Clifton Pye
Linguistics Department

The University of Kansas
Lawrence, KS 66045

How to Keep Semantic Universals in the Face of Semantic Indeterminacy

A hallmark of current syntactic theory is the derivation of phrase structure rules from general principles of X-bar theory and information contained in the lexical entries of individual morphemes (Bresnan 1982, Chomsky 1986, Pesetsky, to appear). Recent work seeks to account for the syntactic idiosyncracies of verbs by devising a fully articulated lexical representation that assumes two levels: the **Lexical Conceptual Structure** (LCS), and the **Lexical Structure** (LS). This work attempts to explain the cross-linguistic uniformity in the mapping between semantics and syntax on the basis of unconstrained semantic representations. For example, the syntactic differences between the English verbs **cut** and **break** are attributed to differences at the level of LCS.

In an effort to constrain semantic representations I propose the **Principle of Semantic Representation** (PSR): words that have the same meaning have the same semantic representation. An immediate consequence of this principle is a commitment to a language neutral ontology. Quine (1968) critiques this assumption as the museum theory of meaning where each semantic feature (e.g. COMPUTER) resides in its own display case and the displays never vary across any language in any universe. I will discuss empirical evidence from Garifuna, German, Mandarin, Mandinko, Thai, Korean, Japanese, German and Winnebago that supports Quine's argument.

In place of the PSR I propose adopting Quine's theory of lexical meaning. This entails relativizing lexical meaning to the situations where speakers encounter words. For mapping principles, the theory requires a relativized set of participant roles along the lines of Dowty (1991). For language acquisition, the theory implies that speakers never arrive at a finished conception of lexical meaning. Rather, speakers will continuously update their theories of lexical meaning in exactly the same way scientists continuously revise their theories of physics and chemistry. With enough experience, speaker theories of lexical meaning approximate those of other speakers in the language community. These lexical theories are only approximations, though, so it is possible to find instances where the theories diverge. Over time, lexical theories will change, leading to the well-documented cases of semantic shift. It is also possible to witness children in the process of developing their own theories of lexical meaning. I will present data from 15 children 3-9 years of age that show the children are in the process of distinguishing cases of cutting from cases of breaking. For the acquisition of verb argument structure, the theory predicts that speakers do not have fixed theories of verb transitivity. This prediction is supported by data in Pinker (1989) and the results of a cross-linguistic survey.

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Breaking Concepts: Constraining Predicate Argument Structure

Clifton Pye

Linguistics Department
The University of Kansas
Lawrence, KS 66045

e-mail: pyersqr@ukanvm.bit

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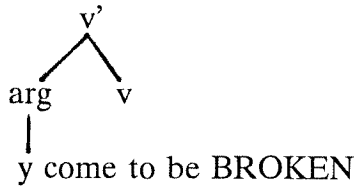
1. Introduction

A hallmark of current syntactic theory is the derivation of phrase structure rules from general principles of X-bar theory and information contained in the lexical entries of individual morphemes (Bresnan 1982, Chomsky 1986, Pesetsky, to appear). Recent work seeks to account for the syntactic idiosyncracies of verbs by devising a fully articulated lexical representation that assumes two levels: the **Lexical Conceptual Structure** (LCS), and the **Lexical Structure** (LS) (Carter 1976, Hale & Keyser 1985, Grimshaw 1990, Guerssel et al. 1985, Jackendoff 1987, Rappaport & Levin 1988). This work attempts to explain the cross-linguistic uniformity in the mapping between semantics and syntax (Hopper & Thompson 1980, Marantz 1984).

The LCS of a verb provides a representation of the grammatically relevant aspects of verb meaning, including the thematic or semantic roles associated with the verb (Fillmore 1968, Gruber 1965, Jackendoff 1972, 1976). The LS of a verb provides the basic syntactic organization of the verb's arguments, i.e. the number and types of arguments the verb projects into the syntax. An explicit set of linking or mapping conventions relates the LCS representation to the LS entry (cf. Carter 1976). Hale and his coworkers refer to a LCS linked to a LS as a Predicate Argument Structure (PAS).

An example of the PAS for inchoative ***break*** from Guerssel et al. is shown in (1). The LCS for ***break*** ('y come to be BROKEN') indicates that the verb represents an action or process with one participant. This participant is understood to be the passive participant that is affected by the action and therefore links to the argument position in the LS by the linking convention for English. This convention requires the theme (or non-agent argument) to link to the argument position (cf. Guerssel et al. 1985).

(1) PAS for inchoative ***break***



The English verb ***cut*** has a different set of syntactic properties than the verb ***break***. Only ***break*** participates in the causative alternation shown in (2) while only ***cut*** participates in the conative alternation shown in (3). Guerssel et al. account for these differences by assuming that ***cut*** has a different PAS. Their PAS for ***cut*** is shown in (4).

(2) a. You broke the stick.

The stick broke.

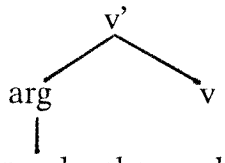
b. You cut the cake.

* The cake cut.

(3) a. Hank cut at the cake.

b. * Matilda broke at the stick.

(4) PAS for the verb ***cut***



x produce CUT in y, by sharp edge coming into contact with y

The main difference between the verbs is their LCS. Guerssel et al. hypothesize that ***cut*** is a dyadic verb and denotes an action that involves both an active and passive participant. Inchoative ***break*** is a monadic predicate that does not require an active participant. ***Cut*** does not participate in the causative alternation since an inchoative form would fail to link one of the variables in the LCS of ***cut*** to its LS. ***Break*** does not participate in the conative alternation because its LCS lacks the necessary surface contact clause. The PAS provides an explicit representation of semantic structure as well as syntactic evidence for the presence of the postulated semantic features. The development of full PAS representations simplifies the grammar at the expense of the lexicon. One dividend is that it becomes easier to explain how children acquire syntactic distinctions. Presumably children learn that the verb ***cut*** requires an active and passive participant because of the nature of the cutting process (it does not occur spontaneously). They can then infer a dyadic LCS representation for the verb. Children learn the verb ***break*** in inchoative contexts in which there is not an obvious active participant (a cracker breaking without an intentional action by the child).

Pinker (1989) has developed a system of lexical representations to account for children's acquisition of the causative, locative, dative and passive alternations. He notes that not only ***break***, but a whole family of verbs with similar semantic features participate in the causative alternation (e.g. ***crack***, ***shatter***, ***split***, ***chip***, etc.). Pinker reasoned that children might initially develop a lexical alternation like the causative, but fail to note how particular semantic features of verbs would prevent or enable the verbs to participate in the alternation. Once children note such features they would be able to restrict the alternation to whole classes of verbs with the appropriate semantic features. This would account for the typical developmental history for lexical alternations where children first use their verbs in limited contexts, then overgeneralize lexical alternations and finally restrict the alternations appropriately (Bowerman 1974).

The theory of PAS representations promises an explicit account of the lexical semantics of verbs and verb acquisition by children. The use of converging sets of data from lexical alternations and language acquisition provides a powerful addition to speculation about semantic features that characterized much of the preceding work on lexical semantics (Goodenough 1956, Katz & Fodor 1963, Lehrer 1974, Lyons 1977, Miller & Johnson-Laird 1976, Wierzbicka 1988). At least one significant problem must be faced before PAS representations can be given a firm empirical footing - the problem of cross-linguistic differences.

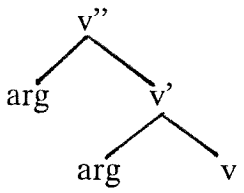
Cross-linguistic studies pose an immediate problem for PAS representations. The Turkish verb ***kes*** 'to cut', for example, undergoes the regular causative alternation. Does this disprove the theory of grammatically relevant semantic features or indicate that the verb ***kes*** has a distinct PAS in Turkish? If the latter is true, there are three variables in the PAS that can change from language to language: 1. the LCS representation, 2. the LS representation, and 3. the linking rules. A fourth possibility is that the causative alternation in Turkish is not the same as the causative alternation in English. The causative alternation in Turkish applies to a wider range of verbs than in English, but Turkish speakers make similar judgements about the directness of causation involved for each verb (Haiman 1985). An extra variable in the LCS is available at the level of semantic interpretation in Turkish, but this does not prevent the application of the causative alternation.

The claim that the verbs have different LCS representations is tantamount to a claim that the verbs have different meanings. Taking this approach would preserve a universal set of LS representations and linking rules, but at the cost of unconstrained LCS representations. The claim that languages have different LS representations would allow a universal set of LCS representations, but complicates the mapping from verb meaning to argument structure. Allowing languages different linking rules also complicates the mapping from verb meaning to argument structure. Constraining the source of cross-linguistic differences in verb behavior is a matter of some urgency for the theory of PAS representations. Unconstrained cross-linguistic differences in verb behavior would defeat the original purpose of the theory of PAS representations.

The issue of cross-linguistic differences has been addressed most directly by Guerssel et al. (1985). These authors explored the syntactic behavior of ***cut*** and ***break*** in four languages: English, Berber, Warlpiri and Winnebago. Only English and Berber possess a lexical causative alternation that distinguishes ***break*** from ***cut***. Warlpiri and Winnebago employ distinct verb forms in the causative and inchoative constructions. Only English and Warlpiri possess a conative alternation; Berber and Winnebago lack such an alternation.

Guerssel et al. assume that 'across languages verbs with shared elements of meaning have similar LCSs' (55). They derive the cross-linguistic differences for the causative alternation from language-specific properties of LS and linking conventions. They assume that the LS of ***break*** in Warlpiri contains two argument positions, as in (5). They also assume a different set of linking conventions for Warlpiri, the main difference from English being that the theme will be linked to the highest remaining argument position.

