Knowledge of Similarity and Narrow Lexical Override
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Knowledge of similarity and narrow lexical override

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0. Introduction

This study summarizes the findings of an investigation into patterns of half-rhyme use in mid-20th century Romanian poetry. The data suggest that linguistically naïve speakers – here Romanian poets and their readers - possess detailed, shared knowledge of context-sensitive relations of phonological similarity. I show that knowledge of sound similarity cannot be deduced from knowledge of lexical patterns (i.e. sound distributions or patterns of alternation). I propose that it is based on speakers' understanding that the distinctiveness of contrasts – the effectiveness of the cues that differentiate a contrasting pair - varies with context. Speakers know that pairs of contrasting sounds are more similar if placed in a context where their differentiating cues are less effective.

1. Half-rhymes

Half-rhymes (HR) are rhyming pairs that fall short of strict identity. Thus Bob Dylan rhymes *ez* with *ezd* in *'all my days/... partly raised* '(Golston 1995). Some HRs are judged closer to identity than others: we infer this from the fact that some HRs are more frequent than others. In the rock-poetry studied by Zwicky (1976) and Golston (1995) HRs like *ez-ezd* are about as frequent as perfect feminine rhymes, and much more frequent than HRs like *'all my days/...all the pretty maids',* in which *ez* is matched with *edz*.

There is a judgment of relative similarity implicit in the frequency difference. I use the notation in (1) to summarize such judgments:

(1) Δ(x-y) > Δ(z-w).

This means "the perceived difference between the strings x and y is greater than that between strings z and w", hence x-y is less similar than z-w. The relative similarity judgment discussed above corresponds, in this notation, to (2):

(2) Δ(ezedz) > Δ(ez-ezd).

The better HR is the more similar pair *ez-ezd*. We can generalize (2) as follows:

(3) $\Delta(C\text{-}\emptyset)//V > \Delta(C\text{-}\emptyset) \neg(//V))$

(3) says that the difference between a string containing a C and an otherwise identical string lacking this C is greater when the C is V-adjacent (i.e. in the context //V) than otherwise (in the context ¬(//V)). This similarity judgment – like that in (2) - is context-dependent: the same C-Ø contrast counts for more in some contexts than in others. Existing models of segmental similarity (Frisch, Broe, Pierrehumbert 1997) operate in context-free fashion and cannot characterize this fact: they are thus unsuited to model the similarity knowledge underlying HR use.

Our hypothesis is that the computation of similarity is context-sensitive because the judgment of similarity is, in part, a context-dependent judgment of relative perceptibility. The transitions into and out of a vowel provide cues to the nature of a consonant's oral constriction. The difference between a V-adjacent C (the [d] of *edz*) and a non-V adjacent C (the [d] of *ezd*) is then one of relative perceptibility: the V-adjacent [d] is more perceptible and thus its absence (in the *edz-ez* HR) is more salient. The non-V adjacent [d] yields the better *ez-ezd* HR because it is less perceptible.

Poets decide which HRs to use; their audience decides which HRs are tolerable. Our experience as readers suggests that these two judgments converge: the more frequently employed HRs are also the ones that readers perceive as more similar. The idea of a widely shared set of relative similarity judgments can be verified by observing if the relative frequencies among HR types are similar in different poetic corpora. The idea that many similarity judgments are shared by poets is tacitly assumed by earlier writers on the subject[1], who pool the HR data of multiple poets rather than separately studying each corpus; this idea is documented below.

HR preferences merit investigation because the shared knowledge of relative similarity they reveal is, in Halle's (1978) terms, "knowledge untaught and unlearned". In this they differ from the knowledge speakers have of the patterns of alternation and sound distribution of their language: these are learned by learning words. Learning one's lexicon doesn't, by itself, teach us which pairs of words are more similar. In most poetic traditions there are no publicly posted standards of HR use. Poets are taught by example what counts as a perfect rhyme, but they're on their own when they need to find the minimal deviation from rhyming identity: it is then remarkable if the HR choices of several poets converge on a shared hierarchy of similarity. How is this knowledge achieved? And how does it relate

[11] Eekman (1974), Zwicky (1976) and Holtman (1996)

to phonological computations? I defer a partial answer to the first question to section 10. The second question is taken up below.

