PREDICTING TRANSFERABILITY FROM SEMANTIC SPACE: AN INVESTIGATION OF TRANSLATION PREFERENCES FOR A POLYSEMOUS WORD [1]

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Introduction

In Kellerman (1977) an attempt was made to characterize a 'strategy of transfer' in second language learning and performance, whereby a learner with a given native language (NL) could use that language to make predictions about the target language (TL), transferring NL forms and features whenever it was felt that they could be successfully employed in the TL ('projection'), with suitable adjustment being made according to the supposed constraints imposed by TL surface structure ('conversion'). The learner could 'project' a) so as to fill a perceived gap in his knowledge of the TL, or b) because he believes that NL and TL are to all intents and purposes identical either in very specific detail or in more general terms. Much will presumably depend on the learner's notion of the 'distance' between NL and TL; the closer the TL is felt to be to the NL, the more useful a strategy of transfer is likely to be.

In the same paper, it was pointed out that if the learner did not believe that a particular NL form or feature could have a parallel existence in the TL, he would not, in the normal run of things, transfer. Thus for a given learner with a given TL, it would be theoretically possible at a given moment to list those items in his NL that he considered 'language-specific' and thus not transferable to the given TL, and those he considered 'language-neutral', i.e. transferable to the given TL. The TL itself is important here, since NL items should not necessarily be seen as *inherently* either transferable or non-

-transferable. A NL item i, for instance, may be labelled 'specific' in terms of TL_a, but 'neutral' towards TL_b. Additionally, with the increase in 'real' knowledge of the TL on the part of the learner (i.e. when both learner and some external authority agree independently that a given language sample he produces *is* the TL), the assignment of these labels to NL items will be under constant revision.

There may well be NL items, however, which tend to remain assigned to one category or the other, irrespective of NL-TL distance. The following is a list of some of such types of items which are considered likely to be generally language-specific and language-neutral respectively; items in the latter category will probably be so only within a European language context.

Language specific: proverbs, slang, expletives, idioms of the more intractable kind etc.

Language neutral: 'international words', Latinisms, borrowings from other languages, especially if apparently from the TL itself, writing and punctuation conventions.

The paper then goes on to describe an experiment designed to test how Dutch learners of English at university level would react to picturesque Dutch idioms if they were translated into English. What happened was that students tended to reject such translations as incorrect English, irrespective of whether these idioms existed in English or not. Third-year students were better at spotting which idioms were correct in both English and Dutch ('real' knowledge) but also tended to be slightly more generous to those which were not, suggesting that while they may have learnt a great deal about what *is* possible in English, they still had something to learn about what is not. First-year students tended to reject all idioms if they were Dutch-like. Thus, on the evidence of these experiments (plus much that is anecdotal) this kind of idiom is characteristically treated as language-specific, a state of affairs that only the acquisition of 'real' knowledge will alter.

Transferability

The rest of this paper will be devoted to testing the notion of 'transferability' in lexis. 'Transferability' is a measure of the relative specificity of a NL item in terms of comparable items. It is independent of perceptions of language distance, though it will interact with these to partially determine actual performance. 'Transferability' is thus a theoretical construct which makes predictions of the following kind: 'if item i is more transferable than item j, then if an ideal population of learners consistently transfer j, they will also transfer i, though the converse is not necessarily true. If j is not transferred, then no prediction can be made about i'. The relationship is thus implicational. In terms of the idiom experiment, such structures have low transferability.

The fact that idiom translations are not seen as feasible between two such close languages as Dutch and English indicates that learners are sensitive to the special nature of such lexical phenomena. If such intuitions about the specificity of these expressions were to be found exclusively amongst advanced learners, we might say that teaching methods, with their accent on language differences, were responsible. But it seems rather more generally true, irrespective of the level of proficiency of the Dutch learner of English at least: true for university students, and doctors, nurses and other professional people brushing up their English at evening classes, and, as we shall see, even true for quite young schoolchildren.

The reactions to what appear to be gross translations of Dutch idioms into English are interesting, in that they can provoke quite marked responses. Such apparent calques are stigmatised as 'silly', 'ridiculous', 'too Dutch', 'impossible in English', or are greeted with sniggers. The strength of the reaction can perhaps be gauged from the following dialogue- which is based on an actual classroom incident:

Teacher: "out + verb" is very productive in English, not like Dutch, where you can only say 'I ran him out of it' which not everybody agrees is acceptable Dutch. You can outrun, outjump, outthink, outplay, outdrink, you know, outdrink someone — you can drink him under the table..."
Student at evening class (brushing up her school English for professional purposes): Excuse me, but what is the correct English for that expression?"
Teacher: Sorry?
Student: The correct English for the Dutch expression ....
Teacher: What Dutch expression?
Student: Iemand onder de tafel drinken.
Teacher: Is that *Dutch* too?

The mutual mystification evident from the above seems to indicate that learners assign special status to idioms. An idiom is very often semantically intractable to non-natives and may reveal syntactic idiosyncrasies as well. It may have special neurological status too, like many of the types of items listed under the heading of 'language-specific' above (see Van Lancker 1975). It would be convenient to say that, psychologically speaking, idioms are 'marked'[2] structures in one's native language. From here it is not difficult

[2] Note that contrary to normal practice, 'markedness' as used in this paper does not presuppose a purely binary opposition 'marked/unmarked'. It is to be understood as a psycholinguistic concept, applicable to some defined linguistic system (i.e. syntactic structures or, as here, the senses of polysemous words) which is itself gradable in terms of 'most marked—least marked'. Alternative terms have been used by the author in

to follow a line of reasoning that would assume that if idioms were already 'special' in one's own language, the likelihood of finding parallels in the language one is learning would be remote. Hence the more 'marked' an item, the less transferable it should be[3].

