PLURACTIONAL DEMONSTRATIONS*

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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).

- Consider the following example of the ideophone *tsok'* in Tseltal.

(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
just fried, it goes *tsok'* in the lard (Pérez González 2012, p. 162)

- First, according to the definition, ideophones pattern together as a class separate from the rest of the lexicon:
  - **special morphology**—e.g., *tsok'* is a bare CVC root complement of a verb in (1). This is impossible for all other kinds of roots in the language, which would at least have to bear some kind of inflection here.
  - **special syntax**—e.g., bare ideophone roots like *tsok'* can *only* appear in this syntactic frame. Their distribution is thus much more restricted than other roots in the language.

- Second, according to the definition, ideophones have a distinctive semantics in virtue of depicting sensory imagery:
  - **sensory semantics**—e.g., *tsok'* in (1) evokes the *sound* of the event. Sound is most commonly depicted, followed by movement, and then visual patterns (see Kilian-Hatz 1999, p. 35–41 and Akita 2009, p. 20–32).
  - **depiction**—e.g., there is an intuition in the literature that expressions like *tsok'* do not *describe* events of perceiving the sound of something hitting hot oil, but instead either *perform* the sound of something hitting hot oil or invite the hearer to *imagine* experiencing the sound of something hitting hot oil (Dingemanse 2011; Kita 1997; Nuckolls 1995).

The literature on the formal semantics of ideophones is scarce. This is, I think, due to two challenges:

(α) It is not at all clear how to formalize the distinction between *descriptive meaning*, which is at the foundation of truth-conditional semantics, and *depictive meaning*, which ideophones seem to traffic in.

(β) The idiosyncractic specificity of ideophone meaning and their restricted (morpho)syntactic distribution presents obstacles for doing formal lexical semantics—in particular, it's hard to compare them with expressions from more familiar categories and it's hard to determine their type.

The goal of this talk 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.

(α^*) Davidson 2015 provides a novel 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.

- I extend her analysis and use it to provide a formal foundation for the semantics ideophones, in particular, one that can address the difference between description and depiction that lies at heart of problem (α).
- The core idea is that when a speaker utters an ideophone, she creates an event d with the ideophone as a linguistic object is the theme, schematically:

$$\text{THEME}(d) = \text{“ideophone”}$$

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The basic ideophone construction then take this event d of uttering the ideophone and requires that there be another event e that share properties with d, in particular, e must satisfy the unquoted predicate the ideophone denotes, schematically:

$$\text{There is an } e \text{ such that } [\![\text{ideophone}]\!](e) = \mathbb{T}$$

(β^*) While ideophone meaning is often idiosyncratic, many ideophones have pluractional semantics (i.e., they make reference to plural events). Since pluractionality is fairly well understood (e.g., Hofherr and Laca 2012; Wood 2007, etc.), it provides exactly the hook into problem (β) 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, I show there are at least two broad types of ideophonic pluractionality and their form supports the demonstration-based analysis à la Davidson 2015.
- 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, schematically:

$$\text{THEME}(d \oplus d') = \text{“ideophone”},$$
$$\text{requiring there be } e \oplus e' \text{ such that } [\![\text{ideophone}]\!](e \oplus e') = \mathbb{T}$$

- The second, which I call a *demonstration-internal pluractionality*, involves a derived ideophone that can be used in an atomic demonstrations to characterize a plurality of events.

$$\text{THEME}(d) = \text{“ideophone-plrc”},$$
$$\text{requiring there be } e \oplus e' \text{ such that } [\![\text{ideophone-plrc}]\!](e \oplus e') = \mathbb{T}$$

2 Demonstration-based theory of quotation

When thinking about direct quotation, we usuaully think about *verbatim* quotation, where the act of quotation concerns the words used—e.g., suppose Mary says (2).

(2) I play guitar.

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

(3) Mary was like “I play guitar”.

While this is maybe the most common situation, *be like*-quotation can be felicitously used to replicate a variety of aspects of an event.

- For instance, words can be used to “quote” an agent’s behavior or inner monologue, even if those particular words are not used.

(4) My cat meows loudly and paces around its food bowl.
  a. My cat was like "feed me!" Davidson 2015, ex. 21

- It is also possible to use *be like*-quotation to mimic an agent’s facial expressions or intontation.

(5) John says, while pouting, I’ll never get into SALT.
Speaker A: Did you hear John say he’ll never get into SALT.
Speaker B: Yeah, he was all like :(

(6) John says, in a whiny voice, I’ll never get into SALT.
Speaker A: Did you hear John say he’ll never get into SALT.
Speaker B: Yeah, he was all like "[in a whiny voice] My paper won’t get in."

Davidson’s 2015 proposal, following earlier work by Clark and Gerrig (1990), is to say that verbatim quotation is merely a special case of what we see in (4)-(6).

- 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 Logic of Demonstrations
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*.

- the domain of demonstrations of type δ is a proper subset of the domain of events: $D_\delta \subset D_\epsilon$

Additionally, following Potts 2007, I include a domain of linguistic entities. It is these entities that are uttered in a act of quotation.

