Optimizing by accident: *A/an* allomorphy and glottal stop

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Abstract. English *a/an* appears to be a textbook case of phonologically optimizing allomorphy: it conspires to yield CV syllables instead of hiatus ([%] ə apple) or extra codas (*an book). But does this effect need to be explained in the synchronic grammar—e.g., is *an* selected before vowels *in order to* provide an onset? I argue that it cannot be, based on the selection of *an* before emphatic glottal stop (an [ʔ]ápple). I provide a serialist analysis of *a/an* in which allomorphy strictly precedes phonology and cannot 'see' surface phonetic forms.

Keywords. phonologically optimizing allomorphy, opacity, PF, serialist models

1. Introduction. In PHONOLOGICALLY OPTIMIZING ALLOMORPHY (POA), the distribution of allomorphs yields less-marked surface forms than would be found otherwise. English *a/an* is a well-known example: the fact that *an* shows up prevocalically and *a* elsewhere, rather than vice versa, seems to conspire to produce well-formed CV syllables (*an egg, a book*) rather than extra codas (*an book*) or onsetless syllables ([%]*a egg*).[1]

 The question I pose here is: Does phonologically optimizing allomorphy need to be explained in the synchronic grammar? In other words, is it part of English speakers' tacit knowledge of language that they select *an* before vowels *because* this produces better syllables? Or do speakers simply acquire an arbitrary rule inserting *an* before vowels, which happens to help produce CV syllables?

 The question is important because of its consequences for the architecture of the grammar. If *an* really is chosen prevocalically *because* this yields better surface forms, then this means that allomorphy in general can 'see' the output of syllabification and other phonology, as assumed in many constraint-based architectures (e.g. McCarthy & Prince 1993, Mascaró 1996). But in many serialist architectures (e.g. Embick & Noyer 2001), where allomorphy strictly precedes phrasal phonology, the idea that allomorphy could look ahead to the surface output is unformulable.

 These two opposing views are summarized in (1) (see Paster 2015 for related discussion):

(1) Does POA need to be explained in the grammar?
  a. Yes. Allomorphy can 'see' and be directly influenced by the output of phonology. Optimizing effects are an inherent part of speakers' knowledge of allomorphy.
  b. No. Allomorphy strictly precedes phrasal phonology and cannot 'know' what its surface effects will be. Optimizing effects are accidental; POA has no special status in the synchronic grammar.

 As the title of this paper suggests, I will be endorsing option (1b), drawing on evidence from the opaque interaction of *a/an* with the English glottal stop.

[1] In this paper I focus on the 'standard' English allomorphy pattern with *an* before vowels and *a* elsewhere, but it is well-known that many dialects of English have optional or invariant *a* before vowels. See Gabrielatos et al. (2010) and references cited there for more information on these dialects, and see Pak (in press:§5) for a proposed analysis.

2. Two proposals. For the sake of concreteness, let's consider two concrete analyses of *a/an*, one based on assumption (1a) (POA explained in the grammar) and one based on assumption (1b) (POA by accident).

Mascaró (1996) offers an analysis in the spirit of (1a), in which *a* and *an* are equally faithful candidates and the choice between them comes down to syllable markedness constraints—a classic emergence-of-the-unmarked (TETU) effect:

(2)　　Mascaró (1996)

{a,an} book	ONSET	NO-CODA		{a,an} egg	ONSET	NO-CODA
☞ a.book	*	*		a.egg	**!	*
an.book	*	**!		☞ a.n egg	*	*

Notice that the optimizing nature of *a/an* is directly explained here: *an* is chosen before vowels *because* it provides an onset for the following syllable, and *an* is never selected before consonants because this would incur an extra NO-CODA violation.

In Pak (in press), I offer a very different analysis of *a/an* in the spirit of (1b). I assume the serialist architecture in Figure 1 (see Embick & Noyer 2001), where allomorph choice is done at a specific point in the PF derivation—notably, *before* (re)syllabification and other phonology.
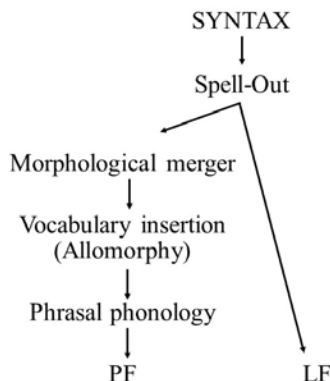