(5) Lexical Structure of Warlpiri (Guerssel et al. 1985):



Guerssel et al. derive the cross-linguistic differences for the conative alternation from different LCS representations. Specifically, they assign the cut verbs in Berber and Winnebago a LCS representation of 'the same form as the LCS associated with the conative alternate of the English and Warlpiri verbs' (59). Their translations of the verbs in Berber and Winnebago imply a difference in meaning since they are translated as 'hit' rather than 'cut'.

Guerssel et al.'s explication of the cross-linguistic differences is unsatisfactory in that it does not provide a principled basis for isolating differences in PAS representations. A preliminary heuristic would be to adopt their assumption that 'across languages verbs with shared elements of meaning have similar LCSs'. I will explicitly adopt this assumption and label it the **Principle of Semantic Representation** (PSR). More formally, the PSR is stated in (6).

(6) **Principle of Semantic Representation**: words that have the same meaning have the same semantic representation.

Something like (6) is assumed in all work on verb argument structure (Marantz 1978, Perlmutter & Postal 1984, Baker 1988). It is the basis for Perlmutter's Universal Alignment Hypothesis (UAH) and Baker's (1988) Uniformity of Theta Assignment Hypothesis (UTAH). Adopting the PSR is the first step towards constraining PAS representations since the PSR restricts cross-linguistic differences in syntax to LS representations or the linking rules. The PSR also serves as an essential catalyst for language acquisition by providing a single semantic representation for events. Without the PSR, children would have to sift through an infinite series of hypotheses about possible word meanings. Nevertheless, the PSR entails several problematic theoretical and empirical consequences. I explore these consequences in the remainder of this paper, returning in the end to a discussion of the theory of PAS representations.

2. Theoretical Implications

If the PSR is going to do any real work, it requires a theory of synonymy to test when two words have the same meaning. Obviously, it will not do to use the syntactic behavior of words as a test of their synonymy since this would create a circular hypothesis (similar meanings predict similar syntactic behavior which serves as a test for similarity in meaning). A purely semantic test of synonymy is required.

A referential test of synonymy will not be acceptable for the standard reasons (although the 'morning star' and the 'evening star' refer to the same celestial object, 'morning star' is not a synonym for 'evening star' (Frege 1892)). The PSR does not require an absolute test of synonymy. All that is required is that the synonymy test indicate when two words are similar enough in meaning to share syntactically significant LCS features. ***Rip*** and ***tear*** may not be synonyms, but they share enough semantic features to warrant the same syntactically relevant semantic features.

An immediate theoretical consequence of the PSR is a commitment to some neutral ontological framework (Lyons 1977). This commitment entails that knowing the meaning of a word is equivalent to knowing a function that picks out the referents of the word under any set of conditions. Each word in the language has a unique meaning (or intension) that enables speakers of the language to state whether two words are synonyms or antonyms. To maintain the PSR one must address Quine's (1960) critique of intensionalist semantics.

Quine (1968) describes a museum of meaning where separate meanings are exhibited in their own display cases and provided with names. Thus, BREAKING would be in one case and CUTTING in another. Different languages would provide their own labels for these cases, but there would be a single exhibit to attach these labels to. If verb meanings derive from a complex set of semantic features leading to possible cross-linguistic differences for the 'same' verbs, there would still be museum exhibits for semantic features. The exhibits provide a universal (in the widest sense) set of intensions that language users on any planet in the universe may attach their words to. Meanings (or semantic features) would be independent of languages and await discovery by language speakers venturing into a new exhibit hall at the museum.

While the museum theory provides a metaphor for the Western folk theory of lexical semantics, Quine (1960) argued that cases of 'radical translation' between languages for which there were no previously established translational conventions raise an insurmountable problem. Quine noted that there is no way to insure that a foreign term such as ***gavagai*** is the proper translation for the English word ***rabbit***. It is possible for ***gavagai*** to refer, not to rabbits, but to 'undetached rabbit parts' or 'rabbit stages'. In the case of radical translation there is no possibility of fixing an absolute reference for ***gavagai***. Thus, there is no way to guarantee that ***gavagai*** and ***rabbit*** label the same exhibit in the museum of meaning.

Quine's argument is too easily dismissed because it upsets the folk theory of the museum of meaning. Katz (1990) gives Quine's argument the attention it deserves, but critiques the argument on two grounds. First, 'in cases of actual translation (as opposed to radical translation), the linguist 'can ask whether an expression has a sense ... whether the sense of one expression is the same as that of another ... whether the sense of a sentence involves redundant predication ... and so on' (194). Katz claims that, 'The possibility of putting such questions to informants automatically provides the possibility of evidential controls like those in other sciences' (194). Second, Katz notes that cases of radical translation can always be finessed by finding someone who speaks both languages. If bilingual speakers do not exist it is possible to raise them by exposing children to both

languages (196). Thus, there is a practical solution to theoretical arguments stemming from cases of radical translation.

Evidential controls are only as good as the evidence available for the terms in different languages. Katz assumes there will be equivalent translations for terms in two languages without further discussion. Linguists following his procedures should arrive at faithful translations for each word in another language, no matter how exotic. In the next section of this paper, I discuss an area of the lexicon where evidential controls lead to the conclusion that equivalent translations are impossible. Quine (1968), himself, presents several cases of indeterminant translation from real languages that Katz does not discuss, including different possibilities for translating nouns in languages with numeral classifiers. There is even a hint in the anthropological linguistics literature in favor of translating ***rabbit*** in at least one language as ***rabbit stage*** (Kinkade 1983).

Katz's bilingual solution does not solve Quine's problem since it is still possible for bilinguals to translate smoothly between 'rabbit' and 'undetached rabbit parts'. Quine bases his argument on the possibility of adjusting the translation of other words in the language to derive an 'identical' translation for any particular item. The network of semantic relations will differ between languages, and bilinguals will translate between these networks rather than between lexical items. Expressions in different languages may have the 'same' sense relative to the network of semantic relations in the language. There is no universal referential frame just as there is no universal inertial frame.

These philosophical issues raise the stakes for the PSR. If Katz's arguments do not go through for the whole lexicon then linguists must forgo appeals to a museum theory of meaning and grapple with the implications of Quine's critique of intensionalist semantics. Quine proposes that meanings are not so much discovered as negotiated through linguistic exchanges with fellow speakers of one's own language and dialect. I believe Katz has a valid point concerning the availability of evidence, but this evidence is more secure for some parts of the lexicon than others. In particular, empirical evidence is most readily available for nouns with concrete referents (although Hintikka 1972 issues a caution for the identification of nouns in belief contexts). The same degree of evidence is not available for verbs, prepositions and particles (Lyons 1977). I explore the semantics and syntax of one verb in the next section of this paper. Other investigators have provided evidence of semantic relativity for prepositions (Choi & Bowerman 1991, Levinson 1991, Herskovits 1986). Needless to say, the issue awaits empirical investigation.

3. Empirical Problems

The heart of the issue for the PSR is to find an acceptable method of translating lexical items. It makes sense to begin with the verbs ***cut*** and ***break*** in view of the work lexical semanticists have done on these verbs. What is required is an empirical method that leads to the 'correct' translation of these verbs.

Brousseau & Ritter (1990) note that French has two inchoative verb forms that can be translated into English as ***break***: a simple inchoative form shown in (7) and a pronominal inchoative form shown in (8):

(7) La fenêtre a cassé.
The window broke.

(8) La fenêtre s'est brisée.
The window broke.

The two French inchoative forms use different auxiliaries and the pronominal form requires the reflexive clitic ***se***. Brousseau and Ritter classify ***casser*** as an unergative verb and ***briser*** as unaccusative (cf. Perlmutter 1978). They also state that the two inchoatives have different semantic interpretations. The pronominal form carries an extra implication that the entity undergoing the change is somehow responsible for that change.

Brousseau and Ritter claim that ***casser*** roughly means '(cause to) come to be apart, in pieces, under a pressure, a shock, a hit, etc. while ***briser*** means something like (cause to) become interrupted, inefficient or useless' (15). They present Labelle's (1992) formulation of the semantic difference as (their example 29):

(9) a.***casser***: x come to be apart (as its capacity of resistance is exceeded)

b.***briser***: x (forcefully) interrupt the continuity/integrity of y.

According to Labelle, '[A]lthough the stress could be imposed externally, the verb [***casser***] focuses on the resistance to stress of the entity.' '[***B]riser*** makes reference to an interruption in continuity rather than to the act of coming apart. Whereas the act of coming apart can be conceived of as being intrinsic, an interruption conceptually implies two participants.'

Brousseau and Ritter formulate an account of the different syntactic properties of ***casser*** and ***briser*** that depends on their exegesis of the distinction in the verbs' meaning. The crucial step in their derivation is their claim that the meaning of ***briser*** entails a single event of direct causation involving two entities while ***casser*** may refer to an autonomous event of breaking that only involves a single entity or an indirect causation event that adds an external CAUSER to the event of breaking. Their argument reduces to the claim that ***briser*** is a dyadic predicate while ***casser*** is a monadic predicate at LCS.

In the absence of a viable theory of lexical semantics there is no way to prove that an interruption in continuity is conceptually distinct from the act of coming apart. One approach might be to show that all languages treat interruptions in continuity as causal events while treating acts of coming apart as inchoative events. We might even ask which type of event the English verb ***break*** is used for. If this is a case of polysemy then it demonstrates that polysemous senses do not necessarily produce similar syntactic projections.