- D_μ (disjoint from all other domains) is the domain of well-formed linguistic entities of type μ.
- For simplicity’s sake, I treat linguistic objects as pairs—$\langle \texttt{string}, \text{SEMANTIC REPRESENTATION} \rangle$.

- Thus, while the natural language expression `woman` is translated to a lambda term denoting the particular function in (7), 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 it's denotation, as shown in (8).

Note that I write expressions of type μ in sans serif.

(7) a. $\texttt{woman} \rightsquigarrow \lambda x_e[\textsc{woman}(x)]$
b. $[\![\lambda x_e[\textsc{woman}(x)]]\!]^g =$ the function F with domain D_e such that for all $d \in D_e$, $F(d) = [\![\textsc{woman}(x)]\!]^{g[d/x]}$

(8) a. "`woman`" $\rightsquigarrow \mathsf{woman}_\mu$
b. $[\![\mathsf{woman}_\mu]\!] = \langle \texttt{woman}, \lambda x_e[\textsc{woman}(x)]\rangle$

I use ⌞bottom corners⌟ in the object language to access the semantic content of a linguistic object via the equality in (48).

(9) For any expression M of type μ $[\![\llcorner \mathsf{M} \lrcorner]\!] = [\![\pi_2([\![\mathsf{M}]\!])]\!]$

The interpretation of $\llcorner \mathsf{woman}_{\mu} \lrcorner$ in (10) illustrates how the equality in (48) is used to extract the semantic representation of a linguistic object.

(10) $[\![\llcorner \mathsf{woman}_{\mu} \lrcorner]\!] = [\![\pi_2([\![\mathsf{woman}_\mu]\!])]\!] = [\![\pi_2(\langle \texttt{woman}, \lambda x_e[\textsc{woman}(x)]\rangle)]\!] = [\![\lambda x_e[\textsc{woman}(x)]]\!]$

It is now possible to give an account of *be like*-quotation.

- I'm going to focus on cases like (3) where the demonstration is made via a linguistic expression. This is because it is more similar to case of ideophones, which always involve a linguistic expression.

- I'll call these *quotational demonstrations*

Davidson 2015 treats quoted expressions like "I play guitar" as denoting demonstrations—i.e., entities of type d—namely a demonstration involving the words "I play guitar".

- Diverging from Davidson 2015, I propose to unpack this representation slightly.

- I don't think the words used in a demonstration should be identified with that demonstration. Instead, the words used are the theme of the relevant communication event—recall that demonstrations are just a subtype of event.

- Let us then define a new version of the theme theta role for communication events, namely $\textsc{th}_\delta$, which is a function of type $\delta\mu$, a function from demonstrations to well-formed linguistic expressions.

We can now treat quotational demonstration using an operator like (11), where **demo** is a relation that holds between d and e just in case d reproduces aspects of e.

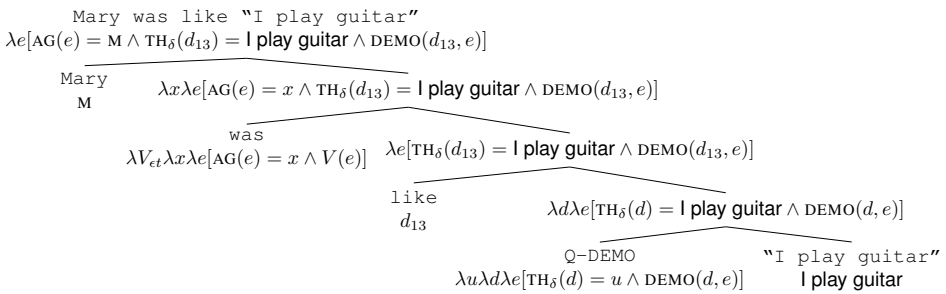
(11) $\texttt{Q-DEMO} \rightsquigarrow \lambda u \lambda d \lambda e[\textsc{th}_\delta(d) = u \wedge \textsc{demo}(d, e)]$

Following Eckardt 2012, which treats *hereby* in performative utterances as denoting the contemporaneous event of information exchange—e.g., I (hereby) promise to leave—I take *like* an indexical denoting the ongoing demonstration event (diverging from Davidson 2015).

(12) $\texttt{like} \rightsquigarrow d_n$ (the ongoing act of information exchange in the utterance)

Finally, following Davidson 2015, the "be" in *be like*-quotation 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 get the following translation for *Mary was like "I play guitar"*.

- $\exists e[\textsc{ag}(e) = \textsc{m} \wedge \textsc{th}_\delta(d_{13}) = \mathsf{I\ play\ guitar} \wedge \textsc{demo}(d_{13}, e)]$

- which is true just in case in case there is an event e whose agent is Mary and the current demonstration event whose theme is the linguistic object $\mathsf{I\ play\ guitar}$ 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 $\mathsf{I\ play\ guitar}$ as its theme, a speaker might reasonably (defeasibly) infer that e is a speaking event in which $\mathsf{I\ play\ guitar}$ is uttered.

- Though this inference must be defeasible—e.g., see (4)

While there is much more to say about *be like*- and standard quotation, I merely want to lay out a basic account of quotation in the style of Davidson 2015.

- In particular, it will allow us to see differences between quoting and using ideophones, which are both crucial and not immediately recognizable.