So far the discussion has limited itself to idiomatic expressions and such notions as language-distance, specificity, neutrality, transferability and 'markedness'. A more rigorous examination of the relationship between intuitions about 'markedness' and transferability would involve more extensive and perhaps more homogeneous material. With such material it might be possible to establish a 'markedness' *gradient* which would be of greater interest than the almost uniformly highly marked idioms[4]. The 'markedness' gradient could then be used to predict the differential transferability of the items. If we may now formulate a working hypothesis, *there should be a strong correlation between the degree of markedness and relative transferability.*

A lexical item whose meaning varies according to linguistic context is ideal material for such an investigation. Such a 'word' may cover intuitively quite distinct meanings, or metaphorical extensions of a basic concrete sense, or senses with more subtle shades of meaning. A 'word' that fills the bill adequately is the verb BREAK and its Dutch counterpart, BREKEN. This is not the place to go into discussion about homonymy and polysemy, but the sorts of senses subsumed under BREAK in English are extensive, even excluding phrasal, prepositional or phrasal-prepositional forms, viz:

He broke the cup.
He broke his leg.
My radio's broken.
The waves broke on the shore.
His fall was broken by a tree.
He broke his journey in Delhi.
Jane broke his heart.
They are always breaking promises /appointments/ the law.
At last they broke the enemy code.
"The man who broke the bank at Monte Carlo".
He broke wind.

earlier papers, but have now been rejected as unsatisfactory for one reason or another. The term 'markedness' may not be the last word either.

[3] It will also follow that the more 'marked' an item, the more likely it is to be adjudged 'specific'. It should again be noted that 'specificity' is an all-or-nothing statement about behaviour ('transferred or not transferred') while 'transferability' is a statement of probability.

[4] This is a convenient overgeneralisation. Idiomatic expressions vary in their semantic transparency and there appears to be some moderate correlation between their transparency and their acceptableness in translation.

Who's going to break the news?
The storm broke.
When will the weather break?
Several workers broke the strike.
The police broke the enemy resistance.
Failure left him a broken man.
His voice broke when he was 13.
It took a few drinks to break the ice.
The East Germans today broke yet another record.
Concorde broke the sound barrier.
Nobody could break the witch's spell.
He could make the ball break both ways (Cricket terminology) etc.

The range of meanings displayed here is reflected in the complexity of dictionary entries for this verb, both in English and Dutch. Dutch BREKEN has many of the meanings listed above, sufficient in number to use this word for the experiments shortly to be described. Before this is done, one observation can be made. It is possible, certainly on intuitive grounds, to select the meaning enshrined in 'he broke his leg' as the primary meaning of BREAK: 'of a solid, [cause to] separate into two or more parts as a result of e.g., a blow'. This is the definition that native speakers should produce first if asked to define BREAK. For them not to do so would be perverse. In the same way, a request for a definition of a word like 'blue' should yield a reference to 'colour' before 'depression', 'jazz' or 'dirty jokes or films'. The 'primary' meaning is thus the unmarked meaning, and its 'primariness' may be a composite of high frequency of occurrence, syntactic flexibility, literalness or concreteness, etc. It would be more difficult to assign degrees of 'markedness' to non-primary items on *a priori* (e.g. linguistic) grounds. An immediate problem arises as to the status of metaphorical extensions. Thus it is difficult to relate 'breaking hearts' and 'breaking voices' to the primary meaning and to each other according to some simple attribute. The grading of the various senses clearly exists in more than one dimension.

The experiments about to be described divide into three sections
    a) gathering data about transferability from Dutch learners of English
    b) gathering data about the intuitions of native speakers of Dutch
    c) correlating the two sets of data

a) *Gathering transferability data*

The first part of the experiment consists of two phases. Phase one was carried out with 210 Dutch subjects (students and schoolchildren). All subjects were learning English; the 109 students were studying English fulltime at Nijmegen University. The sample divides up into the following groups of subjects:

University

Second-year students, tested at end of academic year (NU2), N=26

First-year students, 1976—1977, tested at end of academic year (NU1), N=50

First-year students, 1977—78, tested at beginning of academic year (NU0), N=33

Secondary school

Sixth-year pupils   (A6), N=17
Fifth-year pupils   (A5), N=23
Fourth-year pupils (A4), N=18
Third-year pupils   (A3), N=20
Second-year pupils (A2), N=23

Subjects were given nine Dutch sentences containing a sense of BREKEN The instructions were simple. If subjects thought the sense of BREKEN illustrated by a particular sentence could be translated into English by BREAK, they were to mark the sentence with a cross. Otherwise they were to do nothing. The nine sentences (with the italicized word in English serving as mnemonic for the Dutch sense) were as follows:

1. de golven braken op de rotsen (the *waves* broke on the rocks)
2. zijn stem brak toen hij 13 was (his *voice* broke when he was 13)
3. het kopje brak (the *cup* broke)
4. zijn val werd door een boom gebroken (his *fall* was broken by a tree)
5. hij brak zijn woord (he broke his *word*)
6. na het ongeluk is hij een gebroken man geworden
   (after the accident, he was a broken *man*)
7. hij brak zijn been (he broke his *leg*)
8. zij brak het wereldrecord (she broke the world *record*)
9. zij brak zijn hart (she broke his *heart*)

Every acceptance of BREKEN = BREAK was counted for each item, yielding the group scores and rank orders:
The second phase is essentially the same, except that the number of BREKENs is increased from 9 to 17. This brings with it obvious benefits for testing the hypothesis, and will bear particularly on the collection and processing of native speaker intuitions, as we shall see.

Subjects (N=81) were drawn randomly from Dutch first and third year students of English at Utrecht University. The first-year group (UT1) consisted of 50 subjects, the third-year group (UT3) of 31. The following 17 sentences were used (with the original 9 being marked by an asterisk):

*1. De golven braken op de rotsen (The *waves* broke on the rocks)
 2. De lichtstralen breken in het water (The *light rays* refract in water)

