lambda x_e[\text{WOMAN}(x)] \Leftrightarrow$
 $\pi_2(\langle \text{woman}, \lambda x_e[\text{WOMAN}(x)] \rangle) = \lambda x_e[\text{WOMAN}(x)] \Leftrightarrow$
 $\lambda x_e[\text{WOMAN}(x)] = \lambda x_e[\text{WOMAN}(x)]$

With this background, we can now treat quotational demonstration (a quotation involving a linguistic expression) using an operator like (9), where DEMO is a relation that holds between d and e just in case d reproduces aspects of e . The DEMO relation, following Davidson 2015, is meant to capture the loose connection between what is said in a *be like*-quotation and the demonstrated event. In a canonical case of verbatim quotation like in (2) and (3), the demonstration event stands in the DEMO relation with the quoted event in virtue of words used. In particular, the theme of the demonstration event is precisely the linguistic object uttered in the demonstrated event. But, as we have seen in examples like (4), a demonstration event might have a linguistic object as a theme that does not play a direct role in the demonstrated event. That said, such a demonstration event might still reproduce aspects of the

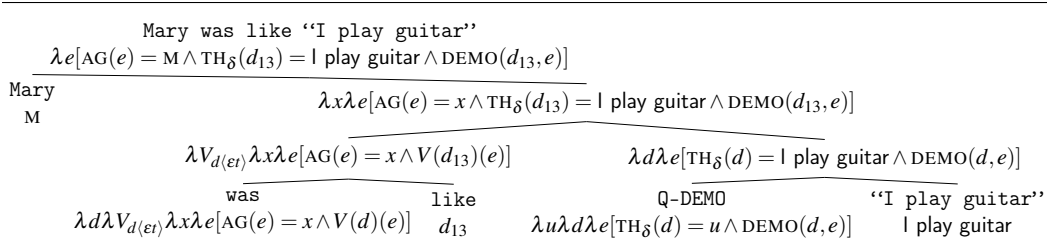


Figure 1 The composition of quotation

demonstrated event well enough to stand in the DEMO relation.

$$(9) \quad \text{Q-DEMO} \rightsquigarrow \lambda u \lambda d \lambda e[\text{TH}_\delta(d) = u \wedge \text{DEMO}(d, e)]$$

If (9) is at the heart of *be like*-quotation, it raises the question of how the demonstration argument is saturated. We need an expression to denote the ongoing act of communication. Something similar is seen in performatives, like (10), where *hereby* refers to the ongoing speech whose words both constitute and report the promise.

$$(10) \quad \text{I (hereby) promise to play guitar.}$$

Following Eckardt 2012, which treats *hereby* in performative utterances as denoting the contemporaneous event of information exchange, I take *like* in *be like*-quotation to denote the ongoing demonstration event (diverging from Davidson (2015) who treats the whole quoted expression as denoting a demonstration event).

$$(11) \quad \text{like} \rightsquigarrow d_n \text{ (the ongoing act of information exchange in the utterance)}$$

Finally, the ‘‘be’’ in *be like*-quotation, after composing with *like*, looks for a relation between demonstrations and events, supplying its demonstration argument via the indexical. This is what gives the construction its quotative character. In addition, following Davidson 2015, it also introduces the external argument—namely the agent of the event being demonstrated. Putting it together we can compositionally derive the meaning of expressions like *Mary was like ‘‘I play guitar’’* as follows: After existential closure we have the translation of *Mary was like ‘‘I play guitar’’*.

$$(12) \quad \exists e[\text{AG}(e) = \text{M} \wedge \text{TH}_\delta(d_{13}) = \text{I play guitar} \wedge \text{DEMO}(d_{13}, e)]$$

Example (12) is true just in case there is an event *e* whose agent is Mary and the current demonstration event whose theme is the linguistic entity ‘‘I play guitar’’ reproduces aspects of *e*. As discussed above, the particular relationship between the *be like*-quotation and what it quotes can be quite loose. In this case, because the demonstration event, which must reproduce aspects of *e*, has the linguistic object

I play guitar as its theme, a speaker might reasonably (defeasibly) infer that *e* is a speaking event in which I play guitar is uttered. Though this inference must be defeasible (see example (4)).