2. Uses of similarity: the P-map hypothesis

Elsewhere (2001, 2003) I have suggested that certain grammatical properties are inferred by learners from their knowledge of relative similarity relations (referred to as "the P-map"). The hypothesis is that learners induce rankings among correspondence constraints from known rankings of similarity: if a learner knows that Δ(C-Ø)//V > Δ(C-Ø) ¬(//V)) he infers that any correspondence condition prohibiting a C//V vs. Ø difference between some pair of representations (say input and output) outranks the correspondence condition that prohibits the less salient C¬(//V)) vs. Ø difference between *that* pair of representations (i.e. input and output). This amounts to saying that knowledge of the similarity relation in (3) causes the learner to infer the ranking in (4):

(4) MAX C//V (IO) >> MAX C¬(//V)) (IO)

The HR data discussed here bears on several aspects of the P-map hypothesis. The evidence suggests specific links between context-dependent differences in cue distribution and context-dependent similarity judgments. It also allows us to explore possible relations between lexically manifest patterns of sounds and knowledge of similarity (cf. Frisch, Brie and Pierrehumbert 1997). In particular we consider here cases in which knowledge of perceptual similarity projects correspondence rankings that differ from those supported by the lexical evidence.

A more direct answer to the question "Is knowledge of similarity relevant to phonology" arises in the study of loan adaptation. This activity also relies on untaught judgments of relative similarity. For any borrowed word in need of nativization, there are multiple adaptation strategies. Choices among these rely on the same similarity computation as those that guide poets in the search of the better HR. Consider for instance a Hausa speaker who borrows English *yeast* as [jis] (Newman 2000). This borrower has to decide whether to simplify the English C_1C_2 coda via epenthesis or via deletion of C_1 or of C_2. The phonology of Hausa has no relevant alternations to break the tie in favor of one of these strategies; and a speaker who can't identify other comparable loans into Hausa does not know how others have solved this problem. Then he is on his own in this choice, exactly like the poet looking for the better HR. A further parallel with the rhyming case is that the choice made in borrowing a CVC_1C_2 syllable (delete the non-V adjacent C_2, not the postvocalic C_1) reflects the ranking of correspondence in (4), and thus the similarity ranking in (3). More generally, the study of coda cluster simplification in loan adaptation supports the idea that the ranking in (4) is constant across different borrowers (Silverman 1992, Steriade 2001), even if their native language lacks informative alternations. The P-map hypothesis offers the same answer to the borrowing question (How does the borrower choose which C delete in CVC_1C_2?) as to the rhyming question (How does the poet know which C is easier to miss: the post-vocalic C_1 or the non-postvocalic C_2?). The answer is in both cases: the least perceptible C. The suggestion, to repeat, is that knowledge of context-dependent perceptibility translates into rankings of similarity which in turn yield correspondence rankings. The latter operate in loan adaptation; they arguably function in the analysis of rhyming as well (Steriade and Zhang 2001).

3. The Romanian corpus

The collection of Romanian poetry analyzed here consists of six rhymed translations and three native poetry texts. The translations are, with one exception, from Russian, and they were all published between 1956-1971: see the appendix for details. The entire translation corpus totals 9791 rhyming pairs, of which 693 pairs are HRs. HR frequency in the six translations range from a high of 18% (in the translation of Briusov poems by Kernbach) to a low of .02% (in the translation of Pushkin by Lesnea.)

The native poets studied are Tudor Arghezi (1956), Miron Radu Paraschivescu (1957) and Niculae Labis (1959). There are 9223 rhyming pairs to 323 HRs in these texts. The HR frequencies are 0.58% (Arghezi), 10% (Paraschivescu) and 4.7% (Labis). The entire poetry-and-translation corpus is linguistically homogeneous: the poets write in Standard Literary Romanian (SLR); with the exception of a few of Arghezi's early poems, the texts were composed from the mid 40's to the late 60's; and, with the possible exception of Niculae Labis, the poets also *spoke* SLR, not a rural dialect.

Romanian poets differ in their tolerance for HRs. The poets I discuss use significant quantities of HRs, compared to others, but even for them the HRs are a very small fraction of overall rhyming pairs: this suggests that the poets distinguish full from partial identity and only *tolerate* the latter.

The data was analyzed to answer three questions. First, do the poets share a hierarchy of similarity, as evidenced by their common preferences for some HRs. If they do, is this hierarchy related to perceptibility factors: are feature mismatches more common in contexts where the relevant contrasts are less distinctive? Finally, do lexical patterns of alternation and distribution influence the poets' judgment of similarity?