Group

	NU2	NU1	NUO	A6	A5	A4	A3	A2	TOTAL	mnemonic
1	54 (14)	32 (16)	18 (6)	16 (2)	4 (1)	11 (2)	5 (5)	39 (9)	26 (55)	'waves'
2	54 (14)	40 (20)	12 (4)	0 (0)	0 (0)	6 (1)	20 (4)	9 (2)	21 (45)	'voice'
3	81 (21)	64 (32)	76 (25)	82 (14)	100 (23)	100 (18)	100 (20)	83 (19)	82 (172)	'cup'
4	19 (5)	32 (16)	6 (2)	6 (1)	13 (3)	22 (4)	20 (4)	48 (11)	22 (46)	'fall'
5	88 (23)	70 (35)	88 (29)	82 (14)	26 (6)	56 (10)	45 (9)	48 (11)	66 (139)	'word'
6	81 (21)	80 (40)	64 (21)	65 (11)	48 (11)	72 (13)	70 (14)	52 (12)	68 (143)	'man'
7	96 (25)	100 (50)	97 (32)	100 (17)	96 (22)	100 (18)	100 (20)	83 (19)	97 (203)	'leg'
8	65 (17)	52 (26)	45 (15)	59 (10)	0 (0)	44 (8)	20 (4)	57 (13)	45 (94)	'record'
9	88 (23)	98 (49)	97 (32)	94 (16)	74 (17)	94 (17)	90 (18)	70 (16)	89.5 (188)	'heart'

Table 1. Acceptance scores for BREKEN=BREAK expressed as percentages. Raw scores in brackets.

Group

	NU2	NU1	NUO	A6	A5	A4	A3	A2	OVER-ALL
1	leg	leg	leg	leg	cup	leg	leg	leg	leg
2	heart	heart	heart	heart	leg	cup	cup	cup	cup
3	word	man	word	cup	heart	heart	heart	record	man
4	cup	word	cup	word	man	man	man	man	word
5	man	cup	man	man	word	word	word	word	record
6	record	record	record	record	fall	record	waves	fall	waves
7	voice	voice	waves	waves	waves	fall	record	waves	fall
8	waves	waves	voice	fall	record	waves	fall	voice	voice
9	fall	fall	fall	voice	voice	voice	voice	voice	voice

Table 2. Rank orders of acceptance scores by group.

*3. Hij brak zijn been (He broke his *leg*)
*4. Het kopje brak (The *cup* broke)
*5. Na het ongeluk is hij een gebroken man geworden
   (After the accident he was a broken *man*)

*6. Zij brak zijn hart (She broke his *heart*)
*7. Hij brak zijn woord (He broke his *word*)
  8. De man brak zijn eed (The man broke his *oath*)
  9. Welk land heeft de wapenstilstand gebroken?
    (Which country has broken the *ceasefire?*)
10. Sommige arbeiders hebben de staking gebroken
    (Some workers have broken the *strike*)
11. Nood breekt wet ('Necessity breaks *law*')
12. Da kzij een paar grapjes was het ijs eindelijk gebroken (Thanks to a few
    jokes the *ice* was finally broken)
13. Een spelletje zou de middag enigszins breken (A *game* would break up
    the afternoon a bit)
*14. Zij brak het wereldrecord (Sie broke the world *record*)
*15. Zijn stem brak toen hij 13 was (His *voice* broke whe he was 13)
*16. Zijn val werd door een boom gebroken (His *fall* was broken by
    a tree)
17. Het ondergrondse verzet werd gebroken (The underground *resistance*
    was broken)

Of the additional sentences, nos. 2 and 11 have no direct English equivalents. The latter, a Dutch proverb, is odd in that the normal word used for *breaking* the law is not BREKEN but *overtreden* (infringe).

The group acceptance figures, expressed in percentages of total possible acceptances, are as follows (raw scores in brackets):

	UT3	UT1	TOTALS	mnemonic
1	55 (17)	36 (18)	43 (35)	'waves'
2	29 (9)	16 (8)	21 (17)	'voice'
3	74 (23)	82 (41)	79 (64)	'cup'
4	19 (6)	22 (11)	21 (17)	'fall'
5	68 (21)	78 (39)	74 (60)	'word'
6	77 (24)	74 (37)	75 (61)	'man'
7	100 (31)	100 (50)	100 (81)	'leg'
8	71 (22)	58 (29)	63 (51)	'record'

	UT3	UT1	TOTALS	mnemonic
9	100 (31)	96 (48)	97.5 (79)	'heart'
10	32 (10)	30 (15)	31 (25)	'light rays'
11	55 (17)	60 (30)	58 (47)	'oath'
12	35 (11)	34 (17)	35 (28)	'ceasefire'
13	6 (2)	14 (7)	11 (9)	'strike'
14	42 (13)	42 (21)	42 (34)	'law'
15	55 (17)	32 (16)	41 (33)	'ice'
16	13 (4)	14 (7)	14 (11)	'game'
17	16 (5)	34 (17)	27 (22)	'resistance'

Table 3. Acceptance scores, Utrecht, for BREKEN=BREAK

These figures give the following rank orders, ranging from 'most acceptable' to 'least acceptable':

	UT3	UT 1	OlVERALL
1	leg*	leg*	log*
2	heart*	heart*	heart*
3	man*	cup*	cup*
4	cup*	word*	man*
5	record*	man*	word*
6	word*	oath	record*
7	oath	record*	oath
8	waves*	law	waves*
9	ice	waves*	law
10	law	ceasefire	ice
11	ceasefire	resistance	ceasefire
12	light rays	ice	light rays
13	voice*	light rays	resistance
14	fall*	fall*	fall*
15	resistance	voice*	voice*
16	game	game	game
17	strike	strike	strike

Table 4. Rank orders of acceptance scores, Utrecht (items also appearing in previous experiment marked with an*)

The rank-order correlation between the two groups is high (Spearman's rho=.919, significant <.01).

Comparison of results of the transferability experiments

If we compare the ranking of the nine original items across all ten groups in the experiments, it will be clear that the Utrecht sample is not substantially different in its behaviour from the earlier sample. Kendall's coefficient of concordance, W. based on the rank orders of the nine original items for the ten groups, is .9047, significant at < .01. Thus the rank orders are very closely related to each other.

What is therefore noteworthy is this consistency between groups, despite the range of ages and experience in the sample. The conclusion one must reach is that the ten groups are drawn from essentially the same population, qualitatively speaking, and that the effects of teaching, learning and growing older do not significantly alter learners' beliefs about the relative transferability of the BREKENs. Clearly we are dealing with an implicational series of items of considerable generality. The overall order for all 291 subjects is:

1 leg
2 heart
3 cut
4 man
5 word
6 record
7 waves
8 fall
9 voice

Table 5. Overall rank order of transferability for ten groups.