This example raises a more serious issue, however, and that is whether there are only two ways to 'break' things. How do we know that we have captured the full panoply of linguistic options by comparing English and French? I do not think we have so I have busied myself by looking into the translation of ***break*** in other languages, and as a result, making a general nuisance of myself among the faculty and students at KU. I have been

fortunate in teaching at a university that draws students from many different countries, so I have been able to accumulate a fair amount of information about how to break things in other languages.

It took me some time to realize that I could not elicit the proper data by simply asking for translations of the verb ***break***. Speakers of other languages would be happy to give me a translation and go on about their business. Since I do not know any of these languages I could not tell whether this was their only way of translating this verb. Working with Yin-Yin Pao I discovered that a better approach was to ask informants how to break various objects and what the result looked like. This led to a list of 34 nouns on a questionnaire with the question of how speakers would 'break' each of these objects in transitive and intransitive contexts. I gave this questionnaire to my graduate introductory linguistics class and was surprised to find that they had a great deal of difficulty completing it. Their queries indicated that they found many of the objects could be broken in ways that I had not anticipated. For example, a hair can be split length-wise, broken across its horizontal axis or plucked from the animal on which it resides. Just seeing the word ***hair*** on the questionnaire did not provide enough information to give an unambiguous response.

The current incarnation of my questionnaire resolves this problem by adding pictures of the breaking objects. While this questionnaire still leaves some issues open (such as the manner in which the object is breaking) it goes much further in resolving the ambiguities of my previous attempts. This history also provides a preview of the difficulties of finding equivalent translations for ***break***. It turns out to be impossible to break things in exactly the same way. Some of the variables include: the type of object, the molecular structure of the object, the amount of force applied to the object, the direction in which the force is applied (including whether the force is applied internally or externally), the instrument delivering the force to the object, the location of the object, and whether or not the object is at rest.

Table 1 will give some indication of the cross-linguistic variation I have encountered. I have selected five of the 30 objects on the questionnaire for illustration. English speakers with similar judgements would have the first set of responses. Note that each of these verbs participates in the causative-inchoative alternation so their syntactic behavior can be said to mirror their lexical conceptual structure. In the following sections of the paper I will discuss the syntactic and semantic differences for ***break*** across the other languages.

3.1. Syntactic Differences

Table 1 contains two rows for each language. The first row provides the inchoative form for each verb while the second row provides the causative form. Comparing the causative alternation for ***break*** across these languages reveals some startling differences in the syntactic behavior of the verbs.

The English verbs exhibit a pattern of lexical alternation. The same verb form is used in both transitive and intransitive contexts. Mandarin Chinese and Thai present a very different picture. Both languages treat these verbs as basically intransitive and

Table 1. Break

	Bubbles	Plates	Sticks	Ropes	Clothes
English	pop	break	break	break	tear/rip
	pop	break	break	break	tear/rip
Mandarin	può	può	dwàn	dwàn	può
	nòŋ può	nòŋ può	nòŋ dwàn	nòŋ dwàn	nòŋ può
Thai	tææk	tææk	hak	k^həət	k^həət
	pəəw tææk	t^haam tææk	t^haam hak	t^haam k^həət	t^haam k^həət
Garifuna	bowgua	bowgua	halagua	tumugua	teirigua
	bowguana	bowguana	halaguana	tumuguana	teiriguana
Mandinko	te?ta	te?ta	katita?	kuntuta	sota?
	te?	te?	kati?	kuntu	soo
Winnebago	rupáx-re	rukšáp-re	rušíš-re	ruwáx-re	rugás-re
	rupáx	rukšáp	rušíš	ruwáx	rugás
Korean	teojida	ggaejida	bureojida	ggeuneojida	gumeongnada
	teoddeurida	ggaeda	bureoddeurida	ggeunta	gumeongnaeda
K'iche'	-poq'ik	-paxik	-q'upinik	-t'oqopinik	-rach'aqinik
	-poq'isa:j	-paxi:j	-q'upi:j	-t'oqopi:j	-rach'aqi:j

employ a syntactic construction to refer to dyadic contexts. The example in (10) is unacceptable because the verb ***può*** appears by itself in a transitive context. The verb ***può*** requires the 'helping' verb ***nòŋ*** to appear in contexts with two participants, as in (11):

(10) * John può lè bei-zi.
John broke ASPECT cup.

John broke the cup.

(11) John nòŋ-può lè bei-zi.
John manipulate-break ASPECT cup.

John broke the cup.

Table 1 shows that the same is true for the Thai verbs. Both Mandarin and Thai have different verbs that refer to ceasing-to-function events somewhat akin to Brousseau & Ritter's description of ***briser***. This verb is ***huaì*** in Mandarin and ***sia*** in Thai. Unlike ***briser***, the Mandarin and Thai verbs are intransitive and require helping verbs to appear in transitive contexts, as in (12). This evidence suggests that the concept of an interruption of integrity does not, by itself, require two arguments at the level of Lexical Conceptual Structure.

(12) John nòŋ-huaì le diàn-nau.
John manipulate-out_of_order ASPECT computer.

John broke the computer.

The Arawakan language Garifuna employs a morphological alternation for its breaking verbs. As in Mandarin and Thai, the basic verb form is intransitive. Garifuna adds the causative affix ***-na*** to create transitive verb stems. These four languages exhibit the extremes of the syntactic devices languages employ for the causative alternation. Although these devices differ with the directness of causation within a single language (Haiman 1985), across languages they denote equivalent means of causation in these contexts.

The morphologically simple form for breaking is transitive in the West African language Mandinko and the American Indian language Winnebago. The languages use a form of the passive to refer to inchoative events. Ken Miner (p.c.) informs me that the Winnebago suffix ***-re*** is derived from the verb 'to go'. The verbs in these languages therefore resemble the French verb ***briser*** in their morphological behavior. It is of interest that the Winnebago verbs require a means prefix of some kind. The prefix ***ru-*** denotes 'with the hand'. This suggests that the LCS of the Winnebago verbs contains at least two participant roles and requires a passive suffix to appear in inchoative contexts (see Comrie 1985 and Nedyalkov & Silnitsky 1973 for discussion of the anti-causative alternation).

Despite the differences between Mandinko, English and Mandarin it is still possible for languages to treat their breaking verbs in a uniform fashion in syntax. We have already seen a French example that suggests this is not the case. Although Brousseau & Ritter stress the conceptual differences between ***casser*** and ***briser***, both verbs belong to the domain of breaking verbs and therefore pose a real problem for the thesis that conceptual similarity results in linguistic similarity. Lest French appear to be an aberration I include data for Korean and K'iche'.

Simply looking at the Korean verb forms shows there is not a simple correlation between morphological complexity and verb transitivity. The morphologically simple forms for breaking bubbles and sticks require a causative morpheme in transitive contexts. Interestingly, the forms of these verbs in intransitive contexts contain a passive affix. Thus, these verbs do not have an uninflected lexical form. The morphologically

simple forms for breaking plates and ropes require a passive morpheme in intransitive contexts. Korean speakers have a plethora of verbs to chose from in referring to breaking events. I have just chosen a single verb for each of these acts.

K'iche' is a Mayan language spoken in the Western Highland region of Guatemala. The K'iche' verbs in Table 1 employ three distinct alternations. The verb ***-poq'ik*** is intransitive and adds the causative affix ***-is(a)*** to form a transitive verb. The verb ***-paxik*** is intransitive, but uses a type of lexical alternation to produce the transitive verb ***-paxi:j***. Lexical alternations in K'iche' merely alter the termination suffix from the intransitive affix ***-ik*** to the transitive affix ***-V:j***, the alternation does not add a derivational affix.

The other K'iche' verbs in Table 1 are transitive verbs. They use the absolutive antipassive alternation to produce an intransitive verb form. K'iche' speakers normally add the absolutive antipassive affix ***-Vn*** to transitive verbs to focus on the action of an agent. The result is similar to the conative alternation in English:

(13) a. x-∅-u-ch'ay le: tz'i' le: achih
ASP-3A-3E-hit the dog the man

The man hit the dog.

b. x-∅-ch'ay-an le: achih che: le: tz'i'
ASP-3A-hit-ABS the man at the dog

The man hit at the dog.

Verbs such as ***-q'upi:j*** receive an exceptional semantic interpretation in that the absolutive antipassive form refers to the result of the action on the patient (Mondloch 1981). The K'iche' verb forms in Table 1 therefore have one unambiguously intransitive root, three unambiguously transitive roots, and one root that may be both transitive and intransitive.

The syntactic survey demonstrates considerable cross-linguistic variation in the treatment of verbs can exist within a circumscribed semantic domain. A treatment of this variation within the theory of PAS is forced to admit the presence of at least two participants in the LCS representations for some break verbs in French, Korean and K'iche'. Consider the argument in Guerssel et al. that cross-linguistic variation in the causative alternation may be attributed to differences in LS. They base their argument on data from Warlpiri where no verbs undergo the causative alternation. French, Korean and K'iche' provide inconsistent examples of verb alternation. Thus, Guerssel et al.'s solution will not work for this data and the resulting differences must be attributed to differences at the level of LCS rather than LS. This may be done without violating the PSR if there is evidence that the verbs have different referents in these languages. I address this issue in the following section.