Figure 1. Architecture of the grammar

The *a/an* pattern is derived in steps. The Vocabulary Insertion rule in (3) inserts the underlying allomorphs of the indefinite article (D[-def]): /æn/ before vowels and /ɛ/ elsewhere. The surface forms [ən] and [ə] are then derived by phonological Vowel Reduction (4). Finally, late in the phrasal phonology, Resyllabification applies. Derivations of *an egg* and *a book* are shown in (5).[2]

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[2] Deriving the *a/an* pattern in two steps allows us to account for the four surface variants of D[-def] that many dialects have: the strong (stressed or isolation) variants [ej] and [æn] as well as the weak counterparts [ə] and [ən]. The [ej] variant is derived by Tensing (which precedes Vowel Reduction): V[-low -stress] → [+tense] / __{V,#} (Chomsky & Halle 1968) (see §4.2). Tensing and Vowel Reduction are also responsible for strong-weak alternations in other English function words, e.g. *for* (fɔɹ/fəɹ), *can* (kæn/kən), *the* (ði/ðə), *to* (tu/tə) (see e.g. Selkirk 1995). Most previous analyses treat *a/an* as a two-way alternation and do not recognize that its strong and weak forms are distributed in the same way as other function words. See Pak (in press) for more discussion.

(Of course, for dialects or grammars that have only the weak forms of *a/an*, the allomorphy rule in (3) can be replaced with one that simply inserts /ən/ before vowels and /ə/ elsewhere.)

The allomorphy rule in (3) is preceded by a Local Dislocation rule that cliticizes D[±def] to the following word; this effectively makes *a/an* part of the same word as its complement, so that Vocabulary Insertion (and subsequent Tensing and Vowel Reduction) can apply word-internally. See Pak (in press) for additional discussion. Local Dislocation is assumed but not explicitly shown to be the first step of all the *a/an* derivations in this paper.

(3)   Vocabulary Insertion (allomorphy) rule for English *a/an:*
        D[-def] ↔ æn / __V
               ↔ ε / elsewhere

(4)   Vowel Reduction: V[-stress **-tense**] → ə   (cf. Chomsky & Halle 1968:111ff)

(5)   <u>an egg</u>   <u>a book</u>
        a.   Allomorphy   æn egg   ε book
        b.   Vowel Reduction   ən egg   ə book
        c.   Resyllabification   ə.n egg   ə. book

   Notice that under my proposal, any optimizing effects of (3) must be accidental—(3) simply states that /æn/ is inserted before vowels and /e/ elsewhere, not that /æn/ is inserted before vowels in order to create better syllables. Nor is there any overarching principle stating that allomorphy should be optimizing in general. Indeed, it is not at all clear how such a principle could be formulated within the architecture in Figure 1: since allomorphy applies before phrasal phonology, there is no way for an allomorphy rule to be conditioned by surface phonological form. This means that under my proposal, (3) is no more (or less) expected than a hypothetical anti-optimizing *a/an* rule, inserting /æn/ before consonants and /e/ elsewhere (6):

(6)   Hypothetical anti-optimizing rule for English *a/an*:
        D[-def] ↔ æn / __C   (*an book, an child, an ticket…*)
               ↔ ε / elsewhere   (*a egg, a apple*, *a umbrella…*)

   Is it a problem that my proposal does not rule out anti-optimizing alternations like (6)? On the one hand, it is true that cases of optimizing allomorphy outnumber cases of anti-optimizing allomorphy in the literature. Indeed, the fact that optimizing effects recur cross-linguistically is appealed to as one of the primary arguments for explaining POA in the grammar (option 1a):

   '[T]he linguistic generalization that the allomorph is chosen because it yields an
     unmarked structure should be incorporated into grammatical theory, since it rests on
     an extensive empirical base.' Mascaró (2007:716)

Some other well-known cases of POA from the literature are listed in (7); note that all of these alternations seem to conspire to yield CV syllables, similar to English *a/an*.[3]

(7)   More examples of POA (Mascaró 1996, 2007; Lee 2009):
        a.   French prenominal adjectives (*beau* mari*, bel* enfant ('good-looking husband/child')
        b.   Korean nominative (sok-*i* 'inside-NOM', so-*ka* 'COW-NOM')
        c.   Catalan personal definite (*en* Wittgenstein*, l'*Einstein)
        d.   Northwest Catalan definite (*lo* pá, *l* ámo, 'the owner/bread')
        e.   Ribagorçan Catalan demonstrative (*ésto* ʎiβre, *ést* ɔme 'this book/man')
        f.   Moroccan Arabic 3SG possessive (ktab-*u*, xtˤa-*h* 'his book/error'

   On the other hand, non-optimizing and anti-optimizing allomorphy are also attested; two well-known examples are given in (8):

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[3] Not all POA involves syllable structure, of course; see Mascaró (2007) for cases involving *NÇ and assimilation.

