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Irregular past tense formation in English interlanguage

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1. Introduction

In 1983, when I attended my first linguistics course, taught by one Professor Rüdiger Zimmermann, Joan Bybee and Carol Moder published an article on „Morphological classes as natural categories" in *Language*. In this article they argued that prototype theory can be applied to morphological classes, in particular ablaut classes in English verb morphology. Their experimental results indicated that native speakers of English do not only use regular inflexion, i.e. *-ed*, to construct past tense forms from given nonce verbs but that, to a certain extent, they also generalize certain ablaut patterns. The probability of the respondents choosing ablaut instead of the more expectable regular past tense suffix crucially depended on the similarity of the nonce verb with a phonologically defined prototype.

The present article reports the results of a study inspired by the Bybee and Moder paper which was designed and carried out by two second-year students and myself in my 1996/97 morphology proseminar.[1] The aim of the study was to test whether irregular past tense formation in advanced English interlanguage shows the same patterning as observed with Bybee and Moder's native speakers. More specifically, we tried to answer the question whether advanced learners construct an ablaut-triggering prototype and if so, whether it is the same as with native speakers of English.

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1 I would like to thank my students Astrid Krahl und Ingo Lange for their participation in this project and the unusual amount of work they invested in its realization. This paper is largely based on the research documented in Krahl and Lange (1997), although the statistical analysis is considerably elaborated. I am indebted to Marcus Callies und Julia Everling for their assistance in computerizing the data and to Christiane Dalton-Puffer and Rita Kupetz for helpful comments on an earlier version.

Apart from the general intention of presenting the findings of this joint project to a larger audience, there are particular reasons for doing so in this Festschrift. First, both Lange and Krahl were also students of our festschriftee. Second, the study illustrates that even undergraduate students can be involved in interesting research projects, and this is a point which characterizes Rüdiger Zimmermann's teaching to a large extent. In his seminars, students are usually required to do their own empirical studies, sometimes with surprising and quite substantial results. As a student, I always found this kind of teaching very inspiring, and have tried as a teacher to emulate this style, with a lot of fun and (hopefully no less) success.

The organization of irregular past tense morphology in learner English is a largely unexplored area. Studies of morphological development in L2 flourished in the early 1970s, perhaps starting with Dulay and Burt's (1973) seminal paper, with significant implications for the field of second language acquisition as a whole. The so-called 'morpheme studies' were instrumental in developing the idea of developmental sequences in L2. Krashen (1977), summarizing a large number of these studies of different interlanguages, posits that irregular past tense forms are invariably acquired before regular past tense endings. This is not surprising, since in early acquisition, these forms are stored individually. However, there are no studies available which tell us something about how advanced learners, who have long passed the stage of regular past tense acquisition, (re-)organize irregular morphology or inflectional classes in their interlanguage lexicon. The present study can, therefore, be seen as a first attempt to shed more light on this[2] issue.

The paper is structured as follows. In the next section, I will summarize the relevant facts of English irregular past tense formation and Bybee and Moder's findings. Section 3 describes the methodology and results of the present study, which is followed by a discussion and comparison of L1 and L2 patterns in section 4.

2. Irregular past tense in English (L1)

In English, past tense is regularly formed by the suffixation of an allomorph of the regular past tense morpheme *-ed* (e.g. *kiss*[t], *answer*[d], *end*[ɪd]). A substantial number of verbs show irregularities of various kinds which are described, for example, in Quirk et al. (1985: 103-120). A number of irregular classes have been proposed, two of which are the focus of our discussion, i.e. those that show /ʌ/ ablaut in their past tense or past participle. One of these two classes has a three-stage ablaut (present tense stem vs. past tense stem vs. past participle stem, e.g. *sing, sang, sung*), the other class has a two-stage ablaut (as in *stick, stuck, stuck*). The former class (let us call it 'class 1') has the members given in (1a), the latter class ('class 2')[3] has the members given in (1b).[4]

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2 It should be noted, however, that the storage and processing of what has traditionally been labeled regular and irregular inflection is a highly controversial issue even with regard to L1 speakers. Most recently, the dual mechanism model has attracted a lot of attention in both theoretically and psycholinguistically oriented circles. Since this is not the place for an exposition of the debate, the reader is referred to the relevant literature (see e.g. some of the articles in Booij and van Marle 1996).