3 Are ideophone just imitative strings?

Recall that the basic ideophone construction in Tseltal looks like (13).

(13) 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
'just fried, it goes *tsok'* in the lard' (Pérez González 2012, p. 162)

It has two core properties, which I will elaborate in turn.

- There is a bare (uninflected) root/stem—*tsok'*
- The root is embedded under the reported speech predicate—*chi*

The fact that the ideophone in (13) 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?
- I will show that the latter is the case. They not merely imitative sounds, but linguistic objects in the fullest sense, namely strings with a (morpho)syntactic cateogry and semantic representation.
- The fact that ideophone 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.

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.

- What I want to show is 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 (13) is clearly a CVC ideophone, but it cannot be used as if it were a root of another category, which I've exemplified in (14) for the category transitive verb.

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

But just like with more familiar lexical categories, there are ways to explicitly derive a root from another category into a derived ideophone stem.

- For instance, there is a derivation -u / -i (phonologically conditioned) that turns transitive verbs or positional roots into ideophones.

(15) 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)

(16) Lek-Ø xan teme ay-Ø orita jax-**u** x-chi-Ø
good-B3 again if exist-B3 quickly VT:scratch-IDF NT-say-B3
k'axel.
DIR:passing
'It's much better if slips by rapidly going **jaxu**'(Pérez González 2012, p. 167)

Crucially, you cannot use these roots in the basic ideophone construction without first deriving them.

- For instance, (17) is ungrammatial. The root *chep* is just not an ideophone root.

(17) ***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 **chepu** on my head.

Finally, 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 (18).
- But unlike other root ideophone, like $\sqrt{tsok'}$ in (14), it can be inflected as a transitive verb without derivation, as in (19).

(18) **jik'** x-chi-on=nax ta jik'ubajel jun-jun-ajk'
IDF:inhale/choke NT-say-B2=just hiccup one-one-moment
You went **jik'** by the hiccup repeatedly (Pérez González 2012, p. 163)

(19) ya j-**jik'**-Ø j-mats'
ICP A1-TV:inhale/choke-B3 A1-pozol
I choked on my pozol. (Pérez González 2012, p. 163)

Summarizing, what we find is that:

- There are CVC roots that can occur in the basic ideophone construction (i.e., they correspond to ideophone stems), but belong to no other lexical category.
- There are ways of deriving ideophone stems from roots of other categories.
- Some roots are belong simultaneously to the class of ideophone stems as well as others (almost always a transitive verb).

These morphosyntactic facts place strong constraints on the space of possible analyses of ideophones.

- First, that fact that one cannot use arbitrary roots in the basic ideophone construction shows that ideophones cannot be reduced to quotation.
- The reason is that practically anything can be quoted—e.g., "The monster was like *chakatubatz'a*"
- If ideophones were mere quotations of an event, that is, the event made a sound that roughly corresponds to the sound of the root in question, then why can't one say (17), even though one can quote the root as in (20)?

(20) "**chep**" x-chi-Ø te alal=e.
POS:filled.bag.thrown.down NT-say-B3 DET baby=ENC
The baby said "chep". (Jaime Pérez González, p.c.)

Given that making a demonstration by way of an ideophone is not mere quotation, whatever differentiates ideophonic demonstrations and quotational demonstrations is part of the compositional semantics.

- Reinforcing this point, want the -u / -i derivation to derive an expression with the kind of syntax / semantic properties that allow it to appear in the basic ideophone constuction, where the underived expression cannot.

Finally, ideophones and verbs share a deep connection—polycategorial ideophone roots are usually also verbs, and derived ideophones are usually derived from verbs.

- Our theory should explain why it is easy to move between verbal meanings and ideophone meanings.

4 A demonstration-based theory of ideophones

We have seen that, morphologically, there is a close connection between ideophones and verbs / positionals.

- For this reason, I will be treating ideophone stems, like verbal and positional (stative predicate) stems to be neo-davidsonian predicates of events—e.g., $\lambda e[V(e)]$
- What constrains the distribution of expressions that can occur in the basic ideophone construction, as opposed to the quotation constuction (which is freer), is that ideophone stems are roots derived by a category defining head v_{id}
- We see an overt morphological realization of this head in derived ideophone stems like `chep-u`, which must bear an affix to be used as an ideophone.

Recall that quotation procedes via the `Q-DEMO` operator that takes a lingustic expression and returns a relation between a demostration event and an event demonstrated.

- In particular, they must stand in the DEMO relation, which is meant to be radically underspecified and mirrors the fact that one can use a *be-like*-quotatives to demonstrate a wide variety of events.

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

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—e.g., using *jik'* means depicting events with an inhaling sound period.
- I propose, then, an `IDEO-DEMO` opeator underlying the basic ideophone construction.

(22) $\texttt{IDEO-DEMO} \rightsquigarrow \lambda u \lambda d \lambda e[\text{TH}_\delta(d) = u \wedge \text{STRUC-SIM}_{\llcorner u \lrcorner}(d, e)]$

- The core idea underlying the $\text{STRUC-SIM}_{\llcorner u \lrcorner}$ 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 (23) provides the meaning of $\text{STRUC-SIM}_{\llcorner u \lrcorner}$ (to be amended in (33)).

