What is American English /l/ *Really*?
Author(s): Josh Guenter
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JOSH GUENTER
University of California, Berkeley

Many authors (De Camp 1945; Kahn 1980: 150-1; Wells 1982: 49; Veatch 1991: 55ff; Harris 1994: 257ff; Guenter, Lewis & Urban 1999) have made some claim to the effect that American English /r/ is not just phonetically a glide but phonologically a glide as well, based on the following reasons:

1) American English /r/ is phonetically a central approximant [ɹ], akin to the central approximants [j] and [w], and not a true sonorant consonant like [n] or [m].

2) A reduced set of vowels contrast before /r/, as few as 4 or 5 in some dialects, as in *ear, air, are, oar, poor*. All the American English vowel phonemes /i ɪ e ɛ æ u ʊ o ɔ ɑ ʌ aj aw ɔj/ can occur before most consonants.

3) Stressed syllabic equivalents of /j w r/ exist (the vowels [i u ɚ]) in words like *sea, sue,* and *sir*, but no other stressed sonorants exist. For example, the stressed syllable *[sn̩] is not possible in American English.

4) Like /j/ and /w/, /r/ is not found after tautosyllabic diphthongs. There are no sequences like tautosyllabic *[ajw] or *[owj] in English. Historical sequences of [ajr] or [awr] have resyllabified to [ajɚ] and [awɚ], so this constraint holds. However, sonorants like /n/ can be found after tautosyllabic diphthongs in words like *line* and *gown*.

5) The flap [ɾ] is found after [j w r] so words like *lighter, louder,* and *carder* are [lajɾɚ], [lawɾɚ], and [kɑɹɾɚ] respectively. But this flap does not occur after consonants like [n], so *wander* is [wɑndɚ], not *[wɑnɾɚ].

6) Final /t/ and /d/ are sometimes deleted after true consonants, but they are never deleted after /r/, vowels, and the glides /j w/ (Guy 1980). Thus, the word *want* can be pronounced [wɑn], but the word *cart* is always [kɑɹt], never *[kɑɹ].

The question this raises is: How does /l/ pattern? Given that /l/ and /r/ sounds frequently pattern together cross-linguistically, we might expect /l/ to pattern with /r/ (and the other glides /j/ and /w/), or with the true sonorant consonants like /n/ or /m/. Kahn (1980: 120ff) contrasts /l/ with /r/, claiming that /r w j/ form a natural class, but that /l/ is in the class with the other consonants. However, Veatch (1991: 67-9) says that in some American English dialects /l/ may have shifted from being a coda consonant into a "glide slot" alongside /r w j/.

The purpose of this paper is to see if there are any ways in which /l/ of any dialect of American English is claimed to pattern like /r w j/ and not like the true

consonants, and to particularly determine if this is true for one particular dialect (California English, henceforth CE).

Data:

   Speakers: All speakers were native speakers of California English between the ages of 19 and 29. Three were Female Northern Californians (FN), five were Female Southern Californians (FS), three were Male Northern Californians (MN), and three were Male Southern Californians (MS).

   Recording: Speakers were asked to read a list of words spoken in a frame sentence of "They said {x} twice." Each sentence was read once. The recordings were then digitized using a Kay CSL Model 4300.

   This data, alongside claims made in the literature for other American English dialects will be used to see if /l/ patterns like the glides /r w j/ or like the true consonants based on the criteria given above.

First Question: Is /l/ phonetically a central approximant?

   Answer: No, it's a lateral consonant, usually the velarized alveolar lateral [ɫ].

   However, Ash (1982) has found post-vocalic /l/ to be the velar central approximant [ɰ] in parts of Pennsylvania.[1]

   CE? Six of the fourteen speakers show post-vocalic /l/ as [ɰ]. My evidence for this is a lack of drop-off of energy after the production of the vowel. A true consonantal /l/ should have some degree of obstruction causing a loss of amplitude, while there would be no obstruction in the production of a central approximant. This difference can be seen in Speaker 04's pronunciation of the word *L* (3, below. This and all subsequent figures are at the end of the paper after the references.) in which there is clear drop-off of amplitude, indicating a consonantal /l/. However, in Speaker 08's pronunciation of the word *L* (4), there is no drop-off of amplitude, indicating a non-consonantal /l/.