3 Note that different authors have used different classifications for English irregular verbs. For example, what we call class 1 is Quirk et al.'s class 6B, our class 2 is Quirk et al.'s 7A (see Quirk et al. 1985: 112, 114). Consulting Jespersen (1942), we see that our class 1 corresponds to his class 9 (1942: 53-56) and that our class 2 is a subset of the forms in his class 8 (1942: 44-53). We use 'class 1' and 'class 2' in this article for convenience's sake.

4 In certain dialects, other verbs complement the lists in (1) (e.g. *bring, brung* or *shake, shuk*), and speakers of different social or regional backgrounds may vary in their knowledge and use of some of the verbs given. Thus, many American speakers do not use the forms *sprang, shrank,* and *stank* (Bybee and Moder 1983: 252).

(1) a. Class 1

begin	*began*	*begun*
come	*came*	*come*
drink	*drank*	*drunk*
ring	*rang*	*rung*
run	*ran*	*run*
shrink	*shrank*	*shrunk*
sing	*sang*	*sung*
sink	*sank*	*sunk*
spring	*sprang*	*sprung*
stink	*stank*	*stunk*
swim	*swam*	*swum*

b. Class 2

cling	*clung*
dig	*dug*
fling	*flung*
hang	*hung*
sling	*slung*
slink	*slunk*
spin	*spun*
stick	*stuck*
sting	*stung*
strike	*struck*
string	*strung*
swing	*swung*
win	*won*
wring	*wrung*

Historically, both ablaut classes stem from Old English strong verbs with a three-stage ablaut system. It is interesting to note that class 2 has attracted a number of verbs that were not strong in Old English (e.g. *dig, fling, sling*), whereas class 1 has attracted only one member since Old English times (*ring*, see Jespersen 1942: 44-56). These two things are remarkable from a diachronic perspective. Thus, although there is a general historical tendency to regularize irregular inflection (e.g. Wurzel 1984), it seems that certain irregular patterns are quite stable and even attract new members (see e.g. Nübling 1998 for a similar observation concerning German number ablaut).

In view of the historical stability of class 2, it is perhaps not so surprising that, in an experimental study with children and adults, Bybee and Slobin (1982) found that class 2 is still - at least to some extent - productive in Modern English. In the experiment, their subjects not only produced regular past tense forms but also innovative past tense forms involving vowel change in apparent analogy to class 2 forms. In order to investigate this phenomenon in more detail, Bybee and Moder (1983) carried out experiments in which native speakers had to produce past tense forms of nonce verbs (written responses to oral stimuli). In the latter study, the stimuli consisted of 109 monosyllabic verbs, 93 of which were nonce verbs and 16 existing verbs. The stimuli varied systematically along the following phonological parameters:

(2) onset consonants: *sCC, sC, CC, C*
stem vowels: /ɪ, æ, ʌ, ey, iy, ay, uw, ow/
coda consonants: /ng, nk[5], k, g, n, m/)

The subjects produced a majority of regular past tense formations. However, a considerable number of past tense forms were constructed in other ways.[6] The distribution of irregular forms is given in (3):

(3) irregular past tense formations:

total		100%
ablaut	/ʌ/	49%
ablaut	/æ/	34%
others		17%

Ablaut is clearly the preferred strategy of non-regular past tense formation, with a strong tendency towards class 2, i.e. /ʌ/ ablaut. The analysis of class 2 ablaut forms according to phonological structure showed that the presence or absence of certain features has a strong effect on the

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5 I use /ng/ and /nk/ as underlying representations for what surfaces phonetically as [ŋ] and [ŋk] respectively, in standard varieties of English. The question of phonological status of angma in English (underlying or derived?) is irrelevant in the context of the present study.

6 The percentage of regular vs. irregular responses was not reported in the article since that figure would have varied depending on the actual number of nonce verbs used under different experimental conditions and their phonological shape. Generally, the percentage of vowel change was not more than 44-50% for even the strongest prototype-based forms (Carol Moder, p.c. June 1997).

occurrence of ablaut. On the basis of their results, Bybee and Moder postulated the existence of a prototype whose phonological shape is /*sCC* ɪ velar nasal/. The probability of triggering ablaut depends on the phonological similarity to the prototype. Consider the following table:

(4) responses in /ʌ/

prototype: *sCC* ɪ velar nasal	44%
- two prototype features present:	
final & initial: *sCC* æ velar nasal	50%
final & vowel: *C* ɪ velar nasal	24%
initial & vowel: *sCC* ɪ *C*	4%
- one prototype feature present:	
final: *C* æ velar nasal	34%
initial: *sCC* æ *C*	17%
vowel: *C* ɪ *C*	7%

(Bybee and Moder 1983: 261)

The table shows that if two prototype features are present, the proportion of ablaut formations is higher than with only one feature present.[7] Furthermore, the three types of features have different weight. The coda executes the strongest influence, followed by the onset, while the nucleus has the smallest influence on the choice of ablaut in past tense formation.