4. Shared knowledge of similarity

On the issue of the shared similarity hierarchy, the first relevant observation is that there is a core of HR types that most poets will employ, and then there is a periphery whose use is sporadic both within and across different authors. A summary of the core types appears in (5). The rightmost column provides the ratio of HRs of the type identified in a given row to the other HRs found in a given text. The texts are identified by the first initial of the author (with key provided in the Appendix): thus the S37% figure in the rightmost top cell states that postnasal voicing - mismatches like *pʌmînt -strîŋgînd* 'earth-squeezing' represent 37% of the HRs found in Petre Solomon's Shelley translation.

(5) Core HR types

Mismatched contrast	**Example**	**Frequency: this HR type/all HRs in a given corpus**
Voice/[+nas]_	*pʌmînt - strîŋgînd*	S37%, B27%, L31%, A25%, P16% M10%, D9%,
Voice/[-nas]_{#, C}	*pantof – popov*	A17%, B14%, M10%, L 11%, D4%, S3%
j-Ø/C_#	*azj – obraz*	S36%, D27%, B24%, L7%, P7%, M6%
(i-ɨ)// [+nasal]	*strîmte - sîmte*	D13%, P 13%, L6%, M5%, S3%
(u-ɨ)// [+nasal]	*sûnt - pʌmînt*	
Liquid-Ø/Back V_C	*surd – aud*	P16%, M6%, D 6%, A4%,
Liquid-Ø/ CC_	*adʌpostu– nostru*	M7%, L1%, S 3%
m-n/_{#, C}	*strîmt – vînt*	L 4%, M3%, A3%, S3%

Two observations were verified against a larger selection of Romanian poetry (native and translation). First, every poet that permits HRs (and for some poets the total may be as low as 8 HRs), will draw mostly on the core types in (5). Second, these core HRs look like familiar phonological processes (postnasal voicing, final devoicing, depalatalization, nasal vowel centralization, liquid loss, nasal place neutralization) but these are not processes active in Romanian. There are no neutralizations of these contrasts in these contexts in Romanian, and there are no relevant alternations.

5. Voicing HRs

We explore now in greater detail the idea of a shared similarity hierarchy. The most commonly mismatched feature is voicing and the most common contexts where it is mismatched are post-nasally and word-finally. Figure 1 shows that every poet in the corpus analyzed has more voicing HRs postnasally than in the post-oral context _#. This is the first clear evidence of a shared hierarchy of similarity for all poets: all show greater use of one HR type over the other.

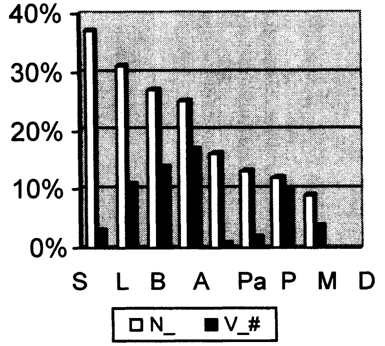


Figure 1: Voicing mismatches in two contexts:
- % = voice mismatch/all HRs in corpus.
- Corpora identified by initials: see appendix.

However, different sequences occur with different frequency in the rhyme domain: specifically, we must control for the possibility that voiced stops are more frequent post-nasally. That alone could explain the data. We compare then four of the corpora with respect to the following ratios: voicing HRs in a specific context/out of all rhymes containing obstruents in the rhyming domain in that context. Thus, if a context is infrequent overall or infrequent in a given corpus, this procedure will factor out this effect. I considered four contexts: V_V (e.g. *fáta-láda*), V_# (*nás-extáz*), N_V (*únde-múnte*) and N_# (*tímp-skímb*). Figures (2)-(5) provide information on the relative frequency of voicing HRs in these contexts for four corpora (two translations and two original poetry collections):

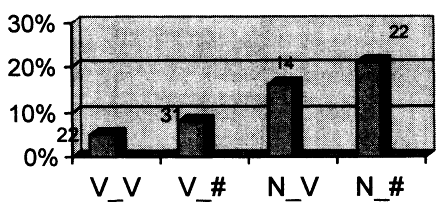


Figure 2: Voicing mismatches in Maiakovsky (Teodorescu)

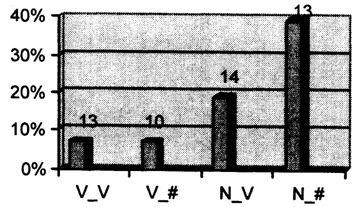


Figure 3: Voicing mismatches in Briusov (Kernbach)