Second Question: Does stressed syllabic /l/ occur?

   Answer: No. Stressed syllabic equivalents of /j w r/ occurs as [i u ɚ] in *beat, boot, burn*, but no other segment in English has this variant (Kahn 1980: 150-1).

   However, Kantner & West (1938: 328) say that /ɪl/ in the word *milk* could be pronounced [mɫk]. Bailey (1985: 237) claims the sequence /ʊl/ in words like *pull* can be [ɫ:]. Wells (1982: 551) claims stressed syllabic velar [L:] occurs as a variant of /ʊl/ in some Southern American dialects. Hammond (1999: 143) claims both /ʊl/ and /ʌl/ can be pronounced as syllabic laterals in some dialects.

   CE? I found no syllabic /l/ corresponding to /ɪl/ or /ʌl/ sequences in the data. However, I found the sequence /ʊl/ in the word *pull* to be [ɫ] for five of the fourteen speakers. My evidence for this is a steady state nucleus in the word *pull*. If this word truly has a sequence of a vowel followed by a consonant, we should see some difference between the vowel and the consonant. However, the stressed syllabic [ɫ] should only have a steady state. I also compared speakers' pronunciations of the word *pull* to their pronunciations of the second syllable in the word *couple*. The second syllable of the word should have a syllabic /l/, hence just a steady state nucleus.

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[1] Thomas (2000) concurs that vocalization of post-vocalic /l/ exists, but that it usually rounded, hence [w], not [ɰ]. I am still using the symbol [ɰ], however, to avoid confusion with unambiguous [w].

We can see the difference between a syllabic /l/ versus a sequence of a vowel followed by a consonant by comparing Speaker 02's pronunciation of the words *pull* and *couple* with Speaker 09's pronunciation of these same words. In Speaker 02's pronunciation of the word *pull* (5) we can see a clear distinction between the vowel [ʊ] and the following consonant [ɫ]. This is different from their steady state nucleus in the second syllable of *couple*. However, in Speaker 09's pronunciation of the word *pull* (6), we see a very steady state nucleus with no distinction between a vowel and following consonant. This is very much the same as Speaker 09's pronunciation of the second syllable of the word *couple*, the only difference being the duration.

Third Question: Is there lack of contrast in vowels before /l/?

Answer: No. All standard vowel phonemes of American English /i ɪ e ɛ æ u ʊ o ɔ ɑ ʌ aj aw ɔj/ occur before /l/ in the words *eel, ill, ale, L, Al, pool, pull, hole, all, doll, hull, isle, owl, oil* respectively.

However, merger of contrast for many sets of vowels before /l/ in many dialects of American English have been reported. Specifically, /i/ and /ɪ/ may merge in Utah, Western Pennsylvania/Ohio, Texas/Oklahoma, and North Carolina; /u/ and /ʊ/ may merge in Utah, Western Pennsylvania/Ohio, Maryland, Texas/Oklahoma, North Carolina; /u/, /ʊ/, and /o/ may merge in Western Pennsylvania/Ohio; /e/ and /ɛ/ merge in Texas/Oklahoma and California; /ʌ/ and /ɔ/ may merge in Ohio and Texas; /æ/ and /ɛ/ may merge in California; and, /ʌ/ and /o/ may merge in California[2].

CE? I found no mergers of /i-ɪ/, /u-ʊ-o/, /e-ɛ/ or /æ-ɛ/. No merger of /ʌ-ɔ/ could be found because the vowel [ɔ] does not occur as a distinct phoneme in CE, having merged in every position with /ɑ/. However, I did find evidence of mergers of /u-ʊ/ and /ʌ-o/ before /l/ for some speakers. My evidence for these mergers is a perception test. In this test, all utterances of the words *pull, pull, hole,* and *hull* spoken by all 14 speakers (56 utterances total) were played to a panel of 13 judges. All the judges were either trained linguists or native Californians. Words were played in a random order. Judges were asked to identify what words they heard by circling the appropriate word on a pre-printed sheet of paper. The results are in (1), below.