Having summarized the most important findings of Bybee and Moder's paper, we now turn to the interlanguage study.

3. Ablaut in German-English interlanguage

3.1. The experiment

In order to test whether advanced learners of English show an organization of irregular past tense morphology similar to that of native speakers, we carried out an experiment with 21 subjects, all of them native speakers of German and graduate students of English, most of them having spent at least six months in an English-speaking country. Subjects were presented with a stretch of text from chapter one of Baum's *The Wonderful Wizard of Oz* (1995). The verbs in the text (N=83) had been substituted by nonce verbs in their infinitives, all of them monosyllabic, which differed in their syllabic structure according to the dimensions given in (2). The text was presented to each subject in written from and was read out by the experimenter in order to ensure the correct phonetic interpretation of the nonce verbs. The subjects followed the reading and were given time to fill in the

7 It is unclear to me why the presence of three prototype features does not lead to a higher proportion of ablaut formations. See section 4 for more discussion.

past tense form for each nonce verb occurring. In terms of modality, written responses were recorded to a stimulus presented both orally and in written form.

Of the 83 test items, 44 were taken directly from Bybee and Moder (1983: 268f). Given that the effect of the vowel was weakest, we constructed the rest of the items in such a way that the effects of onset and coda on the choice of ablaut could be better controlled statistically. Hence, we increased the number of items with the same coda or onset and decreased the number of different vowels to only three (æ; ʌ, i:/. The test items are given in (5):

(5)

brug	*bun*	*clid*	*flug*	*flum*	*flus*	*funk*
gick	*glick*	*greem*	*grun*	*kib*	*krin*	*krink*
lug	*lun*	*lunk*	*lup*	*peet*	*ping*	*plim*
pling	*plut*	*prun*	*puv*	*rum*	*scrun*	*seeg*
shink	*sid*	*sig*	*skeen*	*skig*	*sking*	*skrim*
skrink	*skrit*	*skrug*	*skrun*	*skug*	*skun*	*slub*
slun	*smick*	*sming*	*smip*	*speeb*	*spim*	*spink*
splud	*splug*	*splun*	*spreen*	*sprin*	*sprink*	*sprit*
spriv	*sprun*	*spuk*	*spum*	*spunk*	*steeg*	*stid*
stin	*strick*	*strig*	*struk*	*strul*	*strum*	*strunk*
stug	*stul*	*stun*	*thul*	*tim*	*tink*	*treep*
trib	*trig*	*tring*	*trun*	*veem*	*vin*	

3.2. Results

The subjects' responses were computerized and statistically analyzed using the SPSS and SPSS-CHAID statistical software packages. Subject answers were coded in six categories, regular past, <a>-ablaut, <u>-ablaut, <a>-ablaut accompanied by regular past suffix, <u>-ablaut accompanied by regular past suffix and a residual category 'others'. Forms were categorized as '<a>-ablaut', if the marking of past tense consisted solely of the use of the vowel <a> instead of the original stem vowel. Forms were categorized as '<u>-ablaut' if the marking of past tense was restricted to the use of <u> in the past stem. The classification '<u>-ablaut' was also applied to those nonce verbs which fulfilled the criterion just mentioned (i.e. <u> in the past stem without further marking of past tense) but which already have <u> in their non-past base form. This class of verbs could in fact be argued to be zero-marked. For the sake of simplicity of presentation, the following tables subsume these zero-marked forms surface under the category '<u>-ablaut'. This lumped category will be taken apart and discussed in more detail below. The categories '<a>-ablaut + *-ed*' and '<u>-ablaut + *-ed*' contained such a small number of items (9 tokens in all) that they have been subsumed under the category 'other' in the following table:

Table 1: Past tense marking on nonce verbs

past tense formed by	frequency	percentage
<a>-ablaut	316	21.2
<u>-ablaut	137	9.2
regular	884	59.2
other	157	10.5
total	1494	100.0

About 60% of all responses are regular past tense forms, but, perhaps surprisingly, more than 30% of the verb tokens show ablaut, with a preponderance of <a>-ablaut.