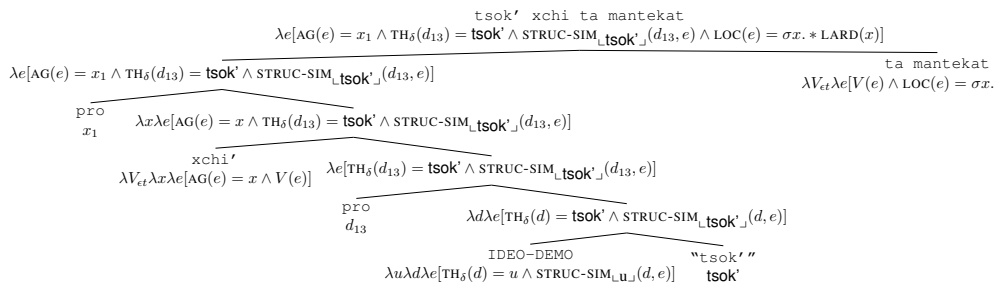
(23) $\text{STRUC-SIM}_{\llcorner u \lrcorner}(d, e)$ iff there is a set P meeting the following conditions:
a. $\text{PARTITION}(\text{P}, e)$
b. $\forall e' \in \text{P}[\llcorner u \lrcorner(e')]$
c. $|\mathbf{atoms}(d)| = |\text{P}|$

We see here that d is an ideophone demonstration of e just in case there is a partition of e with the following properties:

- Every element of the partition satisfies $\llcorner u \lrcorner$, the event predicate the ideophone denotes.
- The cardinality of the partition is the same as the number of atomic demonstrations in the current demonstratione event.

Let's consider now the structure and interpretation of a sentence like (24).

(24) … **tsok'** x-chi-Ø ta mantekat
IDF:sound.start.to.fry NT-say-B3 P lard
…it goes *tsok'* in the lard (Pérez González 2012, p. 162)



After existential closure of the event argument, we get the following denotation, where tsok' is a linguistic object, and $\llcorner$tsok'$\lrcorner$ is the denotation of that linguistic object, namely a predicate of events $\lambda e[\text{TSOK'}(e)]$.

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

This will be true just in case:

- 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).
- The current demonstration event d_{13} has as its theme the linguistic object tsok'
- This demonstration event is structurally similar to e
  - This means that (i) there must be a partition of e of the same cardinality of the demonstration event, here 1 since d_{13} is atomic
  - and (ii) the elements of the partition (here just e itself) must be an event of frying sound emission

These are precisely the truth-conditions of (24).

5 Demonstration-external pluractionality in Tseltal

With this 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.

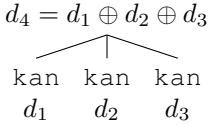
We can now begin to examine the rich pluractional semantics of ideophones.

- Pérez González 2012, p. 242-243 notes that, in Tseltal, one can totally reduplicate an ideophone to demonstrate a plurality of events.

(26) ja'-Ø te **kan**-kon-Ø, **kan** [pause] **kan** [pause] **kan**
FOC-B3 SUB IDF:sound.wood/drum-**C**$_1$**on**-B3 IDF [pause] IDF [pause] IDF
x-chi-Ø=e
NT-say-B3=ENC
'When it knocks, it goes knock knock knock.' Pérez González 2012, p. 242

This fact follows immediately under the account of ideophones I've proposed.

- I propose that when a speaker says "kan kan kan xchi" she makes a plural demonstration—e.g.,



An ideophone demonstration like this would yield the following predicate of events.

(27) $\lambda e[\text{TH}_\delta(d_4) = \textsf{kan} \wedge \text{STRUC-SIM}_{\llcorner \textsf{kan} \lrcorner}(d_4, e)]$

An event e satisfies (35) just in case:

- the theme of d_4 is the linguistic object kan—which I assume is always distributively satisfied, that is, the atomic parts of d_4 have as their theme the linguistic object kan
- and $\text{STRUC-SIM}_{\llcorner \textsf{kan} \lrcorner}(d_4, e)$ holds between d_4 and e, which requires that:
  - e can be partitioned into as many $\llcorner$kan$\lrcorner = \lambda e[\text{KAN}(e)]$ events—i.e., knocking events—as there are atoms in d_4

That is, the demonstration "kan kan kan" faithfully demonstrates an event just in case it is an event of three knockings.

- These are not exactly the truth conditions of (35), but they provide a lower bound until we update the meaning of STRUC-SIM$_{\llcorner n \lrcorner}(d, e)$ in (33).
- 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 demonstration pluractional events.
- It is this that I call "demonstration-external pluractionality" because plural event reference is external to any particular atomic demonstration.

Let's now refine the meaning of STRUC-SIM$_{\llcorner n \lrcorner}(d, e)$ 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 (28) 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.

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

The second property of demonstration-external pluractionality that we must account for is that the manner of reduplication iconically reproduces the temporal properties of the event-plurality.