From the table below, we can see that there was one situation where a large majority (> 75%) of the judges identified an utterance of the word *pull* as *pool*, and two situations where a large majority of the judges identified utterances of the word *hull* as *hole*. There were no instances in which a majority of judges identified an utterance of the word *pool* as *pull* or an utterance of the word *hole* as *hull*. I conclude from this that merger of some vowels before /l/ has taken place in CE. Since these mergers are unidirectional, we can simply say that for some speakers two sound changes have taken place:

ʊ > u / _ l
ʌ > o / _ l

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[2] Sources for these mergers are: Utah (Labov *et al.* 1972; Di Paolo 1988); Western Pennsylvania/Ohio (Johnson 1971; Hankey 1972; Thomas 1989; Dickey 1997; McElhinny 1999), Texas/Oklahoma (Bailey *et al.* 1991; Bernstein 1993; Bailey *et al* 1993), North Carolina (Thomas 2000), Maryland (Bowie 1998), California (Veatch 1992).

(1)
Data is listed by Speaker on the left-hand column. Bold face indicates words that a significant majority of speakers categorized "incorrectly."

word read:	*pool*		*pull*		*hull*		*hole*	
word circled:	pull	pool	pull	pool	hull	hole	hull	hole
S01	1	12	13	0	3	10	10	3
S02	0	13	13	0	0	13	10	3
S03	1	12	9	4	4	9	13	0
S04	0	13	*1*	*12*	3	10	7	6
S05	1	12	6	7	2	11	*3*	*10*
S06	4	9	13	0	5	8	*1*	*12*
S07	1	12	13	0	3	10	5	8
S08	1	12	12	1	5	8	8	5
S09	5	8	12	1	6	7	13	0
S10	2	11	13	0	5	8	6	7
S11	2	11	12	1	2	11	9	4
S12	0	13	13	0	2	11	10	3
S13	4	9	13	0	5	8	6	7
S14	0	13	12	1	2	11	8	5

Evidence for these mergers can also be seen looking at sound spectrograms of the speakers' recordings. In (7) we can see Speaker 04's pronunciations of the words *pool* and *pull*. They are virtually the same with regard to formant frequencies, having only a difference of duration. This can be contrasted with Speaker 14's pronunciations of *pool* and *pull* (8). The two words are clearly different with regard to formant frequencies. The word *pull* has a higher F2 throughout than the word *pool*, indicating a more centralized and/or less rounded vowel.

In (9) we can see Speaker 06's pronunciations of the words *hole* and *hull*. They are virtually the same. This can be contrasted with Speaker 03's pronunciations of the same two words (10). The words are clearly different with regard to formant frequencies. The word *hull* has a higher F2 throughout than the word *hole*, indicating a more centralized and/or less rounded vowel.

Fourth Question: Is /l/ allowed after tautosyllabic diphthongs?
Answer: Yes. Kahn (1980: 122) has [tajl], [tɔjl] for *tile, toil,* etc.
However, Bronstein (1960: 201) has [fajəl, skawəl, fɔjəl] for *file, scowl, foil.* Veatch (1991: 68) counts two syllables in *owl* and *oil*. Lavoie & Cohn (1999) gave 6 subjects a questionnaire in which they were supposed to count the syllables of a list of words. Half of their subjects said words like *file* and *oil* were monosyllabic. Half said they had more than one syllable (subjects were allowed the possibility of claiming a word had 1.5 syllables).
CE? Speakers read the words *Nile, denial, line,* and *lion*. We expect *Nile* to be monosyllabic, coming from Latin *Nilus* (the *–us* suffix would have dropped) and *denial* to be bisyllabic (after the /n/), coming from the Old French stem *denie* plus the suffix *–aile*. We expect the word *line* to be monosyllabic, coming from Old English *line* (the final syllable would have dropped) and the word *lion* to be bisyllabic, coming from Middle French *lioun*. Hence, if /l/ is not allowed after tautosyllabic diphthongs, and resyllabification has occurred, then the word *Nile* should rhyme with *denial*. Furthermore, both of these words should pattern syllabically like *lion*, not *line*.