(8)   a.   Tzeltal perfective: /-oh/ after monosyllabic stems, /-ɛh/ after polysyllabic stems
             (Mascaró 2007:715-716)
        b.   Haitian Creole definite: /-a/ after V, /-la/ after C
             (Embick 2010:125-129; Bonet, Lloret & Mascaró 2006))

To account for (8)a and other non-optimizing alternations, Mascaró (2007) argues that there are two kinds of allomorphy, internal and external, with only the latter driven by phonological markedness constraints. Paster (2015:237-240), however, points out various complications that result from this addition to the grammar.

It is also important to recognize that at least some optimizing effects can be attributed to the historical development of an alternation, in which case they do not necessarily need to be explained in the synchronic grammar. For example, when English *ān* ('one') became grammaticized and started alternating with *a* in the 13th century, the alternation was probably phonological in nature (Vennemann 1974):

(9)   Phonological /n/ elision in Middle English: an → a / __C

Crisma (2009:132-133) points out that preconsonantal *an* (e.g. *an book)* was common at this early stage. Later, this phonological alternation was reanalyzed as allomorphy, with *a* as the default. Given this history, the fact that Modern English *an* is selected before vowels (3) rather than before consonants (6) is exactly what we would expect—and there is no need to explain the pattern by granting POA a special status in the synchronic grammar.

In the remainder of this paper I present a different kind of argument against option (1a). Recall that in the architecture I assume (Figure 1), allomorphy strictly precedes phrasal phonology. This means that it is possible, in theory, for allomorphy to be conditioned by an *input* form that is later altered and rendered opaque by a phrasal phonological rule (e.g. flapping, resyllabification). In the next section I show evidence for exactly this kind of interaction with *a/an*.

3. Opacity effects. Mascaró's (1996) analysis in (2) makes the following prediction:

(10)   Prediction of (2): The /n/ in *an* should always surface as an onset. (The /n/ in *an* cannot surface as a coda because *an* would always be beaten by *a* under these circumstances.)

However, this prediction is not borne out. There is a context where *an* is selected even though its /n/ cannot be a coda—namely, when the following vowel has a glottal stop.

(11)   a.   What an ʔídiot.
        b.   That's an ʔánt, not a flea.

The glottal stop here is what I call the EMPHATIC GLOTTAL STOP (EGS). It optionally precedes a stressed syllable-initial vowel in English and is more likely to occur when the stress is particularly prominent, e.g. in contrastive utterances like (11)b (although it can occur in non-emphatic speech as well, as long as the following vowel has some stress). See also Borroff (2007:166) and Garellek (2013:ch5).

Crucially, the /n/ in *an* in (11) must be a coda, since English does not allow Cʔ onsets. But under Mascaró's analysis in (2), the choice of *an* in (11) is inexplicable. Since allomorphy is determined by surface phonological constraints, *a/an* should be able to 'see' the EGS and 'know' that the EGS will block the /n/ in *an* from surfacing as an onset. The incorrectly-predicted allomorph here is therefore *a*, which incurs fewer NO-CODA violations than *an*.

(12) Prediction of (2) (not borne out)

{a,an} ʔídiot	Onset	No-coda
an.ʔídiot	**	**!
💣 a.ʔídiot	**	*

Under my proposal, however, utterances like (11) are straightforwardly explained as rule-ordering effects. If we assume that emphatic glottal stops are added in the phrasal phonology, it follows that they will not yet be visible at the stage when *a/an* allomorphy applies (since allomorphy strictly precedes phrasal phonology; Figure 1). A derivation of *an* [ʔ]*ídiot* and its non-emphatic counterpart *an idiot* is shown in (13), with Allomorphy (Vocabulary Insertion) at stage (a) and EGS insertion at stage (c).