- This can be shown via the assertion of the (rough) equivalance between kinds of reduplicated ideophones, and kinds of bona fide derived pluractional verbs, which must be event predicates.
- In examples (29) and (30), speakers use ideophone demonstrations to provide the truth condition for verbal pluractional constructions involving the same root.
- The crucial 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 $-\mathtt{C_1on}$, while «idf» «idf» «idf» demostrates events that can fall in the extension of a pluractional predicate derived by $-\mathtt{lajan}$.

(29) ja'-Ø te **kan**-kon-Ø, **kan** [pause] **kan** [pause] **kan**
FOC-B3 SUB IDF:sound.wood/drum-**C$_1$on**-B3 IDF [pause] IDF [pause] IDF
x-chi-Ø=e
NT-say-B3=ENC
'When it knocks [lit. kankon], it goes «kan» «kan» «kan».' Pérez González 2012, p. 242

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

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.

- The formal account of ideophones based on demonstration events I develop here actually predicts this close connection between ideophones and pluractionals.
  - Demonstrations, which mediate the iconic link between the ideophone and the depicted event, are merely events themselves. As such, the 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.
  - It follows, then, 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.
- We can account for this behavior by adding the following condition to meaning of STRUC-SIM$_{\llcorner u \lrcorner}(d, e)$, which I abbreviate with the predicate TEMP-SIM that holds between sets of events, where ADJACENT and $\mathbf{downtime}$ are abbreviations defined in the appendix.
- 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.

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

"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'"

(32) 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. $\forall d, d' \in D[\text{ADJACENT}_D(d, d') \rightarrow$
  $\mathbf{downtime}(d, d') = \mathbf{downtime}(f(d), f(d'))$

"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."

- Essentially, 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 TEMP-SIM(P, D) has some properties we want for dealing with ideophones.

- In particular, the truth conditions are (I hope) appropriately weak.
  - I assume that when a speaker depicts an event e using «idf» «idf» «idf», the listener reasons that the initial subsequence of e must have the structure e' e'' e''', if this doesn't exhaust e, than further events in e are similarly structured.
  - I don't know the facts yet, but I expect this inference of homogenousness is most likely cancelable—e.g., It was like "bang bang bang", but it started to speed up to towards the end.

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

Let's return to those examples where the temporal structure of the pluractional demonstration of an ideophone mimic the temporal structure of the demonstrated event.

- In example (29) the speaker asserts the (rough) equivalence of the pluractional description `kan-C1on` and the ideophonic depiction `kan kan kan`
- Following the description in Pérez González 2012, I will take the pluractional morpheme `-C1on` to derive predicates of events whose minimal parts are all separated by a temporal interval of a fixed, contextually given, length n.

(34) `C1on` $\rightsquigarrow \lambda V_{\epsilon t}\lambda e[\neg\text{ATOM}(e) \wedge *V(e) \wedge \text{LINEAR.ORDER}_n(e)]$
"Takes a V and returns the characteristic function of plural V-ing events whose atomic parts are linearly ordered in time with a interval of length n between temporally adjacent atoms." [see appedix for def of LINEAR.ORDER$_n$]

What we now need to show is that:

`kan-C1on` $\cong$ `kan kan kan`
"events satisfying $[\![$`kanC1on`$]\!]$ are appoximately those that "`kan kan kan`" faithfully demonstrates, and vice versa."

An ideophone demonstration like "`kan kan kan`" `xchi` this would yield the following predicate of events.

(35) $\lambda e[\text{TH}_\delta(d_4) = \textsf{kan} \wedge \text{STRUC-SIM}_{\llcorner\textsf{kan}\lrcorner}(d_4, e)]$

An event e satisfies (35) just in case:

- the theme of d_4 is the linguistic object kan—which I assume is always distributively satisfied, that is, the atomic parts of $d_4 = d_1 \oplus d_2 \oplus d_3$ have as their theme the object kan
- and STRUC-SIM$_{\llcorner\textsf{kan}\lrcorner}(d_4, e)$
  - e can be partitioned into at least as many $\llcorner\textsf{kan}\lrcorner = \lambda e[\text{KAN}(e)]$ events—i.e., knocking events—as there are atoms in d_4
  - The initial elements of the partition and the atoms in d_4 are similarly structured in time—in particular: All adjacent demonstrations via kan must be mapped to two knocking events the same amount of downtime.

We can now ask whether one such an event would satisfies the pluractional predicate `kanC1on`:

(36) `kanC1on` $\rightsquigarrow \lambda e[\neg\text{ATOM}(e) \wedge *\text{KAN}(e) \wedge \text{LINEAR.ORDER}_n(e)]$

- The first two conditions are immediately satisfied. An event that satisfies (35) must have at least three atomic parts and be a knocking event.
- The third condition also holds given two assumptions, which I why I want to say that certain pluractional verbs and pluractional ideophones are only roughly equivalent.
  - The length of the pauses between d_1, d_2, and d_3 in the demonstration d_4 are the same as the contextually salient length n (and it seems natural that the speaker would demonstrate using the contextually relevant interval).

– $|\mathbf{atoms}(e)| = |\mathbf{atoms}(d_4)|$ or the homogeneity assumptions holds that is, the entire event e is similarly structured to the initial segment that allows TEMP-SIM(P, d_4) to be satisfied.