3 Ideophones in Tseltal

Recall from (1) that the basic ideophone construction in Tseltal has two core properties: (i) there is a bare (uninflected) root / stem, namely *tsok'*, and (ii) the root is embedded under the reported speech predicate, namely *chi*. We consider each of these in turn.

The fact that the ideophone in (1) is a bare stem raises the question of how well-integrated ideophones are into the rest of the grammar. That is, are they merely unanalyzable iconic strings, or are ideophone roots / stems on par with roots and stems of other lexical categories? More concretely, is the ideophone «*tsok'*» in Tseltal more like the verb *sizzle* in English or the imitative string *tsssss*. I will show that the former is the case. They are not merely imitative sounds, but linguistic objects in the fullest sense, namely strings with a (morpho)syntactic category and semantic representation. The fact that ideophones are bona fide linguistic objects argues in favor of the position taken in this work that they deserve a compositional semantic treatment, just like other expressions in the language. While the following discussion requires a detailed discussion of Mayan morphology, the result has important consequences for the theory of ideophones that this work develops. In particular, I propose in this section that using an ideophone requires more than just quoting an ideophone stem. Instead, I argue that the basic ideophone construction includes an ideophone demonstration operator that syntactically selects for stems of the appropriate category, while semantically requiring that those stems denote an event-predicate. This position is harder to maintain if ideophones are merely sound-symbolic strings, and so I must argue against this possibility.

To begin, it is important to note that Mayan languages make a categorical distinction between roots of a particular category, which are always of the form CVC, and derived stems of that category. For example, one often finds that CVC roots of category *X* can occur in certain morphosyntactic configurations that derived stems of category *X* cannot. I will show that Tseltal ideophones are organized along this root/stem paradigm exactly like other lexical categories in the language—i.e., nouns, verbs, adjectives.

First, we find CVC ideophones—ideophone roots—that are specialized as such. That is, they appear in the basic ideophone construction, but cannot be inflected as if they were a root of another category. For instance, *tsok'* in (1) is clearly a CVC ideophone, but it cannot be used as if it were a root of another category, which I've exemplified in (13) for the category transitive verb.

- (13) *ya j-**tsok**'-Ø te chenek'=e.
 ICP A1-fried-B3 DET bean=ENC
 Sought: 'I'm going to fry the beans.' (Pérez González 2012: p. 162)

This fact establishes that there is a category “ideophone” because there CVC ideophone roots that correspond to stems of no other category. We can now ask whether the ideophone category is like other, more familiar categories like verbs.

Now note that Tseltal has explicitly derived ideophone stems. That is, just as with more familiar lexical categories there are ways to form an ideophone stem from a root of a category. For instance, there is a derivation *-u / -i* (phonologically conditioned) that turns transitive verbs as well as positional roots like (14) into ideophone stems.

- (14) **Chep-u** x-chi-Ø ta j-jol.
 POS:filled.bag.thrown.down-IDF NT-say-B3 P A3-head
 '(Being hit will a filled bag), it went «chepu» on my head.' (Pérez González 2012: p. 166)

Crucially, you cannot use these roots in the basic ideophone construction without first deriving them. For instance, (15) is ungrammatical. The root *chep* is just not an ideophone root.

- (15) *Chep x-chi-Ø ta j-jol.
 POS:filled.bag.thrown.down NT-say-B3 P A3-head
 Reading sought: '(Being hit will a filled bag), it went «chep» on my head.'

What this shows is that Tseltal ideophones are not just atomic, unanalyzable expressions, but belong to an abstract grammatical category into which other expressions can be derived.

Second, as is common with other lexical categories, there are a non-trivial number of roots that are polycategorial. Consider \sqrt{jik} '. Unlike \sqrt{chep} it can appear underived in the basic ideophone construction, as in (16). But in contrast to other root ideophones, like \sqrt{tsok} ' in (13), it can be inflected as a transitive verb without derivation, as in (17).