3.2. Semantic Differences

Referring back to Table 1, English appears to be unique in its treatment of breaking. No other language has a verb with as broad an extension as the English verb ***break***. The Mandarin and Thai examples demonstrate possible cross-linguistic semantic differences. Mandarin makes a distinction between breaking long objects and breaking other types of objects. Yin-Yin Pao (p.c.) informs me that ***dwàn*** is best translated by the English verb ***sever***. Thai, however, takes a different approach and groups soft materials like rope and clothes together for breaking purposes. These examples forcefully demonstrate that my own Anglo-centric concept of stick-breaking is not the prototypical act of breaking I originally assumed it to be.

If we now turn to the Arawakan language Garifuna (spoken in Belize, Guatemala and Honduras) we see yet another possible semantic split. Garifuna uses three distinct verbs to refer to the breaking of sticks, ropes and clothes. This evidence suggests that breaking sticks, ropes and clothes are three conceptually distinct acts and not simply a matter of verb polysemy. The fact that English, Mandarin, Thai and Garifuna express these acts as intransitive verbs suggests that the verbs may still contain a semantic feature (say SEPARATION) in their Lexical Conceptual Structure that determines their polydicity. Mandinko makes the same distinctions that Garifuna makes even though its causative alternation is precisely the opposite of that in Garifuna. Mandinko and Garifuna use the same verb for breaking bubbles and plates, an indication that speakers of these languages consider these items to have a similar fragile quality.

Events of breaking are distinguished even more finely in Winnebago, Korean and K'iche'. These differences have not received much attention in the literature (although see Choi & Bowerman 1991 and Talmy 1985 for attention to verbs of motion). A recent trip to Guatemala allowed me to explore my breaking questionnaire with several K'iche' friends. K'iche' is a wonderful example of a language that flaunts the semantic nuances in the verb lexicon. The verb ***-q'upi:j*** refers to breaking hard things. This distinguishes its semantic extension from the verb ***-pi'i:j***, which refers to breaking soft things, ***-paxi:j***, which refers to breaking things made of rock, clay or glass, ***-t'oqopi:j***, which refers to breaking long, flexible things, and ***-raqi:j***, which refers to breaking things that are hollow. The verb ***-poq'ik*** refers to things that break from internal pressure, the verb ***-qasa:j*** to things that break from a downward motion, the verb ***-chiko:j*** refers to breaking by throwing the object itself, and the verb ***-q'ipi:j*** refers to breaking sticks across one's knee to make them smaller for kindling.

This robust set of verbs does not begin to do justice to the lexical resources K'iche' speakers command in the breaking domain. A much larger set of verbs is required to talk about agricultural processes, especially those involving maize. An example would be the verb ***-joyopi:j***, which is how you 'break' a banana from a bunch of bananas. I cannot resist adding that the verb ***-jochopi:j*** refers to the situation where a banana breaks off from a bunch of bananas because you cannot carry them all in your hands. I list the K'iche' breaking verbs I have elicited in Appendix A.

I believe the data graphically demonstrate that the concept of breaking is not a unitary act. Every act of breaking contains a multitude of conceptual dimensions such as

INTERNAL FORCE, EXTERNAL FORCE, SEPARATION, LENGTH, RESISTANCE, INTEGRITY, BRITTLENESS, SEPARATENESS, etc. There is no assurance that I have captured the full range of such features in my brief survey. There is also the problem that even the finer distinctions exhibited in Garifuna, Mandinko, Winnebago, Korean and K'iche' may not be equivalent to one another. Each stick breaking verb, for example, may exhibit its own language-specific range of extensions. The K'iche' verb ***-q'ipi:j*** is a case in point. Although it is used to describe the action of breaking sticks across one's knees for kindling, it has a primary meaning closer to chip or reduce. If breaking is the linguistic prototype for verbs of physical state change then we must admit that this domain is semantically under-specified at best. At worst we have allowed the English lexicon to deceive us regarding the closeness of the connection between semantics and syntax.

Inspecting the objects being broken suggests that languages may be sensitive to a certain set of semantic features such as LENGTH, ROUNDNESS, HARDNESS and FLEXIBILITY. Thus, sticks and ropes share the feature LENGTH that the Mandarin verb ***dwàn*** is sensitive to. The Thai verb ***tææk*** picks out the feature of ROUNDNESS while the verb ***kʰəət*** is sensitive to the feature of FLEXIBILITY. These features cross-classify the objects along multiple dimensions. This cross-classification creates the real empirical problem for systems of semantic features like Katz's. Remember that Katz would like to propose a set of ontologically neutral semantic features that will serve in the semantic representations of words in all languages. He discusses words like ***house***, ***table*** or ***game*** that allow simple decompositional analyses among a set of features with 'an appropriate superordinate concept' (65). The availability of the superordinate concept guarantees a fit among different words in a restricted hierarchical relation. Katz must employ some general semantic feature like BREAK and then use a restrictor of some sort to account for the differences between verbs like ***crack***, ***pop*** and ***sever***. Thus, the Mandarin verb ***dwàn*** might be defined as 'Breaking long objects'.

The breaking verbs in Table 1 exhibit a complex set of cross-classifications that erode the boundaries between possible breaking concepts. Of particular interest in this regard are the Chinese verb ***può*** and the Thai verb ***kʰəət***. It is not possible to analyze these verbs as restricted types of breaking since they apply across the English boundary between breaking and tearing. From the standpoint of these languages, the difference between breaking and tearing is no more essential than the difference between breaking sticks and breaking plates. Semantic decomposition would require that we admit the semantic feature TEAR into the same family with BREAK at which point we must either redefine the feature BREAK to do away with the language-specific restrictions of the English verb ***break*** or define a new superordinate feature, say ACCIDENTAL SEPARATION, that is not lexicalized in any language. The concept of a universally valid set of semantic features does not warrant the degree of philosophical léger-de-main necessary to save them in the face of such daunting empirical facts.

4. Implications

Recapitulating the arguments I have presented thus far, I began by arguing that some restrictions had to be placed on possible variation in PAS for the lexical semantic analysis of verbs to be successful. I then proposed the Primary Semantic Restriction (PSR) as a possible candidate. The PSR requires a language neutral set of semantic features for the restriction to do any work. My examination of the semantic and syntactic differences among breaking verbs in various languages showed that language neutral semantic features do not exist in this domain. This demonstration effectively undermines efforts to account for cross-linguistic similarities in verb argument structure in terms of verb meaning. There is no museum exhibit for the concept of breaking that can be used to motivate syntactic analyses.

A worse problem for current accounts of argument linking is the variation within and across languages in the way breaking arguments are mapped into d-structure. The heterogeneity of mapping relations for ***break*** begins to approach that of experiential and bodily-process verbs (Rosen 1985). Languages are free to treat breaking verbs as either monodic or dyadic predicates. There is nothing inherent about breaking that determines its linguistic realization because there is no such neutral ontological entity. Rather, linguistic structure asserts itself even at the level of Lexical Conceptual Structure. In effect, the lexicon serves as a filter of conceptual structures. The implications of the lexical filter may be drawn out by contrasting this hypothesis with that of Guerssel et al. (1985). These authors note a similar set of cross-linguistic differences for the verbs ***break*** and ***cut***, but assume that the break verbs have identical Lexical Conceptual Structures in each language. They derive the syntactic differences from language-specific properties of Lexical Structure and linking conventions.

We disagree most over the treatment of ***break*** in Winnebago. Guerssel et al. assume ***šíš-re*** has the LCS: 'x come to be BROKEN.' Their accounts fails to explain why an 'inchoative marker' is required for this verb. I assume the LCS for ***šíš-re*** is triadic, something like 'x BREAK y by means z'. This provides an immediate account of why Winnebago uses distinct verbs formed on the same root in the causative and inchoative constructions. It also explains why the Winnebago verb does not have a middle voice form. Following Guerssel et al., the middle voice is only possible for verbs with a monadic LCS since the middle voice only allows one verb argument at LS.

The acquisition problem increases proportionately as the linguistic tests of verb argument structure become ever more subtle. If every act of breaking is conceptually distinct from every other act of breaking then the acquisition of breaking verbs is fraught with potential embarrassments. The real question is whether it is possible to learn the meaning of a verb like ***break*** where learning the verb's meaning entails knowing the full range of its uses. Following Quine, children would have to learn how a verb was used rather than learning which concept the verb referred to. It is possible to put Quine's thesis to an immediate test by thinking of novel breaking situations that fall outside our experience. With a little thought it is possible to come up with some candidate examples:

(14) a. break a bag of groceries
b. ? break a ball
c. ? break an eye/ an ear

Bags are made of material like paper or plastic that English speakers say tears or rips. Yet, it is possible for a bag of groceries to break as you carry it from a grocery store. Breaking a ball or an eye sounds distinctly odd. (Note: it is possible to envision a case of breaking one's eye that is distinct from rupturing it.)

Dictionaries provide further evidence that English speakers lack a fixed sense of ***break***. The second college edition of the American Heritage Dictionary lists 17 different senses for ***break***, the first of which is 'to crack or split into two or more pieces with sudden or violent force; smash'. It defines ***crack*** as 'to break or snap apart'. The compact edition of the Oxford English Dictionary lists 47 different senses for ***break***, the first of which is 'to sever into distinct parts by sudden application of force, to part by violence'. It defines ***sever*** as 'to put apart, set asunder ....' Webster's Seventh New Collegiate Dictionary lists the first sense of ***break*** as 'to separate into parts with suddenness or violence'. This small collection of dictionaries indicates a considerable range of definitions in terms of ***crack***, ***sever*** and ***separate***. This range also demonstrates the absence of a clear boundary between these concepts that would be expected if these verbs differed by the presence or absence of a critical semantic feature. Rather than being exhibited in separate display cases, these verbs behave as though they apply to a swirling cluster of everyday experiences.