(13) Derivation of (9)a and its non-emphatic counterpart
    a. Allomorphy (3)   æn. ídiot   æn. idiot
    b. Vowel reduction (4)   ən. ídiot   ən. idiot
    c. EGS insertion   ən. ʔídiot   -----
    d. Resyllabification   -----   ə.n idiot

It is important to recognize that examples like (11) are by no means anomalous. Speakers of many dialects of English have confirmed that the glottal stop here sounds natural and is not restricted to artificially slow or disconnected speech. In a study of connected speech produced by North American English-speaking adults in CHILDES (MacWhinney 2000), *an* was followed by EGS 25% of the time (238/961).[4]

Furthermore, EGS cannot be dismissed as an 'extragrammatical' phenomenon. It is true that the status of the glottal stop in English is unclear—particularly regarding whether it is a phoneme, segment, feature or gesture (see Borroff 2007 for discussion)—and it might be tempting to conclude that English glottal stop is a random, unsystematic, or 'low-level phonetic' phenomenon that plays no role in the grammar proper. But such a conclusion would be inappropriate, because whatever we say about the *status* of emphatic glottal stop, its *distribution* is not at all random.

Consider the following contrast:

(14)   a. an ʔápple, an ʔáttic, an ʔéighty-year-old, an ʔócean, an ʔóil rig, an ʔálley
         b. *Annʔapolis, *fanʔatic, *Canʔadian, *a nʔotion, *annʔoying, *anʔalysis

The emphatic glottal stop follows an apparently exceptionless constraint, which makes crucial reference to syllable structure:

(15)   Generalization: English EGS can occur only on a *syllable-initial* stressed vowel.

This condition is automatically met if a stressed vowel is utterance-initial; hence the well-known tendency for V-initial English citation forms to have an initial glottal stop. If a stressed vowel is immediately preceded by a consonant (C), however, then whether (15) is met depends on whether C can be syllabified as a coda (C.V, as opposed to .CV)—which in turn depends on *morpheme structure*. In (14)a, the /n/ before each EGS is morpheme-final, which enables it to be syllable-final. In the minimally contrasting examples in (14)b, however, EGS is impossible because the preceding /n/ is *not* morpheme-final and thus cannot be syllabified as a coda.

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[4] Based on a sample of adults' utterances from the Braunwald (1993), Ervin-Tripp, MacWhinney (2000), Nelson (1989), Providence (Demuth, Culbertson & Alter 2006), Sawyer and Snow corpora.

The same point is illustrated in (16). The utterance can only be parsed as in (16)a, with a morpheme/syllable break between /n/ and [ʔ]. The parse in (16)b is impossible.

(16)   That's [ənʔów].
      a. 'That's an O.'
      b. * 'That's a *no*.'

The ungrammaticality of (14)b and (16)b is quite clear. There is some interspeaker variation with respect to other aspects of EGS—e.g. whether it can occur between vowels morpheme-internally (17)a, or whether it can occur in C.V contexts across various kinds of morpheme boundaries (between elements of a compound, after a Level 1/2 prefix, etc.) (17)b.

(17)   Interspeaker variation with EGS:
      a. *Morpheme-internal V.ʔV:* %reʔálity, %Minneʔápolis, %Croʔátia
      b. *C.ʔV across various types of morpheme boundaries:*
          Ethan ʔÁllen, mandarin ʔórange, whatʔéver, forʔéver, withʔóut,
          %unʔáble, %disʔhónest, %inʔóperable, %inʔéptitude

But the interspeaker variation in (17) has no effect on the current proposal. Note that (15) describes a necessary but not sufficient condition on EGS; i.e., it defines a context where EGS *cannot* occur, but makes no predictions about whether or where it should occur otherwise. The important point for current purposes is that the general ban described in (15) holds, quite consistently—presenting a serious challenge to the idea that EGS is not part of the grammar proper. Regardless of whether EGS is a phoneme, segment, feature or gesture, English speakers have clearly acquired some knowledge about where they can and cannot use it. As far as I can see, there is no way to reconcile the idea that the /n/ in *an* must surface as an onset (10) with the fact that EGS can appear in *an ʔapple* but not in *Annʔapolis*.