- (16) **jik**' x-chi-on=nax ta jik'ubajel jun-jun-ajk'
 IDF:inhale/choke NT-say-B2=just P hiccup one-one-moment
 'You went **jik**' by the hiccup repeatedly.' (Pérez González 2012: p. 163)
- (17) ya j-**jik**'-Ø j-mats'
 ICP A1-TV:inhale/choke-B3 A1-pozol
 'I choked on my pozol.' (Pérez González 2012: p. 163)

At the heart of the analysis an operator IDEO-DEMO. This operator selects for ideophone stems in the syntax, and in the semantics returns an expression that can be embedded under the verb *chi* ‘to say’, which heads the matrix VP in the basic ideophone construction. In particular, it takes a linguistic expression (here always an ideophone stem denoting a predicate of events) and derives a relation between demonstrations and events.

$$(19) \quad \text{IDEO-DEMO} \rightsquigarrow \lambda u \lambda d \lambda e [\text{TH}_\delta(d) = u \wedge \text{STRUC-SIM}_{\lfloor u \rfloor}(d, e)]$$

In this way, IDEO-DEMO behaves exactly like the operator Q-DEMO in quotative constructions that takes a linguistic object and derives a relation between a demonstrations that involve that object and events, as shown in (20) (repeated from (9)).

$$(20) \quad \text{Q-DEMO} \rightsquigarrow \lambda u \lambda d \lambda e [\text{TH}_\delta(d) = u \wedge \text{DEMO}(d, e)]$$

Instead of a quotational demonstration, though, IDEO-DEMO operator requires the event and demonstration must stand in the ideophone relation, which we saw must be formally distinct due to the fact that quotation has a wider distribution. The present account captures this difference in terms of whether the demonstration and event argument have to stand in the DEMO relation or STRUC-SIM_{⌊u⌋} relation. Recall that, following Davidson 2015, the DEMO relation is meant to be radically underspecified, which is meant to mirror the fact that one can use a *be-like*-quotation to demonstrate a wide variety of events. In contrast, the use of ideophones to depict an event is much more constrained. Not only can just a subset of verbs form ideophone stems, but the events depicted by means of the ideophone must satisfy the relevant aspects of its lexical content. For instance, using *jik*’ as an ideophone means depicting events with an inhaling sound, and only those events. With this in mind, we can begin unpack STRUC-SIM_{⌊u⌋}. I say begin because the next section on demonstration-external pluractionality fleshes out the account to more faithfully address the meaning of pluractional ideophones.

The core idea underlying the STRUC-SIM_{⌊u⌋} relation is that the utterance of an ideophone as a linguistic object is meant to stand for an event that satisfies the predicate that the ideophone stem denotes. That is, the demonstration event is meant to be structurally similar to the demonstrated event, where ‘‘structurally similar’’ at this first pass means just similar cardinality. Example (21) provides the meaning of STRUC-SIM_{⌊u⌋}.⁴

$$(21) \quad \text{STRUC-SIM}_{\lfloor u \rfloor}(d, e) \text{ iff there is a set } P \text{ meeting the following conditions:}$$

⁴ The following defines partitions for sum-individuals and a useful abbreviation to refer to the atomic parts of a sum-individual, as used in (21): namely, **partition**(P, x) iff $\bigoplus P = x \ \& \ \forall x(x \in P \rightarrow \neg \exists y(y \in P \wedge O(x, y)))$, and **atoms**(x) := $\{x' | x' \leq x \wedge \text{ATOM}(x')\}$

$$\begin{array}{c}
\text{tsok' xchi ta mantekat} \\
\lambda e[\text{AG}(e) = x_1 \wedge \text{TH}_\delta(d_{13}) = \text{tsok}' \wedge \text{STRUC-SIM}_{\text{tsok}'_{\perp}}(d_{13}, e) \wedge \text{LOC}(e) = \sigma x. * \text{LARD}(x)] \\
\hline
\lambda e[\text{AG}(e) = x_1 \wedge \text{TH}_\delta(d_{13}) = \text{tsok}' \wedge \text{STRUC-SIM}_{\text{tsok}'_{\perp}}(d_{13}, e)] \quad \text{ta mantekat} \\
\lambda V_{e'} \lambda e[V(e) \wedge \text{LOC}(e) = \sigma x. * \text{LARD}(x)] \\
\hline
\text{pro} \quad \lambda x \lambda e[\text{AG}(e) = x \wedge \text{TH}_\delta(d_{13}) = \text{tsok}' \wedge \text{STRUC-SIM}_{\text{tsok}'_{\perp}}(d_{13}, e)] \\
x_1 \\
\hline
\lambda V_{d(e)} \lambda x \lambda e[\text{AG}(e) = x \wedge V(d_{13})(e)] \quad \lambda d \lambda e[\text{TH}_\delta(d) = \text{tsok}' \wedge \text{STRUC-SIM}_{\text{tsok}'_{\perp}}(d, e)] \\
\text{xchi}' \quad \text{pro} \quad \text{IDEO-DEMO} \quad \text{"tsok'"} \\
\lambda d \lambda V_{d(e)} \lambda x \lambda e[\text{AG}(e) = x \wedge V(e)]_{d_{13}} \quad \lambda u \lambda d \lambda e[\text{TH}_\delta(d) = u \wedge \text{STRUC-SIM}_{\text{u}_{\perp}}(d, e)] \quad \text{tsok}'
\end{array}$$