Let us now consider the effect of the phonological variables on the choice of past tense formation: Table 2 crosstabulates the type of past tense formation (columns 2 through 6) according to input stem vowel (first column). The most interesting cells in Tables 2 and 3 are shaded:

Table 2: Past tense forms according to stem vowel

	past tense formed by				
stem vowel	<a>-ablaut	<u>-ablaut	regular	other	total
/i:/ frequency	4	0	106	52	162
expected frequency	34.3	14.9	95.9	17.0	162.0
% of stem vowel	2.5%	.0%	65.4%	32.1%	100.0%
/ɪ/ frequency	187	50	337	74	648
expected frequency	137.1	59.4	383.4	68.1	648.0
% of stem vowel	28.9%	7.7%	52.0%	11.4%	100.0%
/ʌ/ frequency	125	87	441	31	684
expected frequency	144.7	62.7	404.7	71.9	684.0
% of stem vowel	18.3%	12.7%	64.5%	4.5%	100.0%
total frequency	316	137	884	157	1494
total percent	21.2%	9.2%	59.2%	10.5%	100.0%

The row 'expected frequency' lists the number of items which can be expected to occur in the respective column, given the overall distribution as listed in the bottom row of the table. For example, if the stem vowel /i:/ items behaved like the average (i.e. no special effect is observable), we would expect that of the 162 items with stem vowel /i:/, 21.2% show <a>-ablaut (corresponding to the percentage of all <a>-ablauts in the data, see the bottom row in Table 2). This amounts to an expected frequency of 21.2% of 162, i.e. 34.3. As one can easily see, there are sometimes large discrepancies between expected and observed frequencies, which, if statistically significant, is evidence for effects of the independent variables on the dependent variable.

The most important result which emerges from the distribution in Table 2 is that the choice of past tense formation clearly depends on the kind of stem vowel ($p < .000$, chi-square test, all

measures). Stem /i:/ strongly disfavors <a>-ablaut and <u>-ablaut and favors other non-regular types of past tense formation. /ɪ/-stems have by far the highest proportion of <a>-ablaut (28.9%), followed by /ʌ/-stems, which trigger <a>-ablaut in 18.3% of all cases. Of all <u>-ablauted verbs (N=137), 63.5% (N=87) occur with /ɪ/-stems, the rest occur with /ʌ/-stems.

Let us turn to the effect of the stem-final consonant(s) on the choice of past tense formation. Table 3 shows the distribution:

Table 3: Past tense forms according to coda consonant(s)

		past tense formed by				
coda consonant(s)		<a>-ablaut	<u>-ablaut	regular	other	total
velar obstruent	frequency	48	51	213	30	342
	expected frequency	72.3	31.4	202.4	35.9	342.0
	% of coda consonant(s)	14.0%	14.9%	62.3%	8.8%	100.0%
liquid	frequency	2	2	49	1	54
	expected frequency	11.4	5.0	32.0	5.7	54.0
	% of coda consonant(s)	3.7%	3.7%	90.7%	1.9%	100.0%
non-velar nasal	frequency	112	34	326	32	504
	expected frequency	106.6	46.2	298.2	53.0	504.0
	% of coda consonant(s)	22.2%	6.7%	64.7%	6.3%	100.0%
velar nasal	frequency	38	9	36	7	90
	expected frequency	19.0	8.3	53.3	9.5	90.0
	% of coda consonant(s)	42.2%	10.0%	40.0%	7.8%	100.0%
velar nasal + /k/	frequency	74	16	79	11	180
	expected frequency	38.1	16.5	106.5	18.9	180.0
	% of coda consonant(s)	41.1%	8.9%	43.9%	6.1%	100.0%
other obstruent	frequency	42	25	181	76	324
	expected frequency	68.5	29.7	191.7	34.0	324.0
	% of coda consonant(s)	13.0%	7.7%	55.9%	23.5%	100.0%
total	frequency	316	137	884	157	1494
	expected frequency	316.0	137.0	884.0	157.0	1494.0
	% of coda consonant(s)	21.2%	9.2%	59.2%	10.5%	100.0%

Table 3 shows that nonce verbs ending in certain types of consonants tend to trigger ablaut to a much greater extent than verbs ending in other types of consonants. For example, verbs ending in a liquid hardly ever take ablauted past tense forms (90.7% regular past tense forms), whereas verbs ending in a velar nasal or in a velar nasal and /k/ have the highest percentages of <a>-ablaut (42.2%

and 41.1%, respectively). Hence, we can state that the structure of the coda has also a strong effect on the choice of past tense ($p < .0000$, chi-square test).