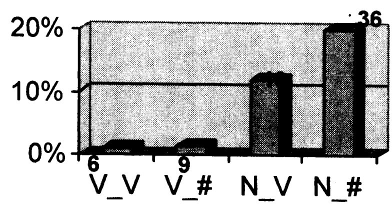


Figure 4: Voicing mismatches by context in Labis

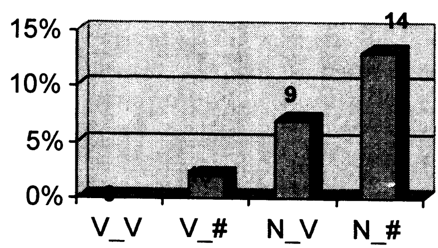


Figure 5: Voicing mismatches in Arghezi

For all four poets, there are significantly more voicing HRs in the post-N than post-V coda and significantly more voicing HRs in post-N codas than in post-N onsets. The differences between intervocalic and postvocalic HRs are not significant but a trend is constant across 3 corpora: there are more mismatches in the coda position. Thus, although the rhymes differ, the frequency of voicing HRs differs, and the frequency of the contexts in which the rhyming obstruents occur differs, the context-sensitive hierarchy of preference for voicing HRs is identical. This shared hierarchy is outlined in (6):

(6) $\Delta(\pm voice/V\_V) \geq \Delta(\pm voice /V\_\#) > \Delta(\pm voice /N\_V) > \Delta(\pm voice /N\_\#)$

Where does knowledge of this hierarchy come from? In a study of two Romanian speakers, Steriade and Zhang (2001) measured the voicing ratio (the duration of the voiced interval divided by the duration of the voiced+voiceless interval in a consonantal sequence) of voiced and voiceless stops (*b, d, g; p, t, k*) in six contexts: after three nasals (*m, n, ŋ*) and three vowels (*a, i, u*). The difference in voicing ratios of voiced and voiceless stops, in a given context, is an indication of their acoustic difference in that context. One result was that for both speakers, the difference in voicing ratios was significantly smaller after nasals than after vowels: in other words, one dimension of the acoustic distance between voiced and voiceless stops – the duration of the voiceless interval - is reduced after nasals. This is the effect of gradient post-nasal voicing (Hayes and Stivers 1996). The preference for postnasal voicing HRs found in Romanian poetry suggests that poets are aware of – and exploit - the perceptual effects of this phonetic process.

The same study found that the voiced-voiceless contrast is invariably realized as a VOT difference (consistently negative for voiced stops; up to 25 ms VOT for [p], [t]; and up to 55 ms VOT for [k]) in prevocalic position, whether post-nasal or not. The voicing contrast is also expressed in word-final releases, but variably: there are multiple realizations for both voiceless and voiced stops in that context. Thus the lack of consistent release-related cues to voicing may render the final contrast less discriminable. This is consistent with the finding that there are slightly more voicing HRs in post-vocalic final position than prevocalically; and with the very significant increase in HR frequency in the N_# context compared to the N_V context, observed in figures 2-5. Here too the poets' use of final voicing HRs reflects a context-sensitive, phonetically-informed similarity computation.

6. Backness HRs

All but one of the poets studied tolerate vowel quality mismatches. The most common vocalic HRs are the backness mismatches involving nasalized ũ-ɨ̃, ĩ-ɨ̃ pairs in pre-NC position: e.g. *karĩmb-plũmb* 'sole-lead' and *sĩmt-strĩmt* 'I feel-narrow'.

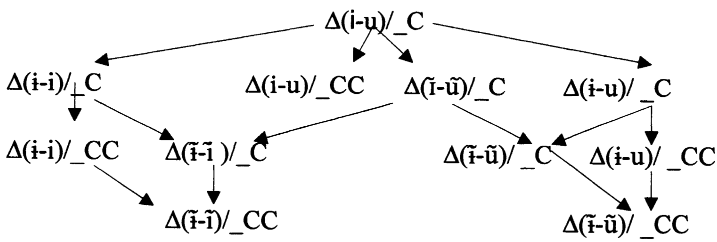
Romanian vowels are nasalized before nasals (Avram 1968); they are shorter before CC clusters. Nasalized *ĩ* and *ũ* are separated by a smaller F2 distance relative to oral *i-u* (Wright 1986), a result that carries over to Romanian. F2/F3 values for Romanian oral high vowels appear in (7).