Figure 2 The composition of ideophones

- a. **partition**(P, e)
- b. $\forall e' \in P[\text{u}_{\perp}(e')]$
- c. $\exists e' \leq e[\text{ATOM}(e') \wedge \text{u}_{\perp}(e')] \rightarrow \forall e' \in P[\text{ATOM}(e')] \quad \text{to be amended in (27)}$
- d. $|\text{atoms}(d)| = |P|$

After existential closure of the event argument, we get the following translation.

$$(22) \quad \exists e[\text{AG}(e) = x_1 \wedge \text{TH}_\delta(d_{13}) = \text{tsok}' \wedge \text{STRUC-SIM}_{\text{tsok}'_{\perp}}(d_{13}, e) \wedge \text{LOC}(e) = \sigma x. \text{LARD}(x)]$$

This is be true just in case: (i) there is an event e that takes place in the lard whose participant is x_1 (the particular individual will be given by the context / variable assignment), (ii) the current demonstration event d_{13} has as its theme the linguistic object tsok' , and (iii) this demonstration event is structurally similar to e . Here structural similarity is easily satisfied. Because d_{13} is atomic, e must be partitionable into a single event (the trivial partition) that satisfied by $\text{u}_{\perp} \text{tsok}'_{\perp} = \lambda e[\text{TSOK}'(e)]$, namely e must be an event of frying sound emission. Less formally, (22) requires that there be an event of trying sound emission that took place in the lard that is presented via the utterance of word “ tsok' ”. These are precisely the truth-conditions of (1).

4 Demonstration-external pluractionality in Tselal

With a demonstration-based account of ideophones in hand, we have a handle on how it is that ideophones seem to depict events instead of describing them. Essentially, using an ideophone means using the utterance of that ideophone to stand for an event that would other satisfy the ideophone (as an event predicate). This immediately predicts that we should be able to utter such a linguistic object more than once, and in doing do, demonstrate a plurality of events. This section is devoted to preceisely this phenomenon, which I call “demonstration-external pluractionality”.

As shown in the following example from Tselal, one can totally reduplicate an

ideophone to demonstrate a plurality of events.

- (23) ja'-Ø te **kan**-kon-Ø, **kan** [pause] **kan** [pause]
 FOC-B3 SUB IDF:sound.wood/drum-C₁on-B3 IDF [pause] IDF [pause]
kan x-chi-Ø=e
 IDF NT-say-B3=ENC
 'When it knocks, it goes knock knock knock.' (Pérez González 2012: p. 242)

While we will see that such pluractional demonstrations are quite complex, the basic facts follow immediately under the account of ideophones I have proposed. I propose that when a speaker says "kan kan kan xchi" she makes a plural demonstration d_4 with the usual part-whole structure, where each atomic demonstration in d_4 has as its theme the ideophone in question. That is, $d_4 = d_1 \oplus d_2 \oplus d_3$ and $\text{TH}_\delta(d_1) = \text{kan}$, $\text{TH}_\delta(d_2) = \text{kan}$, etc.

An ideophone demonstration like this would yield the following predicate of events after composing with the Q-DEMO operator and having its demonstration argument saturated indexically. Note that because theta roles are cumulatively closed, d_4 stands in the theme relation with the linguistic object kan in virtue of its atomic parts standing in that relation.