Reasoning in the other direction is actually easier. We can conclude that an event satisfying the pluractional predicate (36) will also satisfy the predicate (35), and thus be properly demonstrated by a plural demonstration of the form "*kan* [pause] *kan* [pause] *kan*", just in case the length of the pauses in the demonstration event are equal to the contextually salient length n.

- The result is that not only does our account capture the truth conditions of plural ideophone demonstrations, which demonstrate plural events with the same temporal structure as the demonstration...
- ...but we also capture a deep connection between pluractionality and ideophones. Just as one can derive a verb root into a pluractional verb stem that denotes a plurality of events, one can take that same root, derive it into an ideophone, and then use it repeatedly to demonstrate the kind of event that would fall in the extension of the pluractional—e.g., (29).

A core aspect of the account is that when using an ideophone multiple times to demonstrate a plural event, the temporal structure of that demonstration matches the temporal structure of the plural event.

- So, for instance, the time between utterances of kan in "`kan kan kan`" must be like the time between between events of knocking in an event that satisfies `kan-C`$_1$`on`.
- This predicts that changing the downtime between demonstrations in a pluractional demonstration could allow one to demonstrate pluractional events of a different kind.
- This prediction is borne out as the example with the pluractional `-lajan` shows, which this account extends to easily.

6 Upper Necaxa Totonac: Demonstration-internal pluractionality

In the previous section I extended the analysis of *be like*-quotation in Davidson 2015 to the ideophone domain, and then illustrated how this account deftly handles that fact that one can repeatedly use an ideophone to depict a plural event, which I dubbed *demonstration-external pluractionality*.

- 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 to create ideophones that only depict plural events.
- That is, an atomic demonstration using one of these derived ideophone will necessarily depict a plural event.
- I will call this kind of pluractionality—where a single demonstration depicts a plural event—*demonstration-internal pluractionality*, in contrast to *demonstration-external pluractionality*—where a plural demonstration depicts a plural event.

First, note that UNT has demonstration-external pluractionality. One finds pairs of sentences where demonstrating using the ideophone more than once means demonstrating a plural event.

(37) Upper Necaxa Totonac

a. **patʃ** maka-wán
IDF:sound.small.stone.fall hand-say
'The pebble falls **patʃ**.' Beck 2008, ex. 16a

b. **patʃ-patʃ** ta-maka-wán
IDF:sound.small.stone.fall-RED 3PL.SUBJ-hand-say
'The pebbles fall **patʃpatʃ**.' Beck 2008, ex. 16b

(38) Upper Necaxa Totonac

a. **tɛ̰ːɬ** ik-ta-wiːɬ kaː-s'ewí̱wi̱ a̱ntsá
IDF:sound.hit.ground 1SG.SUBJ-INCH-sit PLC-cool here
'**Tɛ̰ːɬ** I plopped myself down here where it's cool.' Beck 2008, ex. 15a

b. mat **tɛ̰ːɬ-tɛ̰ːɬ** liːtaːtiːtáː tsamáː misín
QTV IDF:sound.hit.ground-RED bounce.on.bottom this jaguar
'the jaguar bounced around on its rear end' Beck 2008, ex. 15b

In addition to this, though, UNT has a second way to form ideophones that depict pluractional events, namely through final `-CV` reduplication (usually once—with a possible copy-vowel from the root—but possibly more).

(39) **xalalala** maka-wan tʃiwíʃ
IDF:sound.hot.stone.crackle hand-say stone
'The stones went **xalalala** (crackling with heat).' Beck 2008, ex. 18a

(40) **tsanana** kin-a̱'a-wán taʃkát
IDF:sound.buzzing 1OBJ-eat-say wild.bee
'The bee went **tsanana** in my ear.' Beck 2008, ex. 18b

Example (41-c) 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 are "minimized" relative to their non−CV-reduplicated counterparts.

(41) a. lam 'fire flaring up'
lamama 'coals glowing red'
b. ku̱ʃku̱ʃ 'kocking on something'
ku̱ʃu̱ʃu̱ 'tapping quickly on something'
c. teʃeteʃe '(sound) water coming out in bursts'
teʃeʃe '(sound) water rushing out of a pipe' Beck 2008, p. 14

One natural idea would be to treat −CV reduplication as essentially iconic.

- Recall that in Tseltal we accounted for the difference between ideophones that demonstrate C_1on-type pluractional events and lajan-type pluractional events in a purely iconic fashion—the plurality of demonstration events were completely temporally adjacent in the latter case, but not in the former.
- Perhaps in UNT, each −CV reduplicant would correspond to its own demonstration of an event satisfying the ideophone's event-predicate.
- The reason why CV−reduplicated ideophones in UNT would depict events with rapid repetitions and "minimized" events is that, in virtue of being affixal, these −CV reduplicants are necessarily temporally adjacent and "smaller" than the root itself.

The primary problem with such an analysis is that the semantic effect of −CV reduplication in UNT 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. Reduplicating the ideophone always means depicting a plurality of events of the kind a non-reduplicated ideophone would depict.
- In UNT, 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.