Before moving on, it is worth pointing out that EGS is not the only phenomenon that presents a challenge to (2). In Pak (in press) I offer a similar analysis of opacity effects in an /h/-dropping dialect of Cockney English described in Hurford (1972, 1974), where *a* is selected before *heart, half*, etc. even though the /h/ is later dropped, producing surface hiatus. Again, this pattern is mysterious under (2), but can be attributed to a rule-ordering effect under my proposal:

(18) | | | *a(n)* heart | *a(n)* artist | *a(n)* cart |
|---|---|---|---|---|
| a. | Allomorphy | ɛ hɑːʔ | æn ɑːtɪst | ɛ kʰɑːʔ |
| b. | Vowel Reduction | ə hɑːʔ | ən ɑːtɪst | ə kʰɑːʔ |
| c. | /h/-dropping | ə ɑːʔ | ----- | ----- |

Another problem for (2) is presented by various dialects of English where *an* optionally surfaces as a syllabic nasal /n̩/. The difference between /ən/ and /n̩/ is easily perceivable after /t/ in American English, because /n̩/ blocks Flapping and cause the /t/ to be released nasally.

(19)   I've got an ocean.
      Variant (a): ajvgɔɾənoʃən   (*an* realized as /ən/, /t/ in *got* realized as flap)
      Variant (b): ajvgɔtⁿn̩oʃən   (*an* realized as syllabic nasal, /t/ in *got* released nasally)

Already there is a problem for the proposal in (2): since *an* is realized as a syllabic nasal here, it is not providing an onset for the following /o/, and according to (2) *an* should never be selected unless its /n/ surfaces as an onset. (Even if we were to treat the /n̩/ as a third allomorph of D[-def], we would be at a loss to explain why /n̩/ would ever be selected over *a* under the analysis in (2).)

Under my proposal, the selection of *an* is as expected, since the allomorphy rule in (3) states only that *an* is selected before vowels and says nothing about how it is ultimately syllabified. The /n̩/ is derived from *an* by Syllabic Nasal Formation (cf. Wells 2011),[5] which precedes and bleeds Flapping. In some dialects (including my own), Syllabic Nasal Formation applies only to morpheme-internal /əN/ sequences, producing the contrasts in (20)-(21). A derivation is shown in (22), with the (19)a variant in the first column and the (19)b variant in the second.

(20)   a. I've got an ocean.   [ajvgɔɾənoʃən, ajvgɔtⁿn̩oʃən]
        b. I've got a notion.   [ajvgɔɾənoʃən, %ajvgɔtⁿn̩oʃən]

(21)   a. I want an arrow.   [ajwã̃ɾəneɹow, ajwãntⁿn̩eɹow]
        b. I want a narrow.   [ajwã̃ɾəneɹow, %ajwãntⁿn̩eɹow]   (e.g. a narrow-sized shoe)

(22)

	got an ocean (a)	got an ocean (b)	got a notion
a. Allomorphy	gɔt. æn. o.ʃən	gɔt. æn. o.ʃən	gɔt. ɛ. no.ʃən
b. Vowel reduction	gɔt. ən. o.ʃən	gɔt. ən. o.ʃən	gɔt. ə. no.ʃən
c. Syllabic Nasal Form.	-----	gɔt. n̩. o.ʃən	-----
d. Resyllabification	gɔ.tə.no.ʃən	-----	gɔ.tə.no.ʃən
e. Flapping	gɔ.ɾə.no.ʃən	-----	gɔ.ɾə.no.ʃən

4. Alternative analyses. We have seen that Mascaró's (1996) prediction in (10)—that *an* should be selected iff its /n/ surfaces as an onset—fails to be borne out. But this finding does not automatically doom the POA-explaining approach endorsed by Mascaró (1996) and others. Is there a way to reanalyze *a/an* that would preserve the spirit of (1a) without making the problematic stipulation that *an* must provide an onset? I consider three alternative approaches, and conclude that the first two are unsatisfactory on empirical grounds while the third requires a significant modification to the underlying theory.

4.1. THE DEFAULT CONSTRAINT. Lee (2009) presents a theory-internal problem with Korean *i/ka* allomorphy that resembles some of the problems we observed with *a/an* in §3. The nominative marker in Korean is realized as *-i* if the stem ends in a consonant and *-ka* if the stem ends in a vowel (*pap-i* 'rice-NOM', *anae-ka* 'wife-NOM')—producing a CV-favoring pattern that seems to yield nicely to an analysis like (2). The problem that Lee (2009) points out, however, is that the *-i* allomorph is chosen even when the preceding stem ends with /ŋ/ (e.g. waŋ-i 'king-NOM'), and /ŋ/ cannot be an onset in Korean. The selection of *-i* rather than *-ka* is unexplained here, just as the selection of *an* rather than *a* was unexplained in *an ʔídiot* (11)-(12).