The implications of this difficulty can be brought out by comparing the English verbs ***break*** and ***sever***. The American Heritage Dictionary gives a definition of ***sever*** as 'to cut or break forcibly into two or more parts.' ***Sever*** appears to be halfway between ***break*** and ***cut*** in its meaning, at least according to the American Heritage Dictionary, and yet ***break*** and ***cut*** have very different syntactic properties. The problem ***sever*** creates is that it weakens the conceptual distinctions between ***break*** and ***cut***. A child looking for a lexical conceptual structure for ***sever*** might adopt an LCS similar to that for ***cut*** instead of the LCS for ***break***.

Another indication that English speakers have a fluid concept of breaking is indicated in the history of the word ***break***. The Oxford English Dictionary lists an obsolete sense of break as 'to rend or tear (cloth, paper). A related sense is 'to cut up (a deer); to tear in pieces (a fox); to carve (a fowl). These uses show the distinction between breaking, tearing and cutting is not absolute. Their exhibits in the museum of meaning are in the same display.

Finally, I have some additional data of an empirical nature that indicates the difficulty involved in acquiring ***break***. I elicited descriptions of different breaking events from K'iche' children 3 to 12 years of age and found that although a majority of the time the children used the 'right' verb to describe the event, there were a few breaking events that caused considerable difficulty for the children. Smashing a PlayDoh pot elicited the non-standard responses ***-paxi:j*** for breaking things made of clay, ***-q'upi:j*** for breaking hard things, and ***-pi'i:j*** for breaking soft things. Cutting a piece of paper elicited the non-standard responses ***-pi'i:j*** for breaking soft things and ***-rach'aqi:j*** 'tear'. In contrast, the

K'iche' children had no difficulty responding to acts of string and stick breaking. Their responses are shown in Table 2.

Table 2. Breaking and Cutting (K'iche' 3 to 5 year olds)

	Correct	*-paxi:j*	*-pi'i:j*	*-rach'aqi:j*	*-q'upi:j*	*-q'ipi:j*
String	15				1	
Sticks	14		1			2
PlayDoh	1	2	1		2	1
Cut	8		2	2		

5. Conclusion

Any theory of grammar that ties syntax to semantics has an obligation to make the semantic component as explicit as its syntactic component. Simply noting correlations between syntax and semantics will not explain syntax until the nature of the semantic model is spelled out in detail. In particular, linguists proposing semantic features to account for syntactic rules must address Quine's argument against a language neutral ontology. Otherwise, the semantic features are meaningless.

Accepting Quine's position leads to a more dynamic view of the mental lexicon in which speakers actively construct a model of lexical meaning that is subject to revision over time and flexible enough to apply to novel contexts. This model is compatible with a 'prototype' analysis of meaning where the prototypes serve as a model for use that agrees with a set of semantic features but not absolutely constrained by these features (Rosch & Mervis 1975). Constraints on lexical meaning would derive from a construction analysis mechanism as proposed in Goldberg (1992). The lexicon provides a distillation of a language community's everyday experiences without imposing a final solution to lexical meaning. Cross-linguistic translational equivalence is impossible. We may come as close as we like in our lexical translations, but all translation is approximate, never perfect.

What becomes, then, of the mapping principles that commonly apply across languages? I do not think we need to chose between a relativistic ontology and universal mapping principles. The trick is to recognize how to construct mapping principles that apply to relativized notions rather than static concepts like BREAK. A mapping scheme along the lines proposed by Dowty (1991) would be perfectly suitable. Dowty suggests argument assignment is done relative to thematic proto-roles. His procedure leads to fixed argument assignments for prototypical change of state verbs like ***break***, and variable argument assignments for atypical predicates like ***resemble***. His procedure would not insist that ***break*** in Korean be absolutely synonymous with ***break*** in English before applying.

On a more practical level, this investigation calls attention to the need for much closer descriptions of lexical meaning than presently exist in available dictionaries. The time has come to put lexical investigations on a more scientific footing by analyzing the application of known words to novel contexts rather than idly observing conventional usage (e.g. Labov 1973). The close comparison of word meanings in different languages will provide a much sounder basis for the empirical study of language universals.

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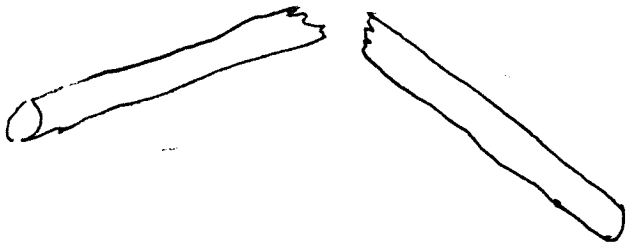
Appendix A

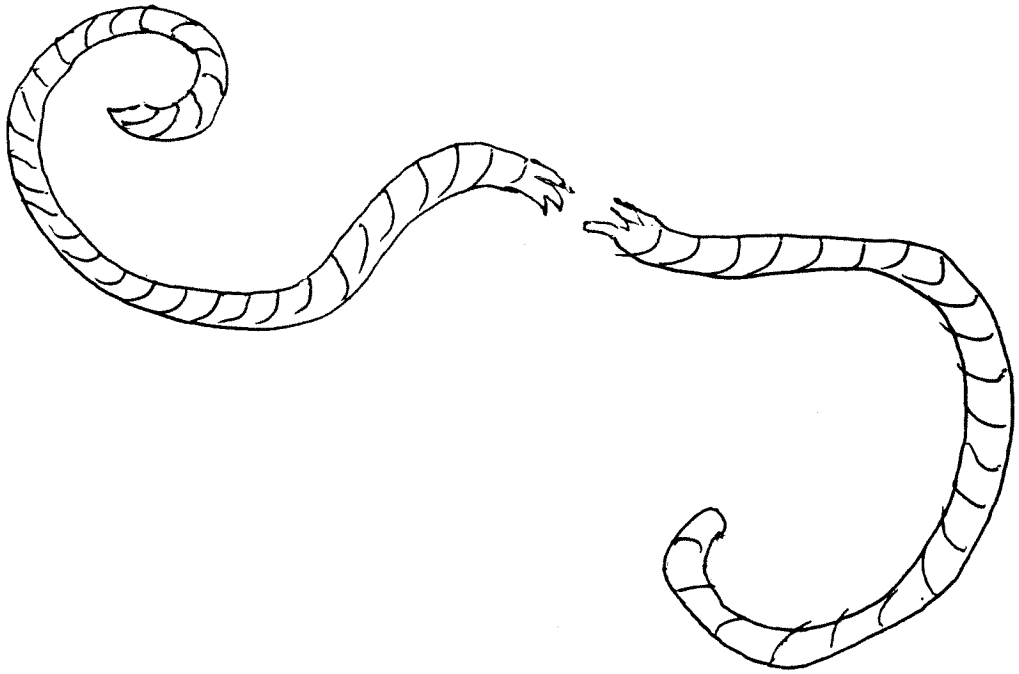
-chiko:j/-chikoxik [to break by throwing the object itself, e.g. chest, stool, pot]
-chup/-chupik [to snuff out something, e.g. candle, light; to erase marks]
-ch'akati:j/-ch'akatixik [to break off a small piece, e.g. bread to feed hens]
-ch'ol/-ch'o:lik [to peel, e.g. fruit, vegetables, animals, skin]
-ch'up/-ch'upik [to pick large fruit, e.g. peaches, pineapples, melons]
-b'oq/-b'oqik [to pick a plant from the ground, roots and all, e.g. onions]
-etzalob'a:j/-etzalob'ik [to break down; ruin, e.g. computer, car, zipper]
-jach'/-jach'ik [to pick corn, e.g. the cob, the ear, the kernels, the husk]
-jisi:j/-jisinik [to crack, slit, e.g. glass, paper; to operate on someone]
-jixi:j/-jixinik [to tear leaves along the veins]
-jochopi:j/-jochopinik [to break a banana by failing to support the whole bunch]
-jok'/-jok'ik [to grind, e.g. lime, rice, wheat]
-jol/-jolik [to pull entire leaf and part of stem from corn in a downward motion]
-joyopi:j/-joyopinik [to break a banana from a bunch of bananas]
-kabiq/-kabiqik [to shell corn by twisting the cob in one's hands]
-ke'e:j/-ke'exik [to grind corn]
-k'et/k'etik [to shell corn with one's thumb - imitating a hen pecking corn]
-mak/-makik [to pick small beans, e.g. coffee, beans]
-mich'/-mich'ik [to chop, e.g. plants; to pluck, e.g. feathers, pine needles]
-pachale:j/-pachalexik [to smash something with one's foot]
-paq'i:j/-paq'inik [to split, e.g. boards, watermelon, balloon]
-paxi:j/-paxik [to break clay, rock, e.g. glass, plate, cup, rock, pot]
-pitz'itz'e:j/-pitz'itz'exik [to crush something soft, e.g. clay]
-pi'i:j/-pi'inik [to break something soft, e.g. book, tortilla, clay, hardboiled egg; to split or break hair, plate; to divide, e.g. road]
-pich'i:j/-pich'inik [to squash bugs, e.g. lice, fleas, worms]
-poq'i:j/-poq'ik [to pop, e.g. bubble, balloon; to explode, e.g. bomb]
-qasa:j/-qajik [to descend; to break in a downward fashion, e.g. arm, leg, stick, tree]
-q'ipi:j/-q'ipinik [to chip; to make smaller, e.g. mug, roll up pants legs, break sticks across one's knee for kindling]
-q'ol/-q'olik [to pick leaves by tearing across the base of the leaf, e.g. picking flowers, leaves to wrap tamales and tortillas]
-q'upi:j/-q'upinik [to break something hard, e.g. bridge, dam, candle, basket, stick, chair, tooth]
-rach'aqi:j/-rach'aqinik [to tear, e.g. pants, cloth, paper]
-raqi:j/-raqinik [to smash something hollow, e.g. glass, pot, plate, chest, bubble]
-sak'i:j/-sak'inik [to crack, e.g. wall, melon, pot, plate, glass, skull, tree, board]
-t'oqopi:j/-t'oqopinik [to sever something long and flexible, e.g. rope, wire, string; to pluck hair]
-t'ub'i:j/-t'ub'inik [to tear, e.g. paper, clothes]
-weqi:j/-weqinik [to smash something hard, e.g. pot, wall, stone griddle, mile post]
-woqi:j/-woqinik [to shatter something fragile, e.g. eggs, vase, lightbulb]