Speakers also read the words *owl, avowal, gown,* and *MacGowan.* We expect *owl* to be monosyllabic, coming from Old English *ule* and we expect *avowal* to be bisyllabic (after the /v/), coming from the Old French verb *avouer* plus the suffix *–aile.* We expect *gown* to be monosyllabic, coming from Old French *goune,* and the name *MacGowan* to be bisyllabic (after the /g/), based on its spelling.

We can see from (11) (Speaker 03's pronunciation of the words *line* and *lion*) what the difference between a monosyllabic and bisyllabic word is. In the monosyllabic *line,* F2 of the diphthong /aj/ rises to a peak immediately before the following sonorant /n/. In the bisyllabic *(de)nial,* F2 of the diphthong /aj/ rises to a peak, then there is a period of decline of around 95ms before the sonorant /n/.

In (12), we can see that Speaker 03's pronunciation of the words *Nile* and *(de)nial* are virtually clones. Furthermore, both follow the pattern of the bisyllabic *lion,* not the monosyllabic *line,* in that F2 of the diphthong /aj/ rises to a peak and then declines for a period, instead of ending abruptly at the peak. All fourteen speakers show the same patterns as Speaker 03 with regard to the words *Nile* and *denial.*

In (13) (Speaker 11's pronunciations of the words *gown* and *MacGowan*), we can see what the difference between a monosyllabic and a bisyllabic word is with regard to words with the diphthong /aw/. The pattern is opposite to that of *lion* and *line.* In the monosyllabic word *gown,* F2 of the diphthong /aw/ declines to a low point immediately before the following /n/. In the bisyllabic *(Mac)Gowan,* F2 of the diphthong /aw/ declines to a low point, then there is a period of raising of F2 (around 80 ms) before the /n/.

In (14), we can see that Speaker 12's pronunciation of the words *owl* and *(av)owal,* while not being the virtual clones we saw for *Nile* and *(de)nial* above, both show the bisyllabic pattern in that F2 of the diphthong /aw/ declines to a low point before raising for a period. Thirteen of the fourteen speakers have this pattern. A possible exception is Speaker 06. We can see a bit of a difference in Speaker 06's pronunciations of *owl* and *(av)owal* (15). Speaker O6's pronunciation of *owl* seems to follow the monosyllabic pattern of *gown* in that F2 of the diphthong /aw/ declines to a low point and then ends. Speaker 06's pronunciation of *(av)owal* seems to follow the bisyllabic pattern more in that there is a period of around 107ms after F2 of the diphthong /aw/ reaches its low point (though no raising is obvious).

I conclude from this that resyllabification of /l/ after tautosyllabic diphthongs is very widespread in CE. This sound change has probably spread completely after the diphthong /aj/.[3] It has no spread as fully after the diphthong /aw/, but there is some evidence of it. Hence, the statement that /l/ is not allowed after tautosyllabic diphthongs has some support.

Fifth Question: Are there flaps (from underlying /t/ and /d/) after /l/ before an unstressed syllable?

Answer: No. Flaps may occur after /r/ in words like *forty or parting,* but not after /l/ in words like *shelter* or *filter* (Kahn 1980: 93-5; Harris 1994: 217-8). I can find no claims to the contrary in the literature.

CE? All fourteen speakers were asked to pronounce the word *boulder.* Eleven of the speakers show a true stop [d] in this word. This can be seen in

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[3] And likely after the diphthong /ɔj/, such that words *oil* and *boil* would rhyme with *royal,* though I have no such utterances to test.