(23)   Lee (2009:421)

waŋ-{i,ka}	*ŋ-ONSET	*VV[6]	NO-CODA	ONSET
waŋ.i			*	*!
☞ waŋ.ka			*	
wa.ŋi	*!			

To explain this pattern while preserving the spirit of (1a), Lee proposes a DEFAULT constraint ('A phonologically simpler allomorph is selected'), which is ranked above ONSET and NO-CODA but below *ŋ-ONSET in Korean—thus forcing the choice of *-i* rather than *-ka* after /ŋ/.

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[5] Wells (2011) points out that speech rate, preceding segment and stress also affect the likelihood of syllabic nasal formation (syllabic nasals are more likely after /t/ and /d/ than after /k/, for example).

[6] *VV does not play a role in the tableaux shown here, but is needed to account for the selection of *-ka* after V-final hosts, e.g. *anae-ka* (otherwise DEFAULT would cause *-i* to be selected across the board).

(24)   Lee (2009:423)

waŋ-{i,ka}	*ŋ-ONSET	*VV	DEFAULT	NO-CODA	ONSET
☞ waŋ.i				*	*
waŋ.ka			*!	*	
wa.ŋi	*!				

While the overselection of Korean *-i* in *waŋ-i* seems at first sight to be similar to the overselection of English *an* in *an ʔídiot*, Lee's DEFAULT constraint cannot solve the English *a/an* problem. This is because *a*, not *an*, is the default *a/an* allomorph. Not only is *a* phonologically simpler than *an*, but *a* is also the allomorph that shows up in 'elsewhere' contexts like (25), where the indefinite article has no complement in the syntax (see also Rotenberg 1974:27ff):

(25)   I think we should try a… (*silence*) Oh, I forgot what I was going to say.

4.2. HIATUS RESOLUTION. Another way to preserve the POA-explaining spirit of (1a) might be to propose another phonological markedness constraint—higher-ranked than ONSET and NO-CODA—that could be held responsible for the *a/an* pattern. One possible candidate would be a hiatus-barring constraint like *əV, which could account for *a/an* as well as the general absence of word-internal /əV/ in English (as suggested in passing by Blumenfeld 2012).

(26)

{a,an} book	*əV	NO-CODA
☞ a book		*
an book		**!

{a,an} egg	*əV	NO-CODA
a egg	*!	*
☞ an egg		*

Under this modification to Mascaró (1996), the problem introduced by the syllabic-nasal alternant of *an* (*I've got* /n̩/ *ocean*) in (19) could potentially be resolved. The syllabic-nasal alternant could be attributed to a constraint like *ən]m ('no morpheme-final ən'), which would outrank ONSET in certain styles or registers. (In other styles/registers, *ən]m would be ranked lower than ONSET, causing *an* to be chosen.) Crucially, unlike in Mascaró (1996), *a* would never be selected before *ocean* here, due to high-ranking *əV.

(27)

{a, an, n̩} ocean	*əV	*ən]m	ONSET	NO-CODA
a ocean	*!			*
a.n ocean		*!		*
☞ n̩ ocean			*	*

This reanalysis is intended merely to serve as an illustration. Whether it introduces problems of its own (e.g. /n̩/ as a third allomorph; the constraint *ən]m) turns out to be largely beside the point—because the other problems discussed in §3 remain unsolved.

The selection of *a* rather than *an* before dropped /h/ in Cockney English (18) remains unexplained, since forms like [əɑːʔ] 'a heart' directly violate *əV.

The selection of *an* before EGS (*an ʔídiot*) also remains unexplained. Why is *an* selected here, given that the glottal stop would suffice in itself to break the hiatus and satisfy *əV?

(28)

{a,an} ʔídiot	*əV	ONSET	NO-coda
an.ʔídiot		**	**!
☀ a.ʔídiot		**	*

The selection of *an* before EGS is particularly hard to explain given the robust tendency for glottal stop to serve as a hiatus-breaker in English—e.g. in phrasal hiatus and in varieties of English with non-alternating prevocalic *a* (as well as non-alternating *the, to*, etc.; see Britain & Fox 2009):

(29)   a. Tuscaloosa ʔAlabama
        b. I'd like a ʔegg.   (grammars with non-alternating *a*)
        c. I want th[ə] ʔother one.   (grammars with non-alternating *th*[ə])

Yet another problem for the *əV hypothesis is that, even in 'standard' *a/an*-alternating varieties of English, there is a context for potential hiatus where *a* nevertheless wins over *an*— before the vowel-initial pause-fillers *uh/um* (Pak, in press).