One interesting feature in the results from the two samples deserves comment. It is evident that there is a certain discrepancy in the scores relating to 'leg' and 'cup' in groups NU1, NUO, UT3 and UT1, and to some extent in A6 and NU2. This discrepancy is not noted in the scores of the other groups. Thus the 'university group' (including A6) tends to find BREKEN=BREAK more acceptable for 'hij brak zijn been' than for 'het kopje brak', the difference in treatment of the two items being statistically significant ($t=7.142$, < .01). A possible explanation for this phenomenon resides in the difference between causative and non-causative BREKEN/BREAK, with the former being adjudged 'unmarked' relative to the latter. This point is discussed at some length in Kellerman (1979)[5].

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[5] A similar test of the 17 Brekens requiring full translation of the Dutch sentences was conducted with 17 first year students (1979). By scoring each time BREAK was used as a translation for each sense, an acceptance score rank order could be established, as was the case with the Utrecht test. The correlation etween the two orders was .837, d< .01, and with the 2-D solution .736, p< .01, and the 3-D solution .273, p< .01.

b. *Gathering native speaker intuitions*

How native speakers perceive the inter-relatedness of the meanings of BREAK or BREAKEN will be crucial for assigning the appropriate degree of 'markedness' to each sense. From these native speaker intuitions, it will be possible to construct a semantic space (see, e.g. Clark and Clark 1977) from which the dimensions along which judgements of inter-relatedness are made, may be revealed.

To arrive at a representation of such a semantic space, a sample of native speakers is required to make judgements about the similarity of the senses to each other. These judgements can take various forms, but a point in common is that all such judgements should be convertible to numerical values. The goal is to arrive at a similarity matrix, where judgements of similarity are converted to distance scores. All this means is that subjects may be asked to rate similarity according to a given scale, say 1-5, where '1' could mean 'identical in meaning' and '5' totally unrelated in meaning'. Thus for any pair of meanings, similarity can be expressed as the sum of the ratings for that pair in a given sample.

In the experiments reported here, this method of paired comparisons was not used, as pre-testing had shown it to be difficult, unreliable and tiring where polysemy was concerned. Instead, use was made of Miller's card sorting method for gathering similarity data (Miller 1969). This method was developed by Miller to investigate the structure of the mental lexicon.

In his study, subjects were asked to sort 48 nouns, typed separately on cards, into piles according to 'similarity of meaning'. The subject could form as many or as few piles as he liked, with as few or as many cards as he chose in each pile. It is Miller's contention that people will sort cards together according to shared semantic features, thus overlooking the features that would normally distinguish one noun from another; thus by pooling data from a number of subjects the number of times a given pair of nouns appeared together in the same pile (with 50 subjects the theoretical maximum is 50) can be seen as a measure of similarity of the two items. The higher the number, the greater the subjects adjudged the similarity of meaning.

50 native speakers of Dutch (all either students or staff in the Faculty of Letters at the University of Nijmegen) took part in this investigation. The subjects were presented with 17 cards, on each of which was written a sentence illustrating a sense of BREKEN. The 17 sentences were those used in the second transferability experiment. Subjects sorted cards into piles according to their individual notions of similarity. The number of piles made by subjects varied from 2 to 15, with an average of 7.28 and a standard deviation of 2.95; some subjects finished in five minutes, others in twenty.

From the data produced by card sorting, a matrix of similarity scores was produced, based on the number of items subjects had put any two cards

in the same pile. The matrix is as follows:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1																	waves
2	33																light rays
3	15	14															leg
4	14	14	45														cup
5	3	3	2	1													man
6	3	3	1	1	41												heart
7	3	3	0	0	8	15											word
8	3	3	0	0	8	15	50										oath
9	4	5	0	0	4	7	20	21									ceasefire
10	3	3	0	0	4	7	18	19	45								strike
11	2	2	0	0	7	9	26	25	20	7							law
12	6	8	6	6	9	11	8	9	7	2	10						ice
13	4	5	0	0	5	5	5	6	8	2	6	22					game
14	4	7	3	3	6	9	13	13	15	3	13	8	8				record
15	7	9	2	2	6	7	4	5	3	0	6	8	6	9			voice
16	18	15	5	7	1	4	5	4	4	3	1	6	6	2	11		fall
17	4	4	0	0	2	6	15	16	34	11	17	6	6	11	4	6	resistance