- (24) $\lambda e[\text{TH}_\delta(d_4) = \text{kan} \wedge \text{STRUC-SIM}_{\lfloor \text{kan} \rfloor}(d_4, e)]$

An event e satisfies (24) just in case the theme of d_4 is the linguistic object kan and $\text{STRUC-SIM}_{\lfloor \text{kan} \rfloor}(d_4, e)$ holds between d_4 and e . The latter condition is satisfied just in case e can be partitioned into as many $\lfloor \text{kan} \rfloor = \lambda e[\text{KAN}(e)]$ events—i.e., knocking events—as there are atoms in d_4 . That is, the pluractional demonstration in (23) faithfully demonstrates an event just in case it is an event of three knockings.

These are not exactly the truth conditions of (24), but they provide a lower bound until we update the meaning of $\text{STRUC-SIM}_{\lfloor n \rfloor}(d, e)$ in (27). More importantly, though, they illustrate how the view of ideophones developed here naturally extends to cases of pluractionality via reduplication. If in an ideophone demonstration the utterance of the ideophone as a linguistic object is meant to stand for an event that satisfies the predicate that linguistic object denotes, then uttering multiple instances of that ideophone in a single demonstration should demonstrate pluractional events. I now want to refine the meaning of $\text{STRUC-SIM}_{\lfloor n \rfloor}(d, e)$ to account for other properties of demonstration-external pluractionality.

First, it is not true that demonstrating an event by uttering an ideophone three times requires that event to be of cardinality three. Instead, the cardinality must be at least three. The third condition in (25) shows the relevant change, namely e is structurally similar to d if there is partition of e that has no fewer cells than d has

atomic parts.

- (25) $\text{STRUC-SIM}_{\lfloor u \rfloor}(d, e)$ iff there is a set P meeting the following conditions:
- $\text{PARTITION}(P, e)$
 - $\forall e' \in P[\lfloor u \rfloor(e')]$
 - $|\mathbf{atoms}(d)| \leq |P|$

The second property of demonstration-external pluractionality that we must account for is much more interesting, requiring greater changes to the notion of structural similarity. In particular, the manner of reduplication in a demonstration-external pluractional utterance iconically reproduces the temporal properties of the event-plurality. This can be shown via the assertion of the (rough) equivalence between kinds of reduplicated ideophones, and kinds of bona fide derived pluractional verbs, which must be event predicates. In examples (23) above and (26), speakers use ideophone demonstrations to provide the truth condition for verbal pluractional constructions that, crucially, involve the same root.

- (26) ja'-Ø x-**chak'**-lajan-Ø te bay
 FOC-B3 NT-IDF:sound.horse.hoofs-lajan-B3 DET where
chak'chak'chak x-chi-Ø=e
 IDF||IDF||IDF NT-say-B3=ENC
 'It's the sound of trotting horses when it goes «chak'»«chak'»«chak'»

The point is that «idf»«idf»«idf» demonstrates events with a different temporal character than «idf» «idf» «idf». In particular, «idf»«idf»«idf» demonstrates events that can fall in the extension of a pluractional predicate derived by -C₁on, while «idf» «idf» «idf» demonstrates events that can fall in the extension of a pluractional predicate derived by -la.jan. These facts show that for a demonstration event to be structurally similar to a second event, the demonstration event must not only have a similar cardinality, but a similar temporal profile.

While the definition of structural similarity must be extended to account for this behavior, the close connection between verbal pluractional constructions and pluractional ideophones is predicted under a demonstration-based account of ideophones. Demonstrations, which mediate the iconic link between the ideophone and the depicted event, are merely events themselves. As such, they have temporal structure. Moreover, in this theory, a demonstration via an ideophone root is supposed to “stand for” an event satisfying the event-predicate underlying the ideophone. The temporality of the ideophone construction is built in, and so it follows that one could make a plurality of demonstrations to depict a plurality of events, and the temporal structure of the plurality of demonstrations, which it inherently has, would then have to match the temporal structure of the depicted event plurality. All that we have to

do to account for the observed behavior is to make the demonstrated event sensitive to the inherent temporal structure of the demonstration event. I do this by adding a temporal similarity condition—TEMP-SIM—to the meaning of STRUC-SIM as follows, which is the final definition.