-xul/-xulik [to pick something by the stem, e.g. grapes]
-yoji:j/-yojinik [to dismantle something, e.g. table, bed, house, car]
-yokoke:j/-yokokenik [to crumple something, e.g. aluminum cans, paper cups]

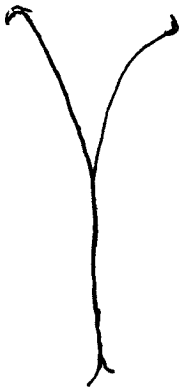
stick



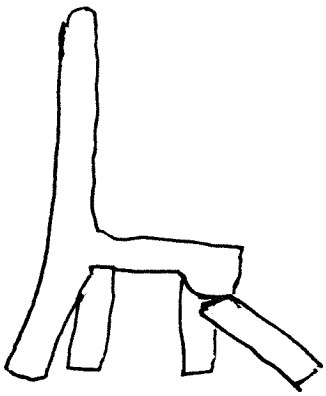
rope



hair



chair



bubble

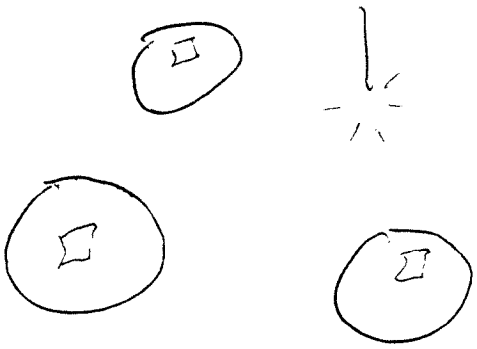


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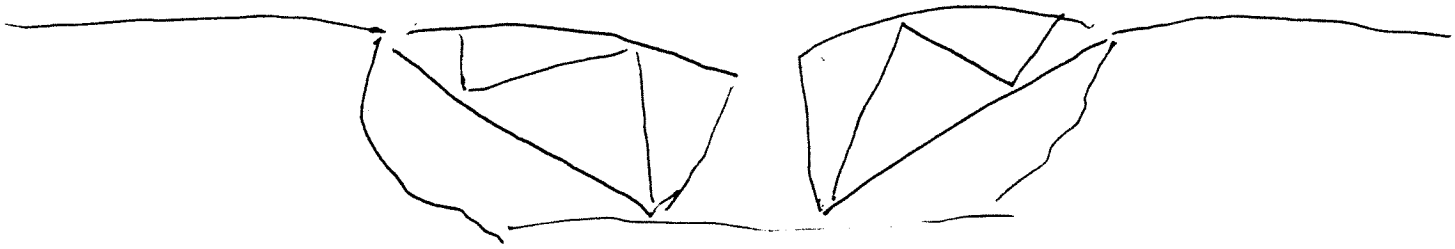
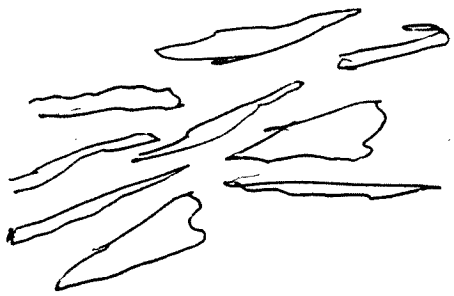
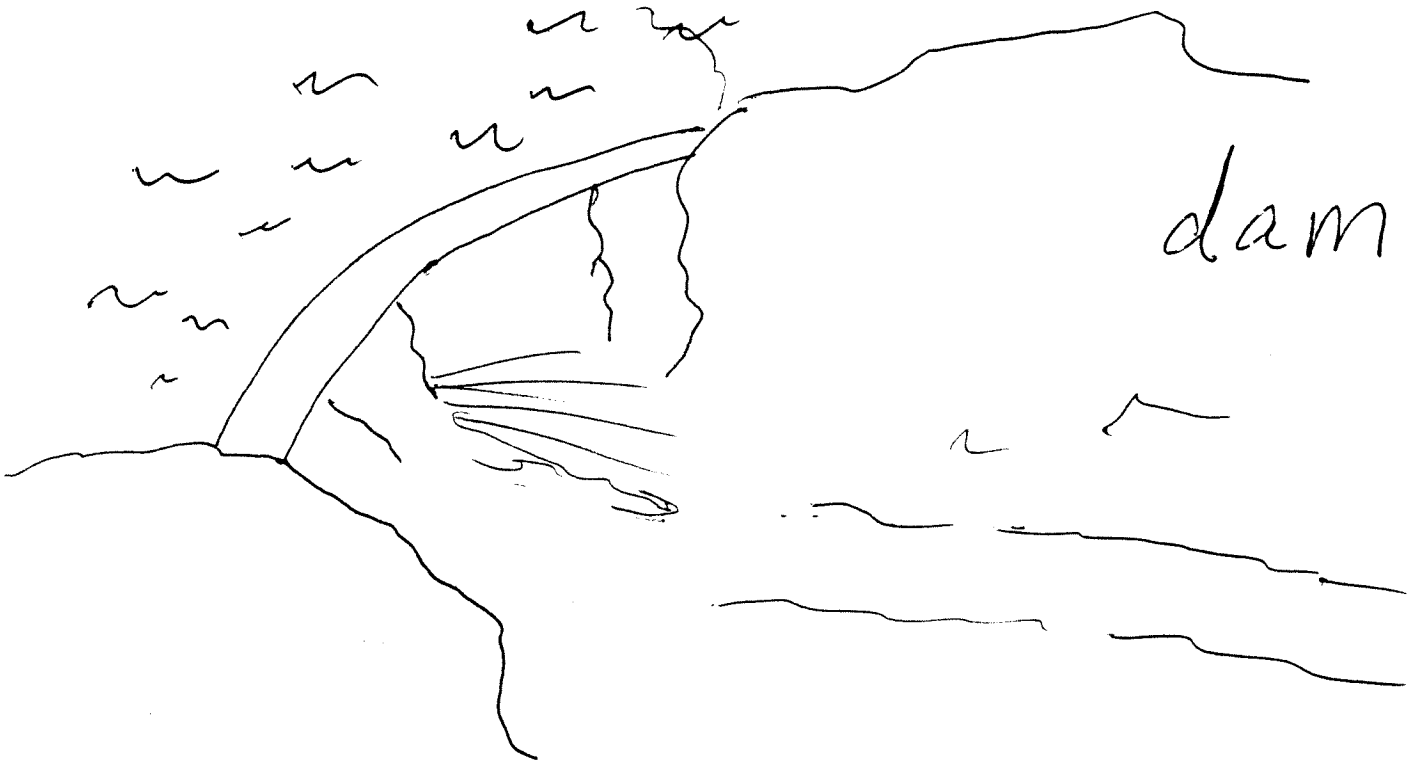
plate