Table 6. Similarity matrix of meanings of BREAK

This matrix was submitted to computer analysis by the MINISSA program (July 1977 version, developed by E. Roskam, Nijmegen, J. Lingoes, Michigan, and M. Raaijmakers, Nijmegen), which scales the data so as to reveal their underlying structure in terms of an n-dimensional Euclidean representation of 'semantic space' (see for instance Caramazza and Grober 1976, or Henley 1969). The smaller the number of dimensions the easier it may be to interpret the dimensions but the higher the risk of unacceptable *stress* (Kruskal 1964), a statistical measure of the 'violence' being done to the data by reduction in the number of dimensions. The stress can be expected to increase as the dimensionality decreases. In our case, two and three-dimensional solutions can be obtained without any intolerable degree of stress. In the case of the 3-D solution, the third dimension to be revealed (and therefore the least important in terms of underlying structure) could not be interpreted and is therefore not shown below. In the 2-D solution, this third dimension of course disappears altogether, with only a minimal increase in stress:
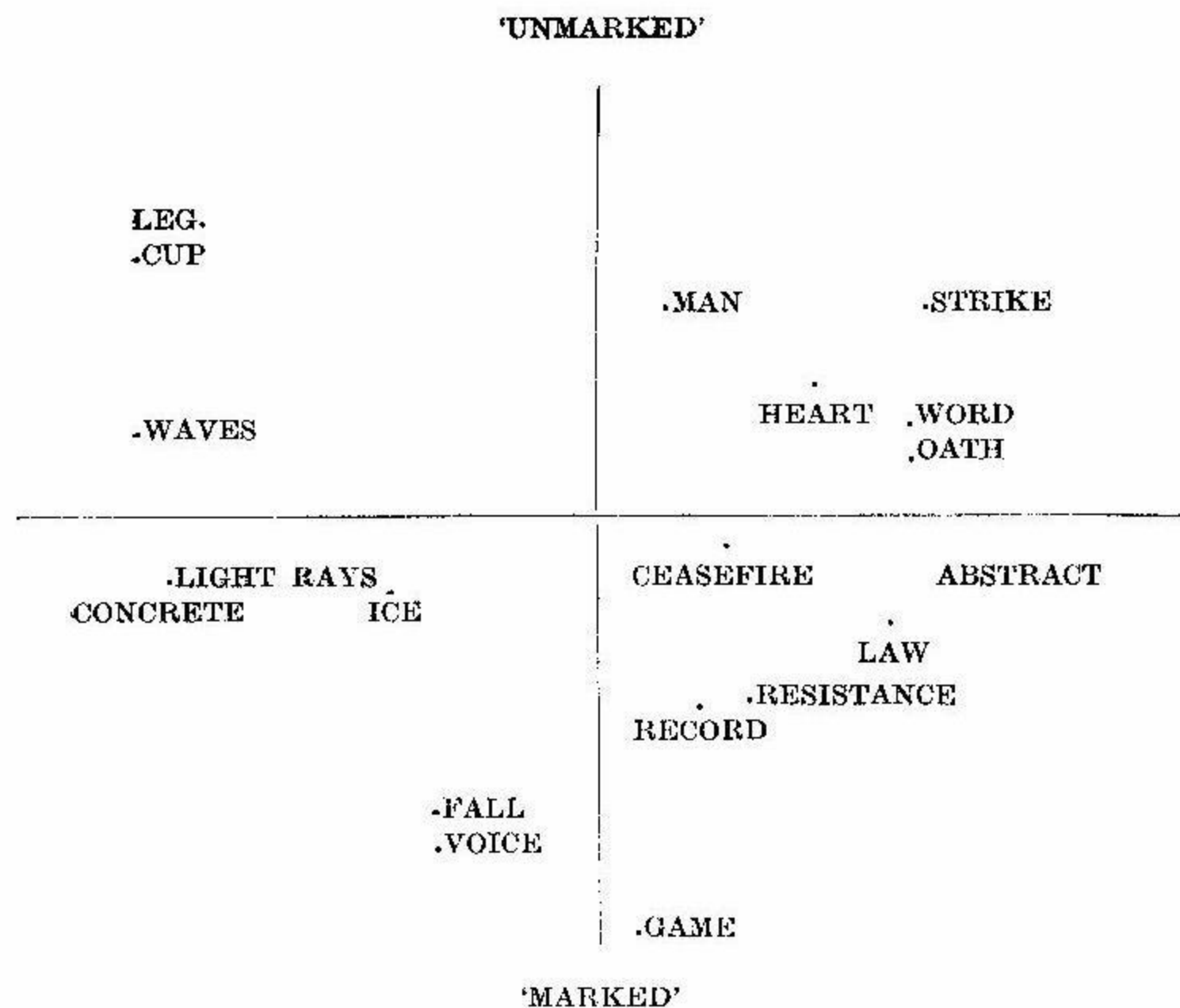
Fig. 1. Multidimensional scaling of 17 BREKENS — 3-D solution (after orthogonal rotation of axes)

After orthogonal rotation of the axes, two possible interpretations of the dimensions presented themselves. The first dimensions to be revealed, thus the most significant in terms of underlying structure, runs West-East in both solutions. This has been labelled 'concreteness', though it could equally wel be labelled 'high imagery — low imagery' as we move from left to right[6]. The North-South dimension has been labelled 'markedness', since it appears to arrange the senses according to their relatedness to the 'primary' sense of BREKEN. In this interpretation, 'to break someone's heart' is simply a metaphorical extension of the primary meaning — the heart, symbol of happiness of whatever, is broken in two. It will be clear that this is not the same as saying that senses like *heart* are adjudged very similar to the primary sens On the contrary; the Euclidean distance between 'heart' (6) and, say, 'cup'

[6] Paivio, Yuille and Madigan (1968) have shown that judgements of concreteness and imagery in nouns show high correlations.
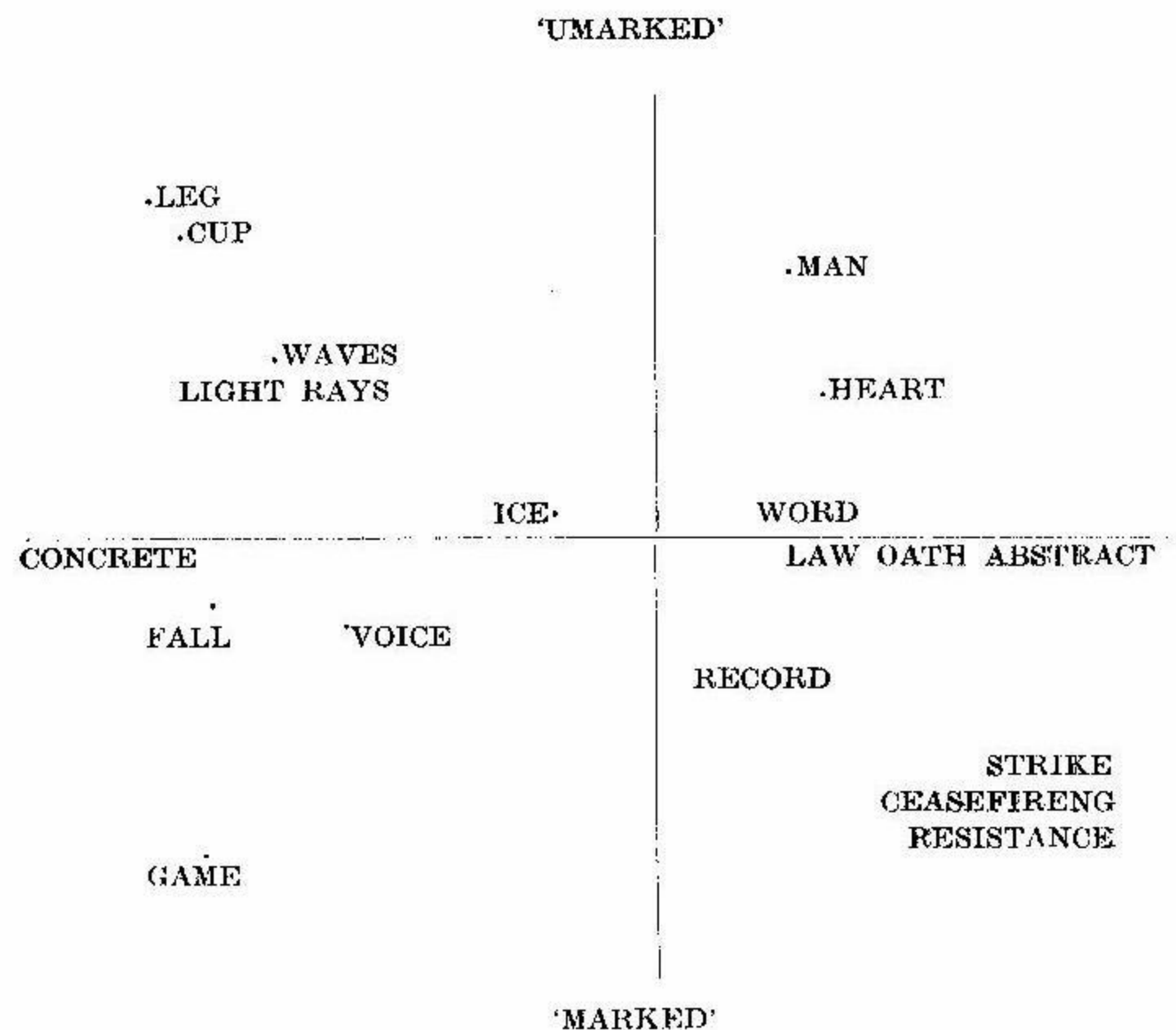
Fig. 2. Multidimensional scaling of 17 BREKENS — 2-D solution (after orthogonal rotation of axes)