- (27) $\text{STRUC-SIM}_{\lfloor u \rfloor}(d, e)$ iff there is a set P meeting the following conditions:
- a. $\text{PARTITION}(P, e)$
 - b. $\forall e' \in P[\lfloor u \rfloor(e')]$
 - c. $|\mathbf{atoms}(d)| \leq |P|$
 - d. $\text{TEMP-SIM}(P, \mathbf{atoms}(d))$

Because the demonstration is allowed to be of a smaller cardinality than the partition, we cannot define temporal similarity by requiring some isomorphism between P and $\mathbf{atoms}(d)$. Instead, temporal similarity will be enforced by requiring structure-preserving mappings to hold between the atomic parts of the demonstration event and initial phases of the event demonstrated. Example (28) provides the first ingredient, which is the definition of “initial subset”. In particular, P' is an initial subset of P just in case it subset of P and there is no event in P and not in P' that precedes any event in P' .

- (28) $P' \subseteq_{\text{init}} P$ iff
- a. $P' \subseteq P$
 - b. $\forall e[e \in P' \rightarrow \neg \exists e'[e' \in P \setminus P' \wedge \tau(e') \prec \tau(e)]]$

We can now define temporal similarity as follows, where P is temporally similar to D just in case for every initial subset P' of the same cardinality of D , there is a one-to-one function mapping temporally adjacent events in D to events in P' that have the same amount of downtime between them.⁵

- (29) $\text{TEMP-SIM}(P, D)$ iff for all $P' \subseteq_{\tau} P$ such that $|P'| = |D|$, there is an injection $f: D \rightarrow P'$ satisfying:
- a. $\forall d, d' \in D[\text{ADJACENT}_D(d, d') \rightarrow \mathbf{downtime}(d, d') = \mathbf{downtime}(f(d), f(d'))]$

The TEMP-SIM condition is used to require that plural demonstrations can only be used to demonstrate events whose initial segments can be chopped into parts where adjacent events have similar downtimes to adjacent atomic demonstrations.

⁵ The definition of the predicate ADJACENT and the function **downtime** are provided here, namely: $\text{ADJACENT}_X(e, e')$ iff $\neg O(e, e') \ \& \ \neg \exists e'' \in X[\tau(e) \prec \tau(e'') \prec \tau(e') \vee \tau(e') \prec \tau(e'') \prec \tau(e)]$, while $\mathbf{downtime}(e, e') := \emptyset$ if $O(\tau(e), \tau(e'))$, else $\bigoplus \{t \in D_{\tau} | \tau(e) \prec t \prec \tau(e') \vee \tau(e') \prec t \prec \tau(e)\}$ (or ‘the contiguous temporal interval between e and e' ’).

Essentially, $\text{TEMP-SIM}(P, D)$ requires that when we look at the beginning of P , we see a copy of D in terms of temporal structure. Note that $\text{TEMP-SIM}(P, D)$ has some properties we want for dealing with ideophones. First, as mentioned above, the condition allows P to be of greater cardinality than D , which is necessary when a smaller number of demonstrations is used to demonstrate a larger number of events. Second, the condition is vacuously satisfied if D is of cardinality 1. This is required for when an atomic demonstration demonstrates an atomic event. We still want to say in that case that they (trivially) have a similar temporal structure. Finally, the resulting truth conditions are appropriately weak. In particular, just as the number of ideophone demonstrations sets a lower bound for the number of events demonstrated, the temporal structure of those demonstrations sets a lower bound for temporal structure of the events demonstrated. When a speaker depicts an event e using «idf»[pause]«idf»[pause]«idf», the listener knows, as an entailment, that the initial subsequence of e must have the structure e' [pause] e'' [pause] e''' . She then reasons (defeasibly) that if these three events do not exhaust e , then subsequent events in e are similarly structured in time.

5 Demonstration-internal pluractionality in Upper Necaxa Totonac

In this section I will show that languages with rich ideophone systems can have other types of pluractional ideophone constructions. In particular, I am interested in cases where there is dedicated derivational morphology that creates ideophone stems that can only depict plural events. That is, an atomic demonstration using one of these derived ideophones will still necessarily depict a plural event. I will call this kind of pluractionality—where a single demonstration depicts a plural event—*demonstration-internal pluractionality*. As we will see, demonstration-internal pluractionality lies in-between demonstration-external pluractionality like that discussed in the previous section and bona fide verbal pluractionality. In particular, the relevant ideophone stems will be like pluractional verbs, denoting plural events. What separates them from pluractional verbs is that, as ideophones, they can be used in the course of a demonstration in the basic ideophone construction, but in virtue of their pluractional semantics, will always demonstrate plural events.