bridge

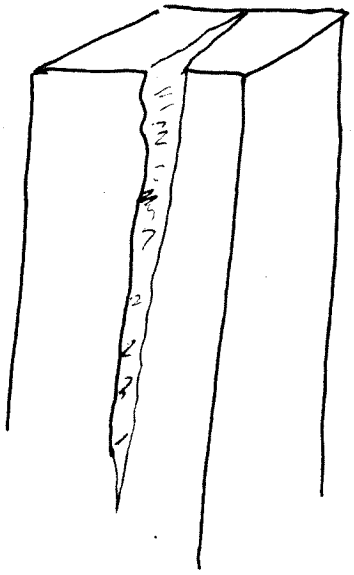


glass

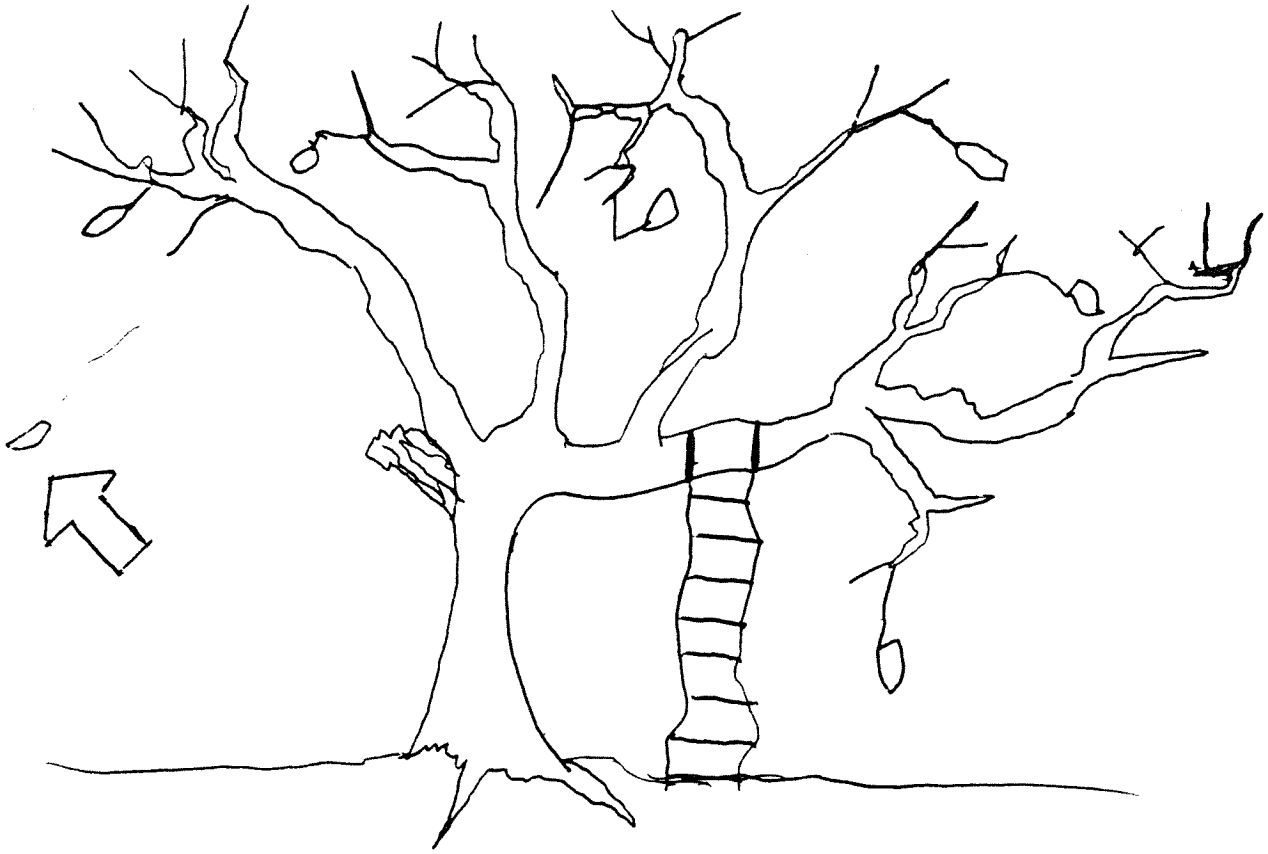




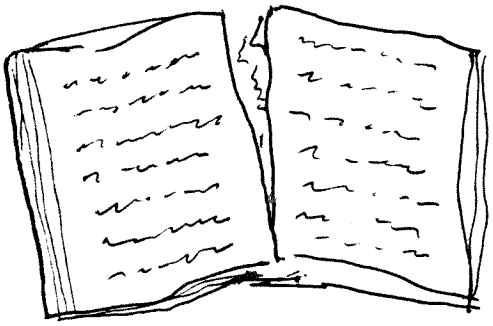
board



leaf

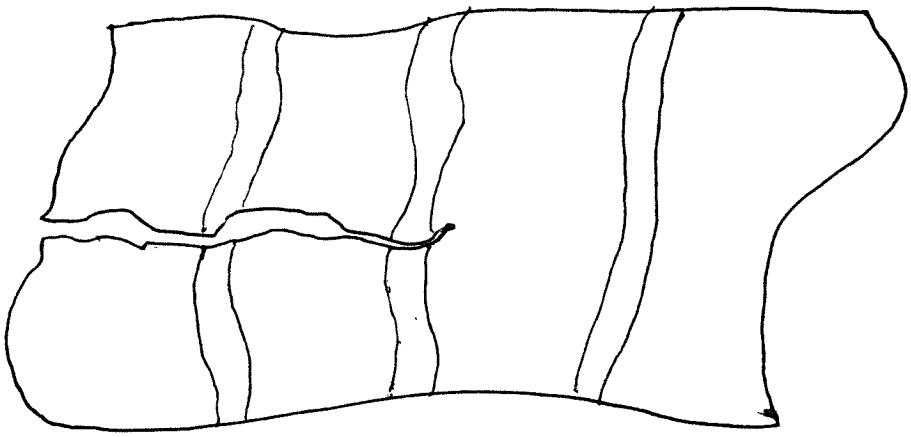


book

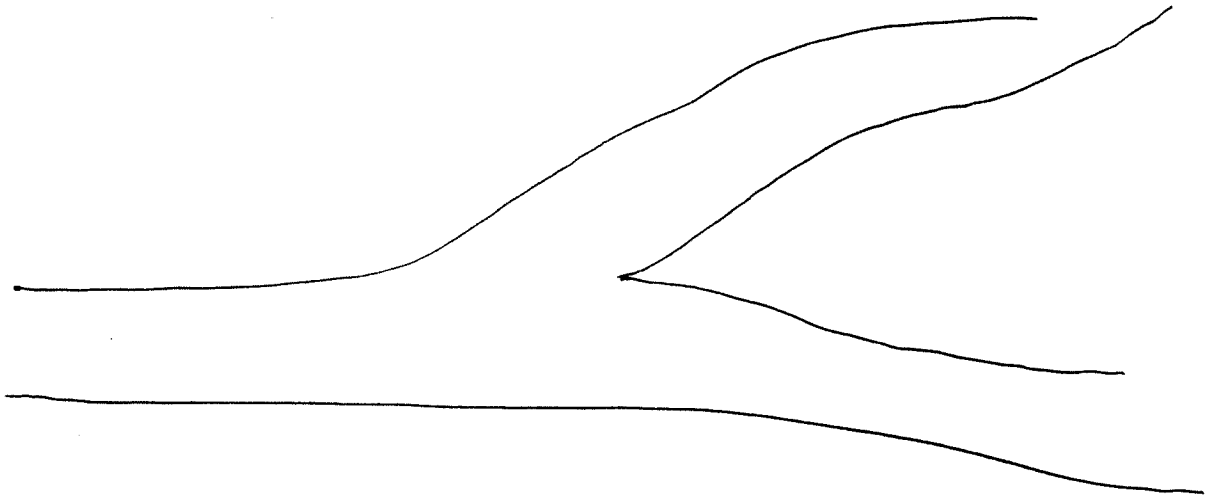


pants

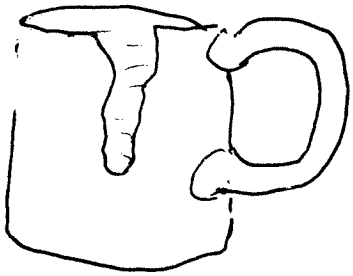
cloth



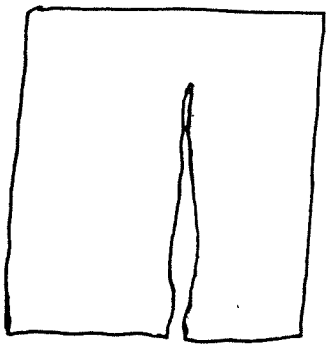
road



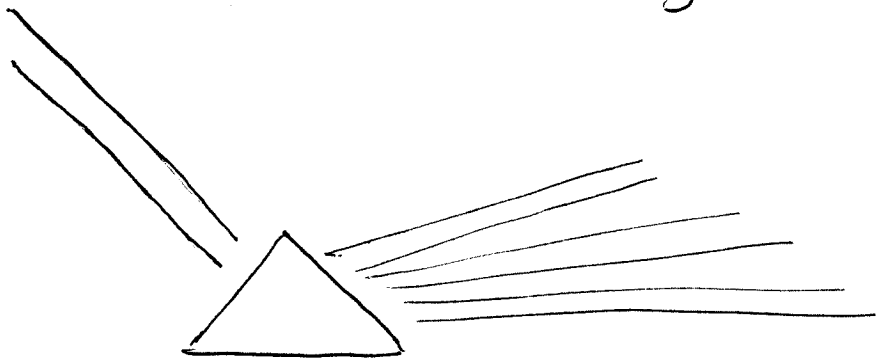
cup



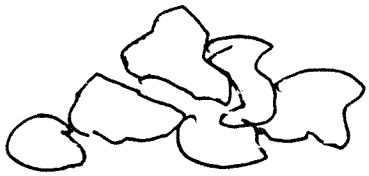
paper



light



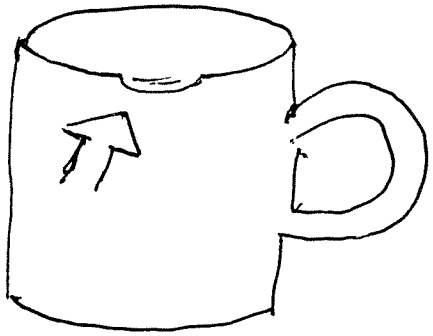
rock



grain

tooth

mug



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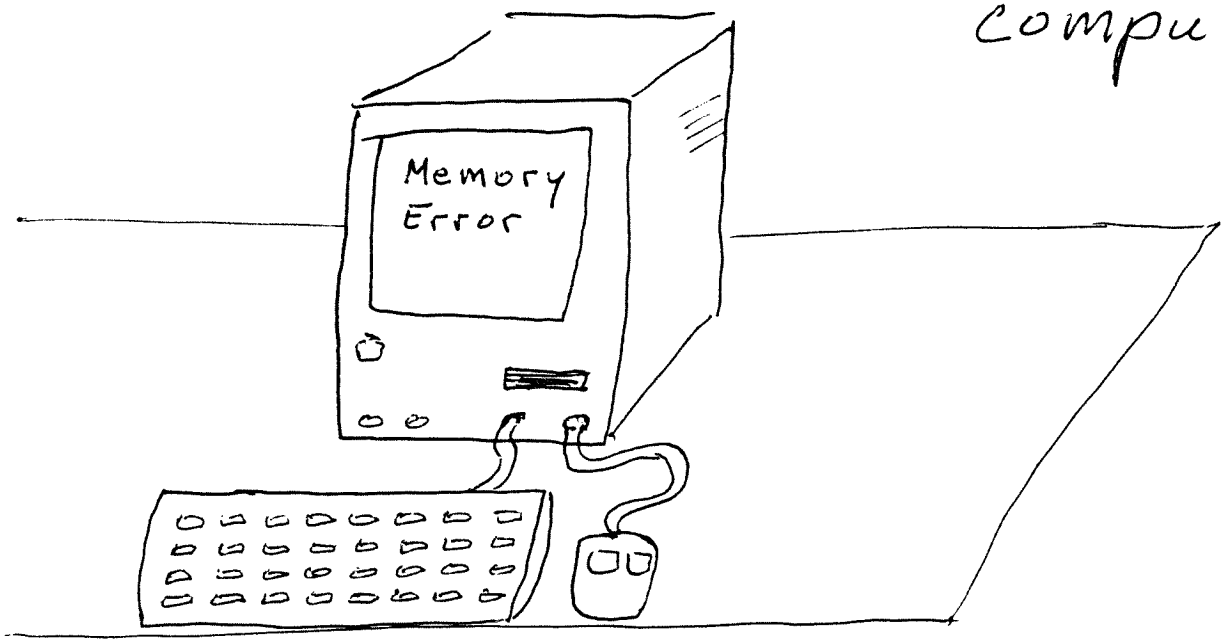
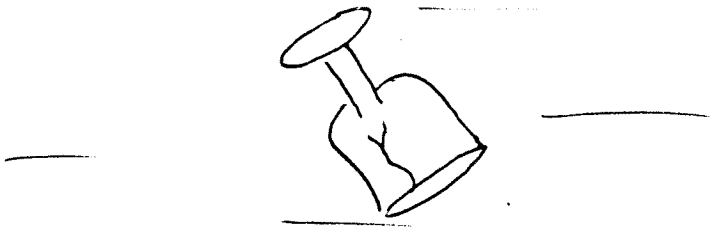
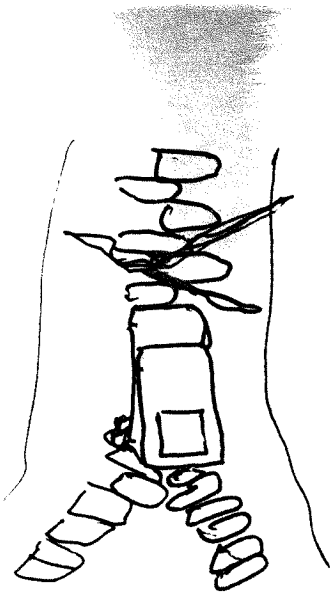
marbles

computer

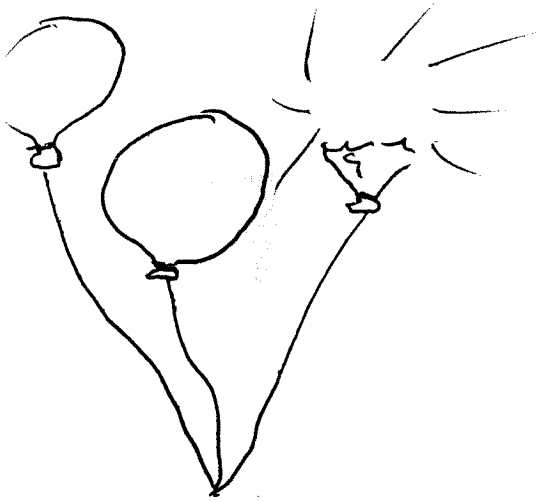


glass



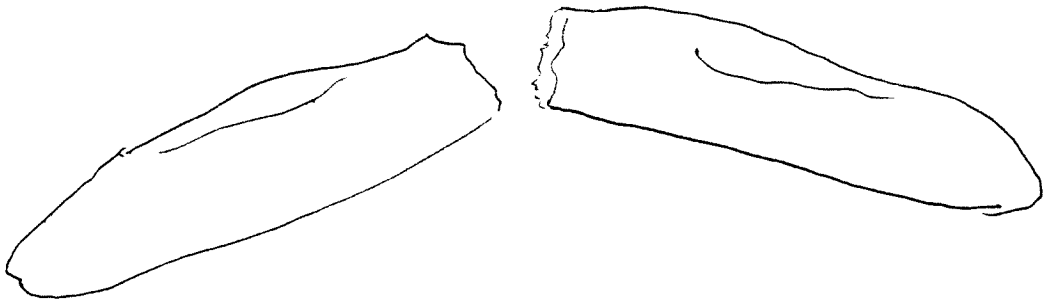


zipper

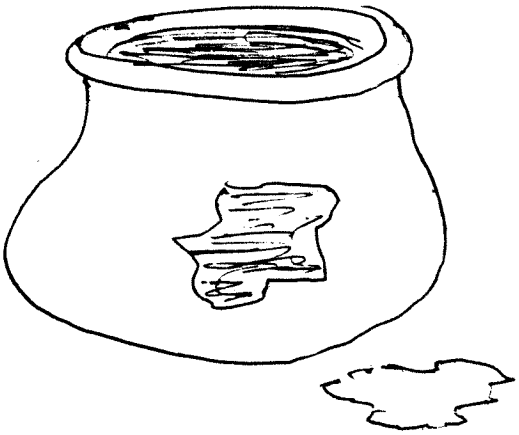


balloon

bread



pot



Breaking Across Languages

	Arm	Sticks	Bread	Ropes	Zipper
English	break	break	break	break	break
	break	break	break	break	break
Mandarin	dwàn	dwàn	dwàn	dwàn	dwàn
	nòŋ dwàn	nòŋ dwàn	nòŋ dwàn	nòŋ dwàn	nòŋ dwàn
Thai	hak	hak		k^həət	p^həəŋ
	t^haam hak	t^haam hak		t^haam k^həət	t^haam p^həəŋ
Garifuna	hala	halagua	halagua	tumugua	teirigua
	halana	halaguana	halaguana	tumuguana	teiriguana
Mandinko	katitaʔ	katitaʔ	katitaʔ	kuntuta	tignataʔ
	katiʔ	katiʔ	katiʔ	kuntu	tigna
Winnebago		rušíš-re		ruwáx-re	
		rušíš		ruwáx	
Korean	bureojida	bureojida	bureojida	ggeuneojida	mulrida
	bureoddeurida	bureoddeurida	bureoddeurida	ggeunta	mulrigaehada