The following table lists the choice of past tense form according to kind of stem-initial consonant(s). In contrast to stem vowel and coda, the onset of the verbs tested had the least effect on past tense choice. The distribution is listed in Table 4:

Table 4: Past tense formation according to onset

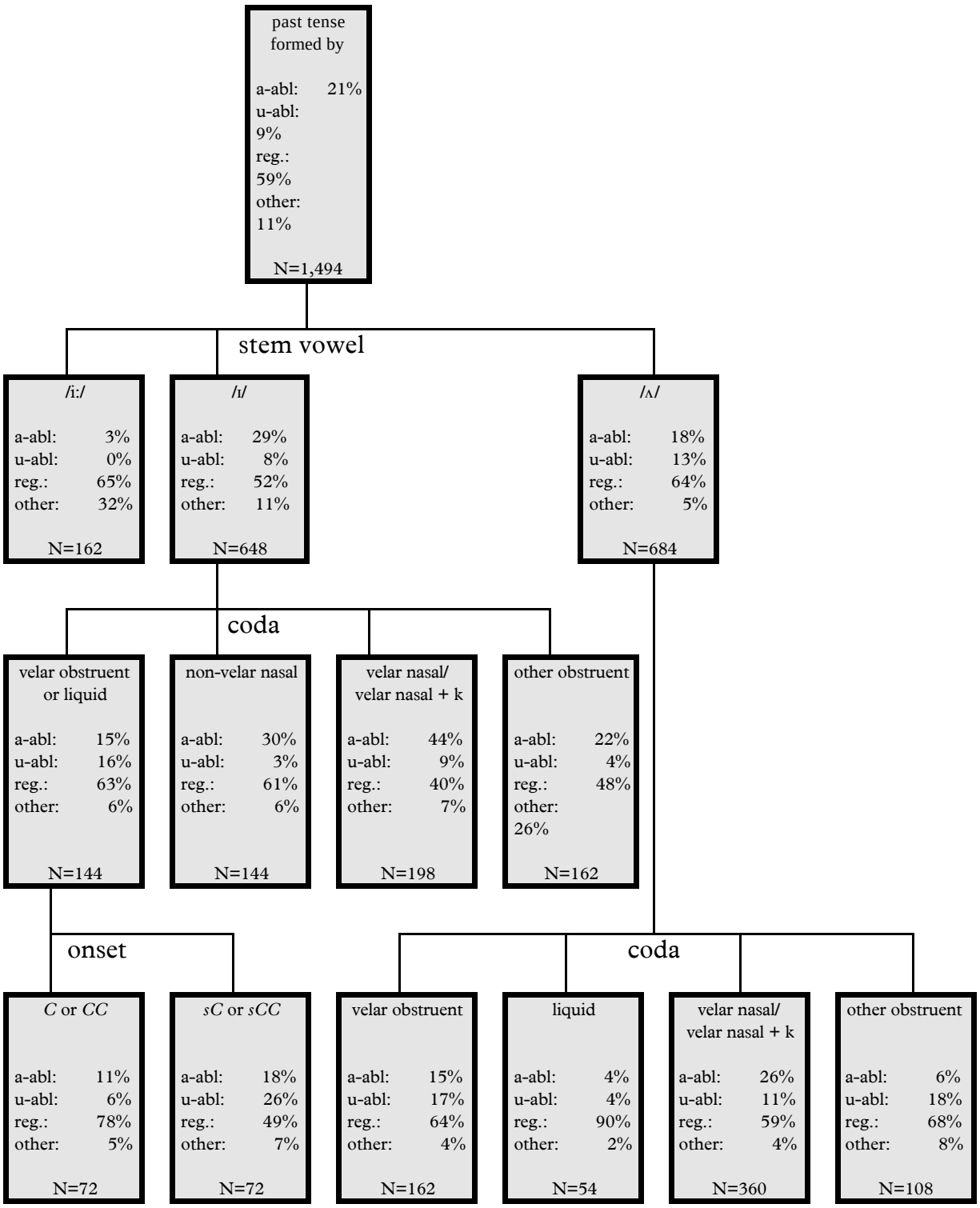
		past tense formed by				
onset		<a>-ablaut	<u>-ablaut	regular	other	total
C	frequency	78	22	233	45	378
	expected frequency	80.0	34.7	223.7	39.7	378.0
	% of onset	20.6%	5.8%	61.6%	11.9%	100.0%
CC	frequency	56	31	220	35	342
	expected frequency	72.3	31.4	202.4	35.9	342.0
	% of onset	16.4%	9.1%	64.3%	10.2%	100.0%
sC	frequency	87	40	229	40	396
	expected frequency	83.8	36.3	234.3	41.6	396.0
	% of onset	22.0%	10.1%	57.8%	10.1%	100.0%
sCC	frequency	95	44	202	37	378
	expected frequency	80.0	34.7	223.7	39.7	378.0
	% of onset	25.1%	11.6%	53.4%	9.8%	100.0%
total	frequency	316	137	884	157	1494
	expected frequency	316.0	137.0	884.0	157.0	1494.0
	% of onset	21.2%	9.2%	59.2%	10.5%	100.0%