(30)   a. I'd like a um [ejəm] … a large coffee.
        b. We-um have a-uh [ejə] pyro-techniques team. (Clark & Fox Tree 2002:103)

The potential hiatus here is usually resolved by either [ʔ] or the glide [j] following the 'strong' variant of *a* [ej]—but crucially, not by *an.* (We found only one instance of <u>*an* uh/um</u> in CHILDES, vs. 38 <u>*a* uh/um</u>; see footnote 5 for details.)

(31)   a. I'd like {əʔ, ej} um…
        b. I'd like an (*ej, [%]*əʔ) umbrella.

If [ʔ] and [ej] are generally available as hiatus-breakers, why don't they get used in (31)b? More generally, if *a/an* allomorphy really sees whatever is on the surface, why would it distinguish between <u>*an umbrella*</u> and <u>*a um*</u>… in the first place?

As with the emphatic glottal stop, it may be tempting at first to argue that pause-fillers are 'outside the grammar proper' and that the contrast in (31) therefore does not need to be explained. This idea, however, cannot be maintained. Pause-fillers must be part of the grammar proper at some stage, because are visible to at least one other phenomenon that is uncontroversially part of English phonology—namely, Flapping:

(32)   Bu[ɾ] um… I think tha[ɾ] um….

Flapping is a classic 'late' or 'postlexical' phonological phenomenon, applying post-resyllabification across strong phrasal boundaries (*Get your jacke*[ɾ]*, it's cold out*) (Kaisse 1985:ch2, Bermúdez-Otero 2004, 2007). Unlike *a/an*, Flapping makes no distinction between pause-fillers and other words (compare (31) to (33))—a contrast that is mysterious under any proposal where *a/an* allomorphy is guided by surface phonological constraints.

(33)   a. I'd like tha[ɾ] um…
        b. I'd like tha[ɾ] umbrella.

The unavoidable conclusion seems to be that while some aspects of English grammar (Flapping) are truly surface-oriented, meaning among other things that they are conditioned by the output of phrase-level resyllabification, *a/an* allomorphy is not. Neither Mascaró's (1996) account nor the modified *əV account above can explain the contrasts in (14) or (31)/(33), because both mistakenly treat *a/an* as a surface-oriented alternation.

Under my proposal, the selection of *a* before *uh/um* is explained as follows. I assume that pause-fillers are not present in the syntax proper but added in the PF component (see Rotenberg 1978, Kaisse 1985:ch1 for precedent for this idea). Allomorphy applies early in PF (Figure 1), crucially before pause-fillers are added. In a context where the indefinite article has no

complement (*I'd like a/an…*), the elsewhere allomorph /ɛ/ is selected (3), and because this /ɛ/ is phrase-final it becomes tensed by the rule in (34)b (see footnote 2). Pause-fillers are added later (34)d, creating a potential hiatus context that is subsequently resolved by glide insertion (34)e.[7]

(34)   Derivation of *a um…*
  a. Allomorphy   ɛ
  b. Tensing   e   (V[-low -stress] → [+tense] / __{V,#})
  c. Vowel reduction   -----
  d. Pause-filler insertion   e. um
  e. Glide insertion/Resyllab.   e.j um

Unlike *a/an*, Flapping sees pause-fillers because it is a late rule of the phrasal phonology, following both pause-filler insertion and resyllabification:

(35)   Derivation of *that um…*
  a. Vocabulary insertion   that   (no allomorphy)
  b. Pause-filler insertion that. um
  c. Resyllabification   tha .t um
  d. Flapping   tha.[ɾ] um

4.3. STRATAL OT. It might be possible to account for the opacity effects discussed in §3 and §4.2 under an approach where traditional OT constraints are organized into serially ordered strata (Kager 1999:§9.2; Bermúdez-Otero 2004, 2007). In stratal OT, (i) the output of Stratum *n* serves as the input for Stratum *n+1;* (ii) each stratum has its own constraint ranking; and (iii) new structure can be introduced with each stratum.