First, note that UNT has what looks like demonstration-external pluractionality in Tseltal where total reduplication indicates the repetition of an event that could be demonstrated by a single utterance of the ideophone.

- (30) Upper Necaxa Totonac
- a. **te:ɬ** ik-ta-wi:ɬ ka:s'ewiwi ʔantsá
 IDF:sound.hit.ground 1SG.SUBJ-INCH-sit PLC-cool here
 ‘**Te:ɬ** I plopped myself down here where it’s cool.’ (Beck 2008: 15a)

- b. mat **te:ɬ-te:ɬ** li:ta:ti:tá: tsamá: misín
 QTV IDF:sound.hit.ground-RED bounce.on.bottom this jaguar
 ‘the jaguar bounced around on its rear end’ (Beck 2008: 15b)

In addition to this, though, UNT has a second way to form ideophones that depict pluractional events, namely through final $-(V)CV$ reduplication (hereafter $-CV$ reduplication).

- (31) **tsanana** kin-a’a-wán tafkát
 IDF:sound.buzzing 1OBJ-eat-say wild.bee
 ‘The bee went **tsanana** in my ear.’ (Beck 2008: ex. 18b)

Example (32) presents a few pairs of ideophone that illustrate a semantic difference between $-CV$ reduplicated ideophones and their plain or completely reduplicated counterparts. In all cases we have pluractional semantics, but $-CV$ reduplicated ideophones appear to depict events whose repetitions comes more rapidly are “minimized” relative to their non- $-CV$ -reduplicated counterparts.

- (32) a. lam ‘fire flaring up’
 lamama ‘coals glowing red’
 b. kuɬkuɬ ‘kocking on something’
 kuɬuɬu ‘tapping quickly on something’ (Beck 2008: p. 14)

While interesting from the perspective of the the theory of pluractionality, the exact semantic contribution of $-CV$ reduplication is not our focus. Instead, the facts in (32) raise the question of whether $-CV$ reduplication and total reduplication in the ideophone domain have a unified account. The previous section defended the proposal that total reduplication in Tseltal, demonstration-external pluractionality, was essentially iconic. Each utterance of the ideophone stem was meant to stand for an event that would satisfy the event predicate denoted by the stem. At first pass, then, we might analyze $-CV$ reduplication in Upper Necaxa Totonac as essentially iconic in the same way. Each $-CV$ reduplicant would correspond to its own demonstration of an event satisfying the event predicate the ideophone stem denotes. Additionally, we might say that the reason why CV -reduplicated ideophones in Upper Necaxa Totonac depict events with rapid repetitions and “minimized” events is also an iconic effect. In particular, in virtue of being affixal, these $-CV$ reduplicants are necessarily temporally adjacent and “smaller” than the root itself. I think we can reject this kind of analysis, though. The data instead support treating CV -derived ideophones as a unique kind of pluractionality in the ideophone domain, separate from demonstration-external pluractionality. In particular, we will see that $-CV$ reduplication in Upper Necaxa Totonac has undergone significant grammaticalization, which argues for treating

its pluractional effect in the descriptive semantics rather than through the iconic, demonstration-based component.

The primary problem for a purely iconic account of partial reduplication is that the semantic effect of -CV reduplication in Upper Necaxa Totonac ideophones is clearly conventionalized in ways that it is not in Tseltal. In Tseltal, one can always predict the meaning of a reduplicated ideophone from the meaning of the ideophone root. Totaly reduplication always means depicting a plurality of events of the kind a non-reduplicated ideophone would depict. In Upper Necaxa Totonac, though, one finds a large numbers of CV-reduplicated ideophones that seem to have no transparent semantic relationship to ideophones that share the same root. As (Beck 2008: p. 14) notes, the two forms appear to be unique lexemes in that one could not predict the meaning of one reduplicated ideophone from the meaning of the other.