Although a chi-square test still shows that the observed differences between categories are statistically significant ($p = 0.02$), onset as a predictor of past tense choice is much less powerful than the other predictors. The most remarkable tendencies are perhaps that the *CC* onset shows a tendency towards more regular past tense whereas the most complex onset *sCC* is the onset which is most likely to trigger ablaut past tense forms.

So far we have dealt with the three different phonological variables onset, stem vowel and coda in isolation. In the rest of this section, we look at how these variables interact. For this purpose, the data were subjected to a classificatory analysis using the SPSS-CHAID software package. The

statistical procedure used is called segmentation modeling, a procedure under which the population is divided into segments which differ with respect to designated criteria. In our case, we wanted to establish the combined effects of the three independent variables onset, stem vowel and coda on the choice of past tense formation. The following tree diagram illustrates these effects. The level of significance chosen for the segmentation of the data was $p < 0.001$ (chi-square test). In other words, the statistical difference between each of the tree's leaves and its neighboring leaves is highly significant.

Figure 1: Classification tree showing the interaction of the phonological variables on past tense formation (percentages are rounded, „a-abl.“ = <a>-ablaut, „u-abl.“ = <u>-ablaut, „reg.“ = regular past tense marking)



The tree diagram reads as follows: The top node gives the overall distribution of the data (total number of observations N=1,494). This distribution is, of course, the same as that given in Table 1 above. The data are then classified into three groups depending on the type of stem vowel, because this is the variable which has the strongest effect on the choice of past tense. Stems with stem vowel /i:/ show no further effects due to onset or coda structure, whereas both /ɪ/- and /ʌ/-stems do.

/ɪ/-stems have the highest proportion of ablaut forms, with the largest amount of <a>-ablaut (44%) in those cases in which the stem ends in either /ng/ or /nk/, out-numbering even regular inflection (40%). (Note that the classification shows that there is no significant difference with regard to past tense choice between these two coda structures. In other words, whether the verb ends in /ng/ or /nk/ does not significantly influence past tense choice.) Conversely, /ɪ/-stems ending in non-velar nasals or in velar obstruents or liquids favor regular inflection in spite of their stem vowel. For a subclass of /ɪ/-stems, namely those ending in a velar obstruent or liquid, we can observe a further effect: If their onset is complex with initial /s/, the proportion of <u>-ablaut rises to a remarkable 26% (as against 8% for all /ɪ/-stems), increasing the overall proportion of ablauted past tense forms to the highest observable percentage of 44% (26% <u>-ablaut plus 18% <a>-ablaut).

Stems with stem-vowel /ʌ/ also show a non-negligible amount of ablaut forms (31%), but differ from /ɪ/-stems mainly in the distribution of <a>-ablaut and <u>-ablaut. /ʌ/-stems have the highest proportion of <u>-ablaut, i.e. in this case zero-marked past tense forms (13%). This proportion increases to some 17%, if the verb ends in a singleton obstruent (17.2% for velar obstruent, 17.6% for non-velar obstruents).

In sum, the strongest effect is that of the vowel, followed by the coda, with onset effects limited to a rather small subset of the data. From the patterning of the data as given in Tables 2 through 4 and Figure 1 we can conclude that the learners have a phonologically defined prototype form which is most likely to trigger ablaut past tense. This prototype is given in (6):

(6) triggers of <a>-ablaut responses

a.	L2- prototype:	*sCC* ɪ nk/ng
b.	*sCC*:	25.1% <a>-ablaut responses
c.	/ɪ/-stems:	28.9% <a>-ablaut responses
d.	/ng/ or /nk/:	41.1% <a>-ablaut responses
e.	*sC* ɪ nk:	61.1% <a>-ablaut responses