K'iche'	-qajik	-q'upinik	-pinik	-t'oqopinik	-etzalob'ik
	-qasa:j	-q'upi:j	-pi'i:j	-t'oqopi:j	-etzalob'a:j
Japanese	oreru	oreru	chigireru	kireru	kowareru
	oru	oru	chigiru	kiru	kowasu
Lillooet					
	qáx^w-aɤan	qáx^w-an'	qɬawš	ƛ'əl'qw	qʌl-wíl'x
Thompson					
	n-q'^{w}óʔp-akst	q'^{w}óʔup		ƛ'yəq^w	maʕ't
French	se casser	se casser	se casser	se casser	se casser
	casser	casser	casser	casser	casser
German	gebrochen	brach	zerbröckelt	derchgerissen	kaputt
Nepali	bhãcnu	bhãcnu		cũDnu	

Pants	Cloth	Bubbles	Plates	Rock	
tear/rip	tear/rip	pop	break	break	English
tear/rip	tear/rip	pop	break	break	
può	lièh	può	può	suèi	Mandarin
nòŋ può	nòŋ lièh	nòŋ può	nòŋ può	nòŋ suèi	
k^həət	k^həət	tææk	tææk		Thai
t^haam k^həət	t^haam k^həət	pəəw tææk	t^haam tææk		
teirigua	teirigua	bowgua	bowgua	bowgua	Garifuna
teiriguana	teiriguana	bowguana	bowguana	bowguana	
sotaʔ	faratаʔ	teʔta	teʔta	tetaʔ	Mandinko
soo	faraʔ	teʔ	teʔ	teʔ	
rugás-re		rupáx-re	rukšáp-re		Winnebago
rugás		rupáx	rukšáp		
gumeongnada	zzijeojida	teojida	ggaejida	buseojida	Korean
gumeongnaeda	zzitda	teoddeurida	ggaeda	busuda	
-rach'aqinik	-rach'aqinik	-poq'ik	-paxik	-paxik	K'iche'
-rach'aqi:j	-rach'aqi:j	-poq'isa:j	-paxi:j	-paxi:j	
yabureru	yabureru	wareru	wareru	kudakeru	Japanese
yaburu	yaburu	waru	waru	kudaku	
					Lillooet
čaʕ'p	čaʕ'p	ƛ'ək^{w}p	šək'^{w}q	šək'^{w}p	
					Thompson
čʕəp	čʕəp	ƛ'k^{w}əp	šík'^{w}uk'^{w}	maʕ't	
se trour	se déchirer	se crever	se casser	se casser	French
trour	déchirer	crever	casser	casser	
zervissen	derchgerissen	geplatet	zerbrochen	gespalten	German
			phuTnu		Nepali