Speaker 03's pronunciation of *boulder* (16). There is a period of silence accompanied by low-level voicing between the two syllables, indicating a true stop. However, three of the speakers display a different pattern. This can be observed in Speaker 06's pronunciation of *boulder* (17). There is no period of silence corresponding to a true stop between the two syllables here. Instead, all formant frequencies continue between from the first syllable to the second, with perhaps a very brief flap-like closure before the [ɚ].

I am not claiming that there is a flap in Speaker 06's pronunciation of *boulder*. But, there is something different from a true stop. This may be an effect of vocalization of the previous /l/, and hence a way in which /l/ is behaving like a glide, not like a true consonant. If we cut Speaker 03's utterance of *boulder* in the silent portion and play the part after the cut, it sounds impressionistically like [dɚ]. If we cut Speaker 06's utterance of *boulder* at an equivalent place and play the part after the cut, it sounds impressionistically like [dlɚ][4]. The laterality continues through to the production of the [ɚ] as we can see by the continuance of F3. I am not entirely sure how to describe this phenomenon phonetically. Perhaps it is a lateral flap. I am not positive that it points to a way in which American English /l/ behaves like a glide for some speakers. It is interesting to note, however.

Sixth Question: Do final /-t/ and /-d/ ever get deleted after /l/.

Answer: Yes, unlike after /r w j/ and vowels, after which /t/ and /d/ are always preserved (Guy 1980). I can find no claims to the contrary in the literature.

CE? I have no evidence to test this claim. All my data is gathered from artificial frame sentences, not the running text in which this deletion occurs. Additionally, there is the problem of negative evidence. We would have to have a large corpus in which /t/ and /d/ delete regularly after other consonants but never after /l/ to say with any certainty that /l/ is behaving like a glide and not a true consonant in this respect.

Conclusion: The answers for all the questions regarding the phonological status of /l/ for all the California English speakers tested in this paper are given in (2), below.

The checklist below can help us answer our original question: What is American English /l/ *really*? It appears that some speakers such as 03, 07, 11, 12, and 14 are more conservative. For these conservative speakers, /l/ still patterns most like a true consonant, not a sonorant. For other speakers, such as 05, 06, 10, and 13, /l/ patterns more like a glide, and may be well on its way to joining /r/, /w/, and /j/ in a natural class. I think that for now, /l/ is best analyzed as a consonant, not a glide. However, even for the most conservative speakers, there is still a way in which /l/ patterns like the glides /r w j/ and not a true consonant in that it is not allowed after tautosyllabic diphthongs.

Veatch (1991: 68) claims that all of the sound changes concerning /l/ are the result of /l/ shifting into the glide slot. The lack of complete coincidence of the sound changes above show that the cause/effect relationship is the other way around. Various sound changes have taken place which result in /l/ patterning like a glide. These sound changes are in the process of spreading as I write.

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[4] This was confirmed by the attending audience at the BLS 26 conference which included many distinguished phoneticians.

(2)

Speaker	Group	vocalic l?	stressed syllabic l?	u/ʊ merge?	ʌ/o merge?	Nile bisyllabic?	owl bisyllabic?	flapping?
01	MS	-	-	-	-	√	√	-
02	MN	-	-	-	-	√	√	-
03	MS	-	-	-	-	√	√	-
04	FN	-	-	√	√	√	√	-
05	FS	√	√	-	√	√	√	-
06	MN	√	√	-	√	√	-	?
07	FN	-	-	-	-	√	√	-
08	MS	√	-	-	-	√	√	?
09	FS	√	√	-	-	√	√	-
10	FN	√	√	-	√	√	√	?
11	MN	-	-	-	-	√	√	-
12	FS	-	-	-	-	√	√	-
13	FS	√	√	-	√	√	√	-
14	FS	-	-	-	-	√	√	-

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Joshua S. Guenter
1203 Dwinelle Hall
University of California, Berkeley
Berkeley, CA 94720-2650
jguenter@socrates.berkeley.edu