The reasons for postulating [*sCC* ɪ nk/ng] as the learner's prototype are the following. (6b-c) give the structures which have the strongest tendency of showing <a>-ablaut in their past tense. Thus, disregarding the other predictors, forms with onsets of the structure *sCC* show the highest amount of <a>-ablaut (25.1%), stems which have /ɪ/ as their stem vowel have 28.9% <a>-ablaut forms (see also Table 2 above) and for those stems that end in /ng/ or /nk/, 41.1% of the past tense forms are <a>-ablauts (see also Table 3 above). With regard to a specific input structure, the highest proportion of <a>-ablaut is observable for the structure given in (6e), [*sC* ɪ nk], which generated 61.1% of <a>-ablaut past tense forms.

4. Ablaut in L1 and L2: a comparison

In this section, I will compare the results of our L2 study with the findings of Bybee and Moder (1983). It will become clear that there are interesting similarities and differences between L1 and L2 speakers.

First, if we compare (4) and (6), we see that in both L1 and L2 prototype effects are clearly visible. In other words, not only native speakers, but also advanced second language learners tend to generate ablauted past tense forms, provided that there is sufficient phonological similarity with a prototype. Depending on the degree of similarity with the prototype and the weight of individual features, native speakers and learners apply regular inflection or ablaut to form past tense verb forms. Second, the L1 prototype and the L2 prototype are almost identical, L2 [*sCC* ɪ nk/ng] as against L1 [*sCC* ɪ velar nasal], the only difference being that in L2 word-final /nk/ triggers the same effects as word-final /ng/.

There is, however, a remarkable difference between native speakers and L2 speakers in the type of ablaut they prefer. L1 speakers prefer /ʌ/-ablaut, that is they enlarge the group of class 2 verbs, whereas the German L2 speakers favor /æ/-ablaut, obviously in accordance with the class 1 pattern.

Another difference between L1 and L2 concerns the nature and effect of the stem vowel. While for both natives and non-natives /ɪ/ is the vowel favoring ablaut most, stem /ʌ/ plays a different role in the two groups. For the L1 speakers it is the stem vowel with the lowest proportion of ablaut past tense forms: „/ɪ/ elicits a significantly higher percentage of /ʌ/ responses, over-all, than other vowels: it is followed by /æ/, the diphthongs, and /ʌ/." (Bybee and Moder 1983: 259). Furthermore, Bybee and Moder observe that „in general, subjects avoided no-change responses which would make the past tense identical to the present". Both observations do not hold for our learners, who have relatively high proportions of zero-marked past tenses in /ʌ/ if the stem ends in an obstruent and has an onset in either *CC* or *sCC* (30.6% and 33.3%, respectively).

How can these similarities and differences between the two groups of speakers be accounted for? First of all, it seems that there is no difference in the fundamental principles of organizing verbal paradigms in L1 and in advanced L2. Both groups of speakers generate categories which are organized in ways predicted by prototype theory. But how does prototypical organization come about? In other words, how do speakers construct a prototype in their L1? This question should be answered first, before turning to possible explanations of L2 patterns. Unfortunately, very little is known about how speakers construct prototypes. In pertinent publications, reference is made to the notion of salience, to type and token frequency effects, but, to my knowledge, a clear mechanism has not been suggested. The problem becomes evident if we note that the highest amount of ablaut responses for both native speakers and L2-speakers occurs with forms which are not completely identical to the prototype. In Bybee and Moder's study, the prototype structure itself [*sCC* ɪ velar nasal] only triggers 44% ablaut responses, whereas the structure [*sCC* æ velar nasal] has 50% ablaut past tenses. In our study, the prototype itself has 41.7% of <a>-ablaut responses, whereas [*sC* ɪ nk] triggers 61.1% <a>-ablaut forms. One might, therefore, be tempted to simply take the form with the highest proportion of ablaut responses as the prototype, which, however, has the disadvantage of making the stronger vowel effect of /ɪ/ as against /æ/ in Bybee and Moder's study, and the stronger onset effect of *sCC* as against *sC* in our study miraculous. No matter which way the

prototype is construed on the basis of the experimental data, it becomes clear that these discrepancies need further investigation.

In view of this state of affairs, our interpretation and explanation of the observed differences between L1 and L2 must necessarily be preliminary and speculative. Assuming that both L1 and L2 speakers make use of the same mechanisms to construe a prototypically organized category, and further assuming that frequency in the input plays a role, we can hypothesize two principled explanations of the differences between natives and non-natives, one based on input frequency, the other on L1-transfer.