(42) a. *xalaxala* 'a wheelbarrow jolting its load as it rolls along'
b. *xalala* 'red-hot rocks crackling from heat'

(43) a. *xilixili* 'horse galloping and rearing'
b. *xilili* 'roaring (plane, rushing water, thunder)'

(44) a. *yanayana* 'flies buzzing around'
b. *yanana* 'water boiling in a pot'

These facts rule out a purely iconic account.

- That is, we don't want to say that there is an ideophone root xala that can be reduplicated in two ways to iconically represent the way an event unfolds since −CV reduplication can have arbitrary, non-iconic semantic effects.
- Instead, we want 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 sometimes is.

That is, just like one finds an overt instantiation of a morpheme v_{id} that derives ideophone stems in Tseltal (e.g., derived ideophones like in (15) and (15) above), Upper Necaxa Totonac would have an ideophone derivation whose phonological reflex is −CV reduplication.

- But, 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 pluractional events.

(45) $\text{CV}_{v_{id}} \rightsquigarrow \lambda V_{\epsilon t} \lambda e[*(V(e) \wedge \neg \text{ATOM}(e)]$ (preliminary)

- I'm not actually going to provide a semantics for the pluractional. I don't have enough data to do this correctly. That said, from the examples I have, this looks like an event-internal pluractional (see Wood 2007; Henderson to appear).
- The two core points are that:
  - $\text{V}^\frown\text{CV}_{v_{id}}$ is an ideophone stem that denotes a predicate that can only be satisfied by events with a plural character.
  - Though we always get an event predicate, we expect sometimes ideosyncractic semantic effects of −CV derivation because this is common to derivational morphology more generally.

Now when we use a pluractional ideophone stem like `xalala` to make an atomic ideophone demonstration d_{10}, we get the following truth conditions.

(46) $\lambda e[\text{TH}_\delta(d_{10}) = \textsf{xalala} \wedge \text{STRUC-SIM}_{\llcorner \textsf{xalala} \lrcorner}(d_{10}, e)$

Which is satisfied by an event e if d_{10} is a demonstration by uttering xalala and d_10 is an ideophone demonstration of e, namely:

- e can be partitioned into XALALA events—i.e., pluractional event of hot stones crackling
- There are at many events this partition there are in the demonstration, i.e., we'll have one XALALA event, which is an event with plural character (stones crackling with heat)
- The elements of partition are structure in time like demonstration event (in terms of temporal adjacency and downtime), which is vacuously satisfied here since we have an atomic demonstration.

The result is that even when the speaker makes a single demonstration by uttering xalala she will be demonstrating an event of plural character. Unlike other ideophones, there is just no way to demonstrate singular events with a `-CV` derived ideophone stem.

- 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 even of singular character.
- It is precisely this contrast that distinguishes demonstration-internal and demonstration-external pluractionality.

7 Conclusion

This project has the follow goal:

- To motivate a compositional semantics of ideophones that respects their iconic character while relating their meaning to more familiar, non-iconic semantic phenomena.
  - 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:
    - plural demonstrations (which are themselves simply plural events)
    - derived ideophones that are simultaneously pluractional stems, and so can only be used to demonstrate events with a plural character

Where now?

- There is a large literature on varieties of pluractionality. Do we find all the same kinds of plural event reference we see in the event domain in the demonstration domain—e.g., do we find event-external pluractional ideophone derivations to complement the seemingly event-internal pluractional ideophone derivation in Upper Necaxa Totonac?
- My account of the two kinds of ideophone pluractionality is based on the idea that languages have a variety of ways of (compositionally) using ideophones to depict plural events.
  - Beyond plurality, what other kinds of event structure can ideophones (compositionally) target?
  - One exciting possible answer is durativity. Alto Perené (Arawak) has a ideophone-deriving affix -(V)k which derives ideophones that characteize punctual (non-durative) events (Mihas 2012).

(47)
a. kori 'gulp' / korik 'take a gulp'
b. tsapo 'pour (liquid)' / tsapok 'splash (liquid) once'
c. cheki 'cut' / chekik 'make a cut'

- It seems that -(V)k syntactically derives an ideophone stem and semantically derives a predicate of punctual events, and thus can only be used in the language's ideophone construction(s) to depict events with that particular structure.

Finally, it will be important to compare the results here with a more general **Icon**$^\Phi$-based proposal like Kuhn and Aristodemo 2015 for iconic pluractional verbs in French Sign Language.

- I have some thoughts on this that I'm happy to talk about in the Q & A, but this is still in development.

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A Definitions / Abbreviations

The backdrop for the account is lax many-sorted type logic. Lax just means (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. Following are highlights of the setup:

The domain of individuals of type e is the powerset of a designated set of entities IN minus the empty set: $D_e = \wp^+(\mathsf{IN}) = \wp(\mathsf{IN}) \setminus \emptyset$. The domain of events of type ϵ is the powerset of a designated set of events EV minus the empty set: $D_\epsilon = \wp^+(\mathsf{EV}) = \wp(\mathsf{EV}) \setminus \emptyset$. The domain of times of type τ is the powerset of a designated set of times (temporal intervals) TM minus the empty set, and is additionally ordered by an irreflexive, asymmetric, transitive relation $\prec$ (temporal precedence) Krifka 1998: $D_\tau = \wp^+(\mathsf{TM}) = \wp(\mathsf{TM}) \setminus \emptyset$. The domain of demonstrations of type δ is a proper subset of the domain of events: $D_\delta \subset D_\epsilon$. Disjoint from all other domains) is the domain of well-formed linguistic entities of type μ. I treat linguistic objects as pairs—$\langle$`string`, SEMANTIC REPRESENTATION$\rangle$. We can think of this a reifying in the model the translation function mapping natural language expressions (here strings) to their semantic representations. I use ⌞bottom corners⌟ in the object language to access the semantic content of a linguistic object via the equality in (48).