(4) is greater than between 'cup' and three other items (waves, light rays and ice), which are judged more similar to 'cup', yet are more 'marked' than 'heart'. We return to the question of rotation in the next section.

The predictive power of the putative 'markedness' dimension for the transferability of the BREKENs

We now have three sets of data:

    a) transferability judgements for nine senses of BREKEN made by 291 subjects (NU2, NU1, NU0, UT3, UT1, A6-A2).

    b) transferability judgements for seventeen senses of BREKEN (including the original nine) made by 81 subjects (UT3, UT1)

    c) multidimensional scaling solutions for native speaker similarity judgements of seventeen BREKENs.

Clearly, to show that transferability is a function of 'markedness' it will be necessary to demonstrate some kind of relationship between the trans-

ferability scores and the semantic spaces revealed by multidimensional scaling. To do this it will prove necessary to rotate the axes orthogonally so that there is eventually an optimum correlation between the ordering of the senses along one dimension and in the transferability data, without destroying the plausibility of the hypothesised dimensions. An examination of Figs. 1 and 2, after optimal rotation, will show this to be the case. Here are the orderings of the senses along the concreteness/imagery dimension:

3D		2D
meaning	*rank order*	*meaning*
cup	1	cup
leg	2	leg
light rays	3	fall
waves	4	waves
fall	5	light rays
voice	6	voice
ice	7	game
man	8	ice
game	9	record
record	10	resistance
heart	11	heart
strike	12	man
ceasefire	13	ceasefire
resistance	14	oath
oath	15	word
word	16	law
law	17	strike

Table 7. Rank orders of meanings along a putative concreteness/imagery dimension, three- and two-dimensional solutions.

It will be seen that the first six senses in both solutions are clearly 'perceivable' senses which is consistent with an 'imagery' or 'concreteness' structure. The 'markedness' ordering is as follows:

3D		2D
meaning	*rank order*	*meaning*
leg	1	leg
cup	2	cup
strike	3	man
man	4	heart
heart	5	waves
word	6	light rays
waves	7	ice
oath	8	word
light rays	9	oath
ceasefire	10	law
law	11	record
ice	12	fall
resistance	13	voice

record	14	strike
fall	15	ceasefire
voice	16	resistance
game	17	game

Table 8. Rank order of meanings along a putative 'markedness' dimension, three- and two-dimensional solutions.

The two concreteness/imagery orders correlate well with each other (Spearman's rho = .985, significant at < 0.01), as do the two 'markedness' orders (Spearman's rho = .721, significant at < .01) Since both solutions correlate with each other strongly, and the 'stress' for both is satisfactorily low, both will now be compared to the scores deriving from the transferability experiment.

The predictive power of the 'markedness' dimension for the transferability of BREKEN

a) Predictions for the original nine senses of BREKEN

If we now compare the rank orders of senses along the 'markedness' dimensions with the rank orders derived from the transferability experiments, it will be seen that there is generally a strong correlation between the two:

| | | 'markedness' rank order | | | |
| | | 3-D solution | | 2-D solution | |
		S	sign level	S	sign level
transferability rank-order per group	NU2	21	<.05	17	.05
	NU1	21	<.05	17	.05
	NU0	23	<0.5	21	<.05
	A6	27	<.01	23	<.01
	A5	<.01	27	<.01	27
	A4	<.01	25	25	<.01
	A3	30	<.01	28	<.01
	A2	27	<.01	21	<.05
	UT3	23	<.01	20	<.05
	UT1	28	<.01	24	<.01

Table 9. Significance levels of correlations between rank ordering's of 'markedness' and rank orderings from group transferability data for nine senses, using Kendall's measure of disarray, S.

b) Predictions for the full seventeen senses

A comparison of the 'markedness' rank orders and the transferability data for the Utrecht groups yields the following:

| | 3-D solution | | 2-D solution | |
	p	sign level	p	sign level
UT3	.586	<.01	.842	<.01
UT1	.629	<.01	.744	<.01

Table 10. Significance level of rank order correlations between 'markedness' dimensions and transferability data for seventeen senses.