A/an allomorph selection would be assigned to an early stratum, perhaps by means of the constraint ranking in (26) (with high-ranking *əV). Whatever allomorph was selected at this early stage (e.g. *an* in *an apple*) would then serve as the input to the next stratum, and faithfulness constraints would prevent the alternant allomorph from ever surfacing again. The opaque forms *a um*, *an* [ʔ]*ídiot* could presumably be explained by allowing EGS and pause-fillers to be introduced on later strata as well.

Under a stratal OT approach, the POA-explaining hypothesis introduced in §1 would need to be reformulated as follows:

(36)   a. Original POA-explaining hypothesis:
            An is selected before vowels because this produces better syllables *on the surface*.
        b. Revised POA-explaining hypothesis:
            An is selected before vowels because this produces better syllables *at some stage*.

Various questions arise at this point. First, does the modification in (36)b satisfactorily preserve the spirit of (1a), or does stratal OT represent a game-changing theoretical departure? (See Kager 1999:§9.2.)

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[7] As shown in (31), it is also possible for *a* to surface as [ə] in this context (*I'd like* [əʔ] *um…*). This form can be derived as follows. As pointed out in footnote 2, I assume that some grammars do not have the strong forms [ej], [æn], but instead have an allomorphy rule that directly inserts /ən/ before vowels and /ə/ elsewhere. In contexts like *I'd like a…*, the elsewhere /ə/ allomorph will be selected, and [ʔ] will later be added by the same epenthesis rule as that responsible for (29). Speakers who variably utter [ej]-*um* and [əʔ]-*um* can be assumed to switch between competing grammars corresponding to various styles or registers (Embick 2008). See Pak (in press:§5) for more discussion.

Second, given that POA can be rendered opaque under hypothesis (36)b—and recall that in our CHILDES study, adults had EGS after *an* 25% of the time (§3)—what would cause a child to arrive at the stratal-OT analysis described above? Somehow, children would need to be able to filter out all the opaque forms in their input, focus on the optimizing tendency of the transparent forms, and conclude that *a/an* is driven by phonological well-formedness constraints (*əV, ONSET, NO-CODA) at an early stratum. But is this analysis really easier to acquire than the purely serialist analysis I laid out in §2, where allomorphy strictly precedes phonology and the contexts for *a/an* insertion are memorized?

At this stage I have not seen convincing evidence for prefering the stratal OT approach over mine, especially since we already know, as pointed out in §2, that: (i) it is possible for allomorphy to be non-optimizing or even anti-optimizing (8), and (ii) there are plausible historical explanations for at least some optimizing effects (9).

I leave further consideration of these questions for future work.

5. Conclusion. Proposals that attempt to explain the optimizing effects of *a/an* in the synchronic grammar (e.g. Mascaró 1996) rely on giving allomorphy access to surface phonology. But if *a/an* really is driven by surface well-formedness constraints, then we should consistently see each allomorph producing the preferred (less-marked) structures on the surface. This prediction is not borne out. I showed that:
- *an* is selected in e.g. *an ʔídiot*—presenting a challenge to the idea that *an* is selected 'in order to provide an onset' or 'in order to avoid hiatus' (§3);
- *a,* rather than *an*, is selected before vowel-initial pause-fillers (*I'd like a uh…*)—presenting another challenge to the idea that *an* is selected in order to avoid hiatus (§4.2).

I was at pains to demonstrate that neither emphatic glottal stops nor pause-fillers can be dismissed as extragrammatical phenomena. I pointed out that:
- the distribution of the emphatic glottal stop is tightly constrained by morpheme structure (*an ʔapple* vs. **anʔalysis*), indicating that it is indeed part of speakers' grammatical knowledge; and
- pause-fillers are visible for Flapping (*bu*[ɾ] *uh, tha*[ɾ] *uh*), indicating that they are present in the phonology at some point in the derivation (just not at the early stage when allomorphs are inserted).

Opacity effects like those described here constitute strong evidence against the idea that *a/an* allomorphy is driven by surface phonological markedness constraints, but are well-explained in a serialist framework where allomorphy sees an early version of the phonological structure rather than the final surface PF. Since *a/an* seems at first sight to be a textbook example of POA, this study raises questions about whether other reported cases are truly surface-optimizing, and in turn, whether optimizing effects should be explained in the synchronic grammar.

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