(48) For any expression M of type μ $[\![\llcorner \mathsf{M} \lrcorner]\!] = [\![\pi_2([\![\mathsf{M}]\!])]\!]$

Atomic individuals and atomic events are the singleton sets in $\wp^+(\mathsf{IN})$, $\wp^+(\mathsf{EV})$, $\wp^+(\mathsf{DM})$ 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 $\wp^+(\mathsf{IN})$ / $\wp^+(\mathsf{EV})$ / $\wp^+(\mathsf{TM})$ / $\wp^+(\mathsf{DM})$: $a \leq b$ iff $a \subseteq b$. The sum operation $\oplus$ (disambiguated by context) is set union over $\wp^+(\mathsf{IN})$ / $\wp^+(\mathsf{EV})$ / $\wp^+(\mathsf{TM})$ / $\wp^+(\mathsf{DM})$: $a \oplus b := a \cup b$. Standard θ-roles are functions of type ϵe from events (type ϵ) to individuals (type e), e.g., TH is the theme role, AG is the agent role, etc. 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—x_ϵ, y_δ, and θ, if $x_\epsilon = y_\delta$, then $\theta_{\epsilon e}(x_\epsilon) = \theta_{\delta e}(y_\delta)$.[1]. I assume all theta-role functions are cumulatively closed, suppressing $**$-notation. The temporal trace function τ is a sum-homomorphism from events to times, while $\mathbf{len}$ is a measure-function from $D_\tau \cup \emptyset$ to the natural numbers representing their lengths, where $\mathbf{len}(\emptyset) = 0$.

(49) $\mathbf{atoms}(x) := \{x' | x' \leq x \wedge \text{ATOM}(x)\}$

[1] Recall that equality is type agnostic, unlike all other object-language functions.

'The set of atomic parts of x'

(50) $O(x, y)$ iff $\exists z[z \leq x \wedge x \leq y]$
'Two entities overlap just in case they share a part.'

(51) $\text{ADJACENT}_X(e, e')$ iff

a. $\neg O(e, e')$
b. $\neg\exists e'' \in X[\tau(e) \prec \tau(e'') \prec \tau(e') \vee \tau(e') \prec \tau(e'') \prec \tau(e)]$

(52) $\text{FIRST}(e, E)$ iff $e \in E \wedge \neg\exists e' \in E[\tau(e') \prec \tau(e)]$

(53) $\text{LAST}(e, E)$ iff $e \in E \wedge \neg\exists e' \in E[\tau(e) \prec \tau(e')]$

(54) $\text{LINEAR-ORDER}(E)$ iff $\forall e', e'' \in E[e' \neq e'' \rightarrow \neg O(\tau(e'), \tau(e''))]$
'E is linearly ordered set of events just in case none of its (distinct) members have overlapping runtimes.'

(55) $\text{LINEAR-ORDER}(e)$ iff $\text{LINEAR-ORDER}(\mathbf{atoms}(e))$
'e is linearly ordered just in case none of its (distinct) atomic parts have overlapping runtimes.'

(56) $\mathbf{downtime}(e, e')$:=

a. $\emptyset$ if $O(\tau(e), \tau(e'))$, else
b. $\bigoplus\{t \in D_\tau | \tau(e) \prec t \prec \tau(e') \vee \tau(e') \prec t \prec \tau(e)\}$
'the contiguous temporal interval between e and e'.'

(57) $\text{LINEAR-ORDER}_n(e)$ iff

a. $\text{LINEAR-ORDER}(e)$
b. $\forall e', e'' \in \mathbf{atoms}(e)[\text{ADJACENT}(e', e'') \rightarrow$
$\mathbf{len}(\mathbf{downtime}(e', e'')) = n]$
'e is linearly ordered and adjacent elements in the order are separated by an interval of length n'

(58) $\text{INTENSE-ORDER}(E)$ iff there is an $E' \subseteq E$ such that

a. $\exists e[\text{FIRST}(e, E) \wedge e \in E']$
b. $\exists e[\text{LAST}(e, E) \wedge e \in E']$
c. $\text{LINEAR.ORDER}_n(E')$ where $n = 0$

(59) $\text{INTENSE-ORDER}(e)$ iff $\text{INTENSE-ORDER}(\mathbf{atoms}(e))$

(60) $\text{PARTITION}(\text{P}, x)$ iff

a. $\bigoplus \text{P} = x$
b. $\forall x(x \in \text{P} \rightarrow \neg\exists y(y \in \text{P} \wedge O(x, y)))$
'P partitions x iff the elements of P sum to x and no elements of P overlap.