- (33) a. *pampam* ‘large bird flying’
 b. *pamama* ‘smoke billowing from a building’ (Beck 2011: p. 471)
- (34) a. *faxfax* ‘dirt, sand, or dust striking a surface’
 b. *faxaxa* ‘heavy rain falling’ (Beck 2011: p. 692)
- (35) a. *xilixili* ‘horse galloping and rearing’
 b. *xilili* ‘roaring (plane, rushing water, thunder)’ (Beck 2008: ex. 20b)

These facts rule out a purely iconic account. We don’t want to say that there is an ideophone root *pam* that can be reduplicated in two ways—as in (33-a) and (33-b)—to depict event-pluralities in its extension with two different temporal profiles. The reason is that (33-a) and (33-b) depict plural events of completely different characters. Instead, I propose to treat -CV reduplication as derivational, which has a partially uniform semantic effect (i.e., pluractionality), but is also sometimes idiosyncratic, as the semantic effect of derivation often is. The idea is that just like one finds an overt instantiation of a morpheme that derives ideophone stems in Tseltal (e.g., derived ideophones like in (14) above), Upper Necaxa Totonac would have an ideophone derivation whose phonological reflex is -CV reduplication. While similar to the Tseltal derivation -i / -u, the proposal is that the -CV derivation in Upper Necaxa Totonac would also have pluractional semantics. That is, instead of returning a simple event predicate that can be used in an ideophone demonstration (as we see in Tseltal), the -CV derivation derives an ideophone stem that is a predicate of plural events. Example (36) gives a preliminary translation emphasizing the pluractional effect of derivation by -CV reduplication.

- (36) $CV_{vid} \rightsquigarrow \lambda V_{Et} \lambda e[*V(e) \wedge \neg \text{ATOM}(e)]$ (preliminary)

While (36) is not a fully fleshed out account of the pluractional, it captures the two core features of the derivation that that interest us here. First, in virtue of its

syntactic category, CV_{vid} derives ideophone stems—expressions restricted to occur in the basic ideophone construction(s) of Upper Necaxa Totonac. Second, in the semantics, CV_{vid} derives predicates of plural events. This will have the crucial effect on the behavior of CV-derived ideophone stems that leads to demonstration-internal pluractionality when used in a demonstration. In particular, a speaker will only be able to demonstrate plural events with CV-derived ideophones, even an in atomic demonstration. We can see how this works by considering an example.

- (37) xalalala maka-wan tʃiwíʃ
 IDF:sound.hot.stone.crackle hand-say stone
 ‘The stones went xalalala (crackling with heat).’ (Beck 2008: ex. 18a)

- (38) $\exists e[\text{AG}(e) = \sigma x.*\text{STONE}(x) \wedge \text{TH}_\delta(d_{13}) = \text{xalalala} \wedge \text{STRUC-SIM}_{\lfloor \text{xalalala} \rfloor}(d_{13}, e)]$

The resulting bottom-line truth conditions for (37) are given in (38). This formula is true just in case there is an event e whose agent is the stones such that d_{13} is a demonstration via xalalala and d_{13} is structurally similar to e . The latter condition is the crucial one. Given that d_{13} is an atomic demonstration, the condition is satisfied just in case e can be partitioned (trivially) into a single event that satisfies $\lfloor \text{xalalala} \rfloor = \lambda e[*\text{XALA}(e) \wedge \neg\text{ATOM}(e)]$. But given that this is a predicate of plural events, e must be a pluractional event. The result is that even when the speaker makes a single demonstration by uttering xalalala she will be demonstrating an event of plural character. This is different from what we saw in Tseltal where the same ideophone stem was uttered multiple times to demonstrate a pluractional event and once to demonstrate an event of singular character. It is precisely this contrast that distinguishes demonstration-internal and demonstration-external pluractionality.

6 Conclusion

The core goal of this project is to motivate a compositional semantics of ideophones that respects their iconic character while relating their meaning to more familiar, non-iconic semantic phenomena. In line with the first goal, I have shown that the core properties of ideophones can be treated in a demonstration-based framework first developed to account for *be like*-quotation and iconic phenomena in sign languages (Davidson 2015). In line with the second goal, I have shown that this semantics allows us to diagnose two kinds of ideophonic pluractionality, and whose account closely tracks previous work on pluractionality. That is, pluractionality involves plural event reference and ideophone pluractionality involves both plural demonstrations (which are themselves simply plural events) and derived ideophones that make direct reference to plural events.

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Demonstrations and ideophones

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