Here it is clear that the two-dimensional solution gives very much better results. However, 'strike' seems unnaturally high on the 'markedness' dimension in the three-dimensional solution. That is more it is of low transferability. The effect of this item on the correlation is substantial, and if it is removed, the resultant rank orders of 16 items correlate extremely highly:

	p	sign level
UT3	.820	<.01
UT1	.867	<.01

Table 11. Significance level of rank order correlations between markedness dimension from 3-D solution and transferability data after the removal of *strike*.

If we now calculate the rank-order correlations between the concreteness/imagery dimensions and the transferability data for the seventeen items (totalled up from UT3+UT1 for convenience), there is virtually no correlation at all (3-D solution and transferability, p = 0.057, n.s., 2-D solution and transferability, p = 0.129, n.s.).

The effect of the target language on transferability

The preceding discussion will have indicated that transferability is theoretically independent of the TL, since it is a direct reflection of the 'markedness' of a NL item. If the TL's role is to partially determine the cut-off point in a transferability scale below which transfer will tend not to occur but not to affect the ordering of that scale, then the scaling solutions used here should also correlate with the translation preferences of Dutch learners of German.

40 Dutch learners of German at Nijmegen (1st and 3rd year students) were given the nine-item transferability test; the instructions were modified to take German grammar into account so that subjects could accept either ZERBRECHEN or BRECHEN as a translation of BREKEN, or reject them both.

The resulting transferability rank order, based on acceptances, is:

		% acceptances
1.	cup	100
2.	leg	100
3.	heart	92.5
4.	word	62.5
5.	man	50
6.	waves	37.5
7.	voice	37.5
8.	record	35
9.	fall	22.5

Table 12. Transferability rank order for Dutch learners of German.

Correlation with the 'markedness' rank orders is as follows (Kendall's S):

S	II	sig	III	sig
	24	<.01	24	<.01

Table 13. Significance level of correlations between rank orders of 'markedness' and rank orders from transferability data for nine senses, using Kendall's measure of disarray (S)

Discussions and Conclusions

The results given above show that for BREKEN, the transferability of its senses can be predicted from analysis of similarity judgements, which can be used to construct a low-stress semantic space of two or three dimensions. Two of the dimensions can be interpreted as, on the one hand, high-low imagery or 'concrete-abstract', and as 'markedness' on the other. Whereas it is perhaps fairly clear what the former dimension entails, a little space should now be devoted to discussion of the latter.

A number of speculations can be made to account for the above findings. The first of these concerns the 'primary sense' of BREKEN/BREAK as represented in such a sentence as 'he broke the cup'. The closer a sense is to this primary sense, the more transferable it should be. The problem lies with the definition of 'closeness' one is going to adopt, since similarity itself does not directly predict transferability. Since senses of BREKEN used in non-concrete environments ('hearts', 'man' etc) can be more transferable than concrete BREKENs like 'voice' or 'fall' it is clear that the structure underlying the data from card sorting reveals a more complex arrangement of items. It is insufficient to say that the 'markedness' dimension is the other (weaker) component underlying the sorting data, without some explanation being offered as to what it is and why it should correlate so well with transferability data. One possibility would be that primary BREAK consists of a bundle of semantic features like 'of solid', 'brittle', 'needs force'. Whenever BREAK is collocated with an object which itself can match these features, then the primary meaning will be inferred. Metaphorical interpretations of senses will be postponed and subsidiary to feature matching. In this scheme, certain metaphorical senses would violate the feature matching condition to a lesser extent than some concrete senses. 'Waves', for instance, are neither solid nor brittle, though they can be *metaphorically* solidified ('a tidal wave like a solid wall of water'); 'fall' would seem to share no obvious features with 'cup', apart from 'perceivable'. 'Word' would require first that one 'solidify' it — a difficult conceptual task not to be found with 'heart' or 'man'. The question with this kind of approach is how far one can go positing 'metaphorical solids'. The greatest problems will occur with senses like 'he broke the news' or 'the storm broke' — unless it would be simpler to claim homonymy for the difficult cases — a tempting claim.

Caramazza and Grober (1976) have argued for an underlying 'core' meaning for all the senses of *line* they studied. They claim that surface meanings would be built up from a 'core' meaning by a number of instruction rules. The greater the number of rules the more complex the processing involved with that sense, and the less likely it is to be cited as 'typical' or 'representative'. Miller's approach is similar; using *line* as his example, he writes:

'the problem is to characterize the relations between this core sense and all the particular senses of *line* listed in the dictionary. Those relations should not be specific to *line*, but should apply to other semantic extensions elsewhere in the lexicon, in which case they might be formulated as rules that people learn when they master their English vocabulary' (1978:101).

Miller's discussion, which closely resembles Kelly and Stone's (1975) in many respects, revolves round the question of how one goes about selecting the appropriate rule or rules for correct interpretation. Having a limited number of core concepts which can be summoned up by a particular context would, he claims, be far more plausible than having to store endless separate meanings for each occurrence of the word in a different context. The context, linguistic and pragmatic, will effectively select the right sense for us — as Miller says, 'it would be distinctly odd to have to execute a disambiguation routine to discover whether the context is the nautical kind in which *line* might be understood as 'rope' (1978:102) when one is discussing the rescue of a drowning woman. Miller goes on to say that the apparent polysemy of *line* may be due to lexicographers including 'a lot of contextual information that is really not part of its meaning' (1978:102). He notes that

the inferential process seems more plausible than an ad hoc list of ... objects ... In some cases the set of admissible subjects or objects of a verb seem to form a coherent class that can simply be remembered. But in other cases — and probably in most cases for young children — inferences based on practical knowledge and prevailing circumstances are the ultimate court of appeal (1977: 409--410; see also Kelly and Stone 1975: 65ff.).

One could invoke here the concept of *syncategorematicity*, which is discussed in e.g. Kelly and Stone (1975), and Miller (1977), where the precise meaning of a word like *good* is determined by the nouns it qualifies, e.g. a good knife cuts well, a good chair is comfortable etc. Miller writes:

" 'good' can select a salient feature of the meaning of its noun and assign a positive value to that feature" (1977:405).

Presumably one might try to argue on similar lines for BREAK, though it would be difficult to account for every sense of the word in this way (consider for instance a principle like 'BREAK puts an end to the continued existence of some given entity' — how would this apply to "she broke the news" or "the storm broke"?).