(7) F2/F3 values for Bucharest Romanian oral *i, ɨ, u* (Suteu 1963)

	u	ɨ	i
F2	800	1500	2200
F3	2500		2900

The *u-ɨ, ɨ-i* distances shown above will be reduced by nasalization. If the distinctiveness of vocalic contrasts is in part a function of vowel duration, then the front/back distinctions in the shorter vowels before CC will be diminished relative to the longer vowels of the same quality that precede a single C. These three considerations (greater distance in F2 between *u-i* vs. *u-ɨ, ɨ-i*; the effect of short duration on vocalic distinctiveness; the effect of nasalization on distinctiveness of F2-based contrasts) combine to yield the following expected set of perceptually based similarity relations:

(8)



(8) identifies as least distinctive the contrasts between shortened *ɨ̃-ĩ* and *ɨ̃-ũ* before NC. The HR evidence identifies these as the most similar pairs.

A subset of the poets who admit HRs like *karɨ̃mb-plũmb* also rhyme *ɨ̃-ĩ* and *ɨ̃-ũ* before single nasals, as in *sũnʌ-tsʌrɨ̃nʌ* 'sounds-soil'. These HRs are much less frequent, as shown in figure (6), and as predicted by (8).

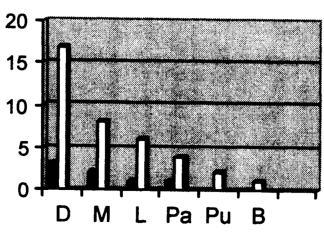


Figure 6: frequency of *ɨ̃-ĩ* and HRs *ɨ̃-ũ* by context:
Light columns: before _NC. Dark columns: before N.

A further subgroup of poets rhyme oral *ɨ-i* and *ɨ-u*, in specific contexts (_j, //r), as in *ɨ̃ntij-gutuj* 'first; quinces'. These cases are too rare to yield significant counts in each corpus but the contexts are significant, as both [j] and [r] influence vowel quality and thus are likely to diminish the perceptibility of the backness contrast. Only the most HR-tolerant poets (such as Maiakovsky's translator Cicerone Teodorescu) admit, rarely, oral *ɨ-i* and *ɨ-u* HRs in other contexts as well: an example is *hide-ude* 'ugly-pl; wet-pl'. Finally, *u* and *i* practically never rhyme; when they do (as in *pune-lumine* 'puts-lights'), it's in the context of an adjacent nasal. Although these frequency comparisons are informal and certain effects remain unexplored, they recapitulate many of the similarity relations in (8).

7. j-Ø mismatches

Romanian realizes word-final unstressed *i* as [j] in most contexts, after a vowel or a consonant. All poets studied allow C-Cj HRs like *nor-zborj* 'cloud; you-fly'. These are very frequent, as indicated by the figures in table (4): they represent more than a third of all HRs in the Shelley translation and about a quarter of the HRs in the translations of Briusov and Derjavin. In contrast, V-Vj HRs like *fade-baladej* 'insipid.pl-of the balad' are very rare. I have verified in the Labis corpus that this frequency difference between V-Vj and C-Cj HRs is not attributable to the frequency of word-final Cj and Vj. Labis has two V-Vj HRs and thirteen C-Cj HRs: figure (7) shows how these HRs compare to the overall frequency of Vj and Cj sequences in Labis's rhymes.

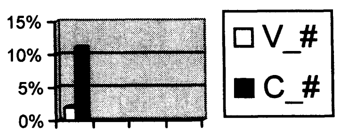


Figure 7: j-Ø HRs as a function of context in Labis
% = ratio of j-Ø HRs in a context to all j-final rhymes in that context

This data shows that Labis strongly prefers the C-Cj HRs to the V-Vj HRs: the relative frequency of line-final Cj and Vj is the same for Labis and thus cannot explain the rarity of his V-Vj HRs. The comparable difference between V-Vj and C-Cj HRs in all other corpora must be explained in the same way: poets tolerate a missing *j* much better if it is not adjacent to a vowel. Recall now the earlier comments on English *ez-ezd* HRs: Romanian C-Cj HRs are their direct counterparts[2]. They too are explained by the shared knowledge of the similarity ranking in (3).

8. Summary thus far

The last three sections have provided a sketch of the argument that establishes shared knowledge among Romanian poets for three similarity hierarchies – (3), (6), (8). It was also suggested that knowledge of these similarity relations is based on knowledge of perceptibility. We now consider how knowledge of the sound

[2] Romanian [j] is the surface realization of two very frequent suffixes: the plural and the 2nd pers. sing present. Other word final CC sequences are far less common in Romanian, hence the lesser opportunity for other C-Ø mismatches in word final position.

distributions in the Romanian lexicon interacts with the knowledge of perceptual similarity documented by the HR data.