According to the first possible explanation, L1 speakers would have a kind of input that gives salience to class 1 items but neglects class 2 items. Thus, one could hypothesize that German L2 speakers are more exposed to words like *sing* (*sang*, *sung*) than to words like *spin* (*spun*, *spun*). Furthermore, words with invariable past tenses (such as *cut*) would have to be more salient to non-native than to native speakers. In order to test these hypotheses, one would have to carefully investigate the input of German learners of English. This process was not undertaken for the purposes of this study. Given that we do not know how exactly salience in the input and its contribution to prototype formation can be measured, it is doubtful whether such a study could yield any substantial results.

According to the second possible explanation, cross-linguistic influence may be responsible for the L2 patterns. Under this hypothesis, the organization of German past tense formation interferes with the organization of past tense formation in the target language. For example, Köpcke (1998) has shown that in German the highest percentage of ablaut occurs with verbs that end in /i + nasal (+ *C*)/. Of the verbs that end in /i + velar nasal (+ *C*)/, even 92% take ablaut. Thus the phonological structure of the ablaut-triggering prototype is the same in the subjects' English interlanguage and their native German. Further evidence for the transfer hypothesis comes from the *kind* of ablaut in German, where a three-stage-ablaut as in *singen*, *sang*, *gesungen* can be considered prototypical. Ségéral and Scheer (1998) have recently argued for the existence of a universal ablaut strategy ('apophonic path') being also instantiated in German strong verb inflection:

(7) apophonic path
∅ => /i/ => /a/ => /u/ => /u/ (from Ségéral and Scheer 1998: 31)

German has a vast number of ablaut classes (39 in the traditional classification, e.g. in Drosdowski et al. 1984), but Ségéral and Scheer (1998) show that despite the apparent irregularity of strong verb inflection, the apophonic path can quite elegantly account for the vast majority of German ablauted verb forms. Independent evidence for the centrality of the apophonic path in German are onomatopoetic or reduplicated forms, such as those[8] in (8):

(8) *Bi-Ba-Butzemann*
bim-bam-bum
ding-dang-dong
hicke-hacke (zu)

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8 Note that English seems to prefer onomatopoetic expressions with a tendency toward two-member forms. Thus Marchand (1969: 430) lists a plethora of expressions, with very few three-member forms.

hi-ha-ho (Schalke ist k.o.)
kribbel-krabbel
kritzi-kratzi
Lirum-Larum- (Löffelstiel)
Misch-Masch
picke-packe (voll)
pling-plang-plong
ri-ra-rutsch (wir fahren mit der Kutsch')
ritsche-ratsche
Zick-Zack
Zicke-Zacke- (Hühnerkacke)

In view of these facts and analyses, one might be tempted to analyze the L2-pattern as a transfer phenomenon. There are two problems, however. One is the mapping of German segments on English segments. Under one possible transfer analysis, we might expect that German /a/ is mapped onto English /ʌ/ and German /ʊ/ on English /ʊ/, thereby producing a pattern such as *kr*[ɪ]*nk*, *kr*[ʌ]*nk*, *kr*[ʊ]*nk*. This is, however, not what we find, perhaps because English does not have any verbs which feature this kind of ablaut. Under the assumption that advanced learners already know the majority of English ablaut verbs, it is unlikely that they would invent ablaut patterns completely alien to the target language. What the learners seem to do instead is to use an ablaut pattern which is both close to their German native pattern and possible in English. I therefore suggest that the learners transfer the prototypical three-stage ablaut of German and realize it in their English interlanguage in a way compatible with the output of class 1 items in English. The parallelism between the German spelling and the English spelling (cf. *singen, sang, gesungen* vs. *sing, sang, sung*) may further strengthen this interlanguage pattern.

In order to substantiate the explanation just proposed, it would be necessary to gather independent evidence for the prominence of a three-stage ablaut in German-English interlanguage. Such evidence would have to come from a study which is not restricted to past tense formation but also includes past participles.

A serious challenge for the transfer analysis comes from the proposed universality of the apophonic path. If the German-type ablaut is in direct correspondence with the universal ablaut path found in a great many unrelated languages, it could be argued that the interlanguage pattern is not a transfer phenomenon but a universal developmental effect. In order to investigate this question one would have to compare the German learners with learners who do not have ablaut in their native language systems.

In sum, the present study seems to raise more questions than it answers, but I hope to have shown that these questions are sufficiently interesting to merit further investigation (perhaps by some of my students in my next morphology course...).

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