Perhaps there is a compromise position which tends to favour Miller's

'static' position rather than Caramazza and Grober's 'dynamic' one. This would be as follows: senses are learned as part of conventional collocations[7] in some cases, and as generalisable concepts in others. Thus the child can learn to generalise from 'breaking cups' to all manner of 'breakable' objects. But other senses are only evoked in collocations where the meaning is ritualised, as in 'to break one's word', or 'to break somebody's heart'. It will not normally be necessary for there to be a cognitive link between these 'breaks' and generalisable ones. However, when the child, or learner of a foreign language, or reader of some idiosyncratic dialect, comes across what is for him a novel environment for a word, and an attempt is made to interpret it, then rapid scanning of 'core' concepts will take place, with the help of pragmatic knowledge — the 'ultimate court of appeal'. I would argue against the generalisability of all 'core' concepts to new cases, on the basis of differences between typologically close languages. Take the sense of BREAK as typified in 'to break one's word, an agreement, the rules, the law, an appointment, a contract, a code of behaviour, cease-fire etc. etc., e.g. to violate some sort of agreement, or set of rules binding parties. In Dutch, the generalisability of BREKEN is limited to 'agreement', 'contract' and 'word'. The generalisability of a sense to new cases will be ad hoc — first we learn its meaning, *then* we have it available for building up interpretation rules. But unlike objects like 'cup', the generalisation may only be receptive, that is, we do not use it produce new forms before we have heard them and they have impinged on our consciousness[8].

To illustrate the point, let us look at what would be a novel use of BREAK in English, but one which is interpretable nonetheless:

his life broke

By itself, a number of interpretations might be possible for this use of BREAK. Put in the following context, however, the interpretations seem, on the basis of informal elicitation, to reduce to one or two:

Finally, at the age of 21, his life broke.

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[7] As Kelly and Stone (1975) point out, we do perhaps suffer by an obsession with analysis of meaning at the morpheme level. They say 'dictionaries often exaggerate the polysemy of a word by attributing to it the meaning of phrases in which it appears — both idiom and common locutions'.

[8] Bolinger (1976), in a highly entertaining and instructive article, makes the general point very convincingly: "The question is, why do we not generate *an extended time ago* if we generate *a lifetime ago*, and why do we not generate *sometime else* if we generate *somewhere else*? It is not because the generative mechanism is lacking. I suggest that as least in part we do not do it because we have *not* heard it done. We have no memory of it".

Also: "... learning goes on constantly — but especially with young children — in segments of collocation size as much as it does in segments of word size, and that much if not most of our later manipulative grasp of words is by way of analysis of collocations" (Bolinger 1976:8). See also the ensuing discussion of to 'bear' on p. 9 of this same article.

This sentence has been interpreted for me either as meaning 'changed for the better' or 'changed for the worse'. Yet if we simply change '21' to '96':

Finally, at the age of 96, his life broke.

The interpretation shifts from 'changed' to 'ended' — in other words 'he died'. Only pragmatic considerations can lead to this shift in interpretation, which also highlights the potential ambiguity of 'life' — 'period of biological activity' or 'history of personal events in that life'. The main point is still that some sort of drumming up of available concepts must take place ('combined with practical knowledge) to reach an appropriate interpretation. However, the generalisability of such concepts to potential collocations is restricted by convention. For this reason, lexicographers should not be put off by psycho-economists from preparing their involved dictionary entries for words like 'line' or 'break'. (It would be interesting to see what kinds of overgeneralisation occur in children 'neo-collocations').

A further point to consider is that there may be no single underlying organisational system for handling the diverse 'core' meanings of a polysemous word. For BREAK one could argue for a 'primary' sense to which all the others are variously related +a number of 'core' senses; this primary sense is a surface, not an underlying one. For 'line', an underlying 'core' concept is perhaps more likely, since it is difficult to agree upon a 'primary' sense[9]. And for 'eye' (Kellerman, 1980), it would only make sense to have a 'primary' sense, features of which are variously shared with extensions of meaning to concrete objects (eye of needle, electronic eye, etc.). Perhaps in the case of BREAK we should even be thinking in terms of actual homonymy, with 'cups', 'hearts', and 'legs' representing one discrete meaning. There is certainly a degree of discomfort about the entry for the verb BREAK in Kelly and Stone's (1975) 'disambiguation dictionary', viz.:

Sense 1: To fracture, split, stop or cause to stop functioning, cause a division or change, enter forcibly, escape, begin suddenly, interrupt, etc.
Sense 2: (Idiom) break the news
Sense 3 (Idiom) break a law

Since Kelly and Stone argue for a small member of 'core' senses being appropriately interpreted in situ it is a pity that their own entries for this verb are woefully inadequate. If there is a unifying sense in Sense 1, it escapes the present author. A more interesting proposal of theirs is to develop evidence of parallel sense-development in separate languages... as this would suggest the operation of "cognitive universals" (1975:77).

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[9] A quick survey of 9 dictionaries reveals that 7 give as their first definition of *line* 'piece of string, thread, cord' etc. Only two list 'mark or storke' first.

This last proposal really brings us back to the experiments described above. Historical comparisons of meaning extensions are complex, and ways must be found, as Kelly and Stone acknowledge, of eliminating the effects of interlanguage borrowing. However, we can make use of the uninformed translations by learners of languages from NL to TL to establish the transferability of senses. These translations, though often at variance with the facts of diachrony, nevertheless may be revealing of the structure and limits of polysemy, and may also help to settle the question of whether a small number of 'core' concepts and interpretation rules versus a fully (or over-) specified description of environments of occurrence in the mental lexicon is the right one. In this respect, the results above show that the generalised intuitions of learners do not allow the same degree of sense generalisation for English as for Dutch, despite the fact that all but a few senses in the experiment could be successfully translated between both languages, and also despite the fact that English also has extra senses not shared by Dutch. That this is so must be due to precisely the kind of cognitive mechanism that potentially generalises senses to new environments receptively or productively. Since cross-language comparisons only incidentally provide insight into the language facilities of individuals, it is surely essential to tap the intuitions of native speakers who also happen to be learners of foreign languages as well.

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