9. Lexical knowledge does not affect similarity judgments

Recall that the major HR types (in (4)) do not correspond to alternations or distributional limitations. Below I list three productive Romanian processes: none gives rise to well-documented HRs. I discuss first the process highlighted .

(9) Productive segmental alternations lack HR counterparts

Process	Example	Restricted?	SR reflex? Attested?
t -> tˢ / _ i	*frate / fratˢ-ij* 'brother-brothers'	Derived environments	*lut-putˢ* unattested *fete-betˢe* unattested
s -> ʃ/ _i s -> ʃ/ _j	*pas/ paʃ -ij* 'step-the steps' *pas/ paʃ-j* 'step- steps'	Derived environments; native words Unrestricted	*kos - moʃ* unattested *waste-paʃte* very rare *deskiʃj-vis* very rare
ó ->wá/_C[-high] é ->eá/_C[-high]	*kot / kwat-e* 'elbow-elbows' *tem/ teamʌ* 'I fear-fear'	Derived environments; native words	*swarbʌ-tʃorbʌ* unattested *seamʌ-temʌ* unattested

I consider the hypothesis that the perceived similarity of a pair of strings is a function of its distributional status in the lexicon: in particular, I consider the possibility that members of an alternating pair will be perceived as functionally equivalent and that this will enhance their similarity (Hume and Johnson 2002) compared to non-alternating items. With this in mind, consider the extreme rarity of a HR type like *deskiʃj-vis* 'open.pl-dream', found only once in the entire corpus. The relevant facts are as follows: the palatalization of *sj* to [ʃj] is obligatory and thus surface [sj] is impossible. Further, most surface [ʃj] sequences – including the one in *deskiʃj* - correspond to /s-j/ inputs. Now when we unpack the effect of obligatory palatalization in *deskiʃj-vis,* we obtain a very popular HR type: the Cj-C variety discussed above. The question then is why the *ʃj –s* HRs like *deskiʃj-vis* are so rare, when HRs like *ʃj-ʃ* (like *uʃj–kʌuʃ* 'doors-muzzle') are among the most frequent. Perhaps the answer is to be found in the fact that any *ʃj-s* HR suffers from two mismatches: anteriority (*s* vs. *ʃ*) plus the added j-Ø difference. However HRs that cumulate two independently acceptable mismatches are very common in general. Just in Labis's collection – the poet who rhymes *deskiʃj* with *vis* - we find the following (with rhyming domains underlined): *strivind-simt, kind-strimt, atʃelor-dʒerurj, huruind-vint, bate-tatij, inimj-nimenj.* Thus the cumulative effect of feature differences does not explain why it is particularly *ʃj-s* that can't rhyme. The only explanation for this fact is the dissimilarity between *s-ʃ*: this pair almost never rhymes, in any context, *and their alternating status before i and j does not alter this fact.* We can conclude that alternation do not contribute, in this case, to the perception of similarity. The same can be shown for potential HRs generated by the automatic and robustly attested processes of coronal and velar palatalization before *j*: pairs like *t-tsj, z-ʒj, k-tʃj, g-dʒj* alternate but don't rhyme.

A distinct argument for the same point emerges when we consider the status of *i-ɨ* and *ɨ-u* in Romanian. The pair *i-ɨ* stands in near-complementary distribution: [ɨ] is rare, except after [r]; [i] is very frequent, except after [r], where it is rare in native forms. The pair *i-ɨ* alternate: in derived environments /i/ becomes [ɨ] after postvocalic [r]. The theme vowel of the 4th conjugation surfaces as [i] in *jub-i* 'love' but as [ɨ] in *ur-ɨ* 'hate'. Despite the distributional facts, HRs involving oral *i-ɨ* are rare, especially in 20th century poetry, as noted above. Compare now the pair *i-ɨ* with *ɨ-u*. Acoustically, the two pairs appear to be equally close (cf. 7), with the possible difference that *ɨ-u* is not differentiated by F3 values and thus might be perceived as more similar. But distributionally, there is a significant difference: unlike *i* and *ɨ*, *ɨ* and *u* neither alternate nor stand in near-complementarity. The question then is whether perceived similarity reflects the functional equivalence suggested by the distributional facts: if so, the alternating *i-ɨ* should rhyme more frequently. In the translation corpus we find 32 HRs involving the high pairs *i-ɨ* and *ɨ-u*: 28 of these occur before nasals (the context of nasalization) and 24 occur before CC (the context of vowel shortening). This is exactly as predicted by (8). Only 4 HRs involve oral vowels (*farfuzʌ-gizʌ, kʌtsuje-tʌmɨje, pis-rɨs, azvɨrle-turle*) and only one (*pis-rɨs*) involves an alternating vowel pair, *i-ɨ*. Thus functional equivalence does not affect similarity. If we consider all HRs involving a high vowel, nasalized or not, we find that one or both vowels are adjacent to [r] in 9/23 *u-ɨ* HRs and in 5/9 *i-ɨ* HRs. The conclusion is this: a neighboring [r] probably alters the similarity evaluation – perhaps because it lowers F2-F3 values - but does so equally for *u-ɨ* and *i-ɨ*. Recall though that [r] conditions only the distribution of the *i-ɨ* pair. Had distributional or alternating status affected the evaluation of similarity (as suggested by Hume and Johnson (2002)) we should have been able to observe this effect. We did not, as in the previous case.

10. Phonetic knowledge

In this paper nothing has been said about the source of similarity knowledge. The suggestion is that similarity judgments are rooted in the speaker/hearer's understanding that the perceptibility of contrasts varies in context. We can identify three perceptual factors that model the judgments discussed thus far: I'll refer to these as relative distance, the subset effect and cue duration. Relative distance refers to the case in which the contrasts x-y and z-w are realized on a shared auditory dimension D. If the distance in D between x-y is smaller than that between z-w then, all else equal, x-y is more similar. This characterization applies to the differences listed in (10), all of which correlate with the similarity judgments underlying HR use as discussed above.

(10) Relative distance effects: F2 distance
Δ_{F2}(u-i) > Δ_{F2}(u-ɨ), Δ_{F2}(i-ɨ);
Δ_{F2}(u-ɨ) > Δ_{F2} (ũ-ɨ̃); Δ_{F2}(i-ɨ) > Δ_{F2} (ĩ-ɨ̃)

The subset effect is a subcase of relative distance: if the pair x-y is differentiated by a proper subset of the acoustic dimensions differentiating z-w, then, all else equal, x-y is more similar. This characterization applies to the possible difference between *u-ɨ* and *i-ɨ*, whether oral or nasalized: the *u-ɨ* HRs are more frequent. M.R.Paraschivescu lacks *i-ɨ* HRs altogether. This may correlate with the absence of any F3 difference between *u-ɨ*.

Finally cue duration refers to case in which the pairs x-y and z-w are differentiated by some shared cue, which is however expressed over a longer period of time in z-w than in x-y. Then, all else equal, x-y is again the more similar. This characterization applies to the high vowel HRs (more frequent for shorter vowels) and to the post-nasal voicing HRs (the shorter postnasal voiceless closure yields a voiceless stop that is more similar to a voiced one).

I anticipate that an explicit model of perceptual similarity can be formulated by assigning weights to these factors and other comparable ones. This however must be left for future work.

11. Narrow lexical override

Suppose that naïve speakers of a language are aware of a relative similarity relation Δ(x-y)> Δ(z-w) and, as suggested earlier, they infer from this knowledge a correspondence ranking Corr(x-y)>>Corr(z-w). But suppose also that the language provides overt data showing that the opposite ranking is necessary to describe existing alternations. I have suggested thus far that knowledge of similarity exists, that it is shared among speakers even in the absence of lexical evidence for it, and that it is employed in loan adaptation. Now we must consider the cases in which the lexical evidence is at odds with the grammatical rankings inferred from knowledge of similarity. The case presented below is not entirely realistic but serves to illustrate the nature of the problem.

In Steriade and Zhang (2001), we argued that rhyming identity is computed by a set of correspondence conditions, which map elements of one rhyming domain (RD) onto corresponding elements of another line's domain. We further argued that the relative frequency of HR types reflects the rankings of different RD correspondence constraints: the frequent HRs violate low ranked RD constraints. The ranking itself is derived form similarity rankings, in accordance with the P-map hypothesis. Consider now the consequences of this proposal.

A common Romanian HR type involves post-tonic height mismatches, as in *rekínilor-kabínelor* 'of the sharks-of the cabins'. This HR, which looks like the rhyming equivalent of post-tonic reduction, violates Ident [±high]/$\sigma_{[+stress]}$_(RD). If HR frequency is an indication of the low rank of the relevant RD constraint then Ident[±high]/$\sigma_{[+stress]}$_ (RD) is low ranked. Consider now a conceivable but virtually unattested HR type, discussed earlier: *tot-hotsj* 'all-thieves'. This is the rhyming equivalent of assibilation and it violates Ident[±strident](RD). The very substantial frequency difference between "posttonic reduction" HRs and "assibilation" HRs suggests Ident[±strident](RD) >> Ident[±high]/$\sigma_{[+stress]}$_(RD).

The lexicon of Romanian shows that the opposite ranking holds among IO correspondence constraints: /t/ becomes [ts] before [j] as shown by alternations like *tot* 'all.sg' vs. plural *totsj* /tot-i/. The ranking is **tj* (a preliminary characterization of the phonotactic that triggers assibilation), **[+high]#* (the constraint causing final *i, u* to become glides), Ident[high]/$\sigma_{[+stress]}$_(IO) >>Ident[strident](IO). We focus on the ranking of correspondence needed to block a failed candidate like **tóte* for UR */toti*. Lowering posttonic /i/ in **tóte* will satisfy the phonotactic **tj* and will avoid the correspondence violations entailed by glide formation (*toti* → *totj*) and affrication (*totj* → *totsj*). To select *totsj* as the winning candidate we must then rely on Ident[high]/$\sigma_{[+stress]}$_(IO) >>Ident[strident](IO). But we have seen above that the opposite ranking holds for RD correspondence.

The question is this: if one of these correspondence rankings is inferred from knowledge of similarity, then clearly the other one is not. What then is the source of the other ranking? How do the two come to coexist in one grammar?

It is useful now to return to a point made at the beginning of this study about the nature of evidence for phonological relations. Learners of Romanian find out about the *ti* → *tsj* assibilation process by learning the words of Romanian. The same learners – if they are poets or readers of poetry – lack any comparably overt evidence about tolerable HRs. In that case then we must assume a hidden source of evidence: this, we proposed, is the knowledge of similarity. Under this interpretation the assibilation example shows a familiar fact: languages can acquire alternations – perhaps through the successive, telescoping action of local changes – whose synchronic result is to relate sounds viewed by speakers as highly dissimilar. It appears that, whatever role the judgments of similarity play in phonology, they do not inhibit such historical evolution: the dissimilarity of *t* and *ts* did not block the chain of events leading to assibilation in Romanian. This much is familiar.

There are also two less familiar points lurking here. First, if the learner infers rankings of correspondence from similarity relations, then it must also be that overt lexical evidence for the opposite ranking takes priority: if the P-map suggests Ident[±strident](IO)>>Ident[±high]/$\sigma_{[+stress]}$_(IO) and the lexical evidence shows the opposite, as we have seen, then the P-map based inference is blocked. The P-map then should be viewed as one inference mechanism, potentially overriden by other inference mechanisms, rather than as an absolute ban on certain linguistic relations. In this case, the lexical evidence of *t-ts* alternations overrides the similarity based inference that the two sounds cannot relate as correspondents.

However the Romanian evidence also shows that the lexical evidence for a given correspondence ranking is *narrowly interpreted* by learners: it is interpreted as bearing strictly on the lexical domain where the evidence originates. Romanian speakers do not view alternating pairs as more similar, just because they alternate: the simple fact that assibilation causes *t* to become *ts*, doesn't alter the similarity judgment, which HR selection reflects. The lexical evidence is narrowly interpreted: it requires a certain ranking of IO correspondence, but nothing further follows from this ranking. In contrast, it appears that similarity rankings are broadly construed, as bearing on all domains of correspondence – whether rhyming correspondence or the correspondence between a non-native input and its nativized correspondent - subject to lexical override.

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Appendix: The translation corpus:

	Poet	Translator	Year	Total rhymes	HRs	HR frequency
B	Valeri Briusov	V. Kernbach	1961	761	131	17%
D	Gavril Derjavin	V.Teodorescu	1964	1386	156	11%
K	I.A.Krylov	T.Arghezi	1957	2258	15	7%
M	Vladimir Maiakovski	C.Teodorescu	1970	3230	315	10%
P	Aleksandr Pushkin	G.Lesnea et al.	1957	1865	46	.02%
S	P.B.Shelley	P.Solomon	1957	350	30	9%