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Quentin Dabouis

# Is the Adjectival Suffix *-al* a Strong Suffix?

## 1. Introduction<sup>1</sup>

1 Outside of the approach introduced by Guierre (1979), few studies on English phonology have sought to give an extensive account of English stress by using quantitative data (Collie 2007, 2008; Wenszky 2004). Using a restricted set of a given class of words (e.g. Chomsky & Halle 1968: 81, only provide 15 example adjectives in *-al* to illustrate the rule they propose)<sup>2</sup> might lead to oversimplification or inaccuracy. Without a corpus study, it is impossible to establish the **productivity** of a given class, the **efficiency** of the rule applying to it (if any) and the list of **exceptions** to the rule (if any). These are concepts which have been widely used in Guierre's approach, whose main characteristics will be presented in §2. Any corpus analysis requires a theoretical framework in order to interpret the data, and we will adopt Fournier's (1998, 2010) definition of what a strong suffix is for the present study. In § 3, we will present the reasons which have lead us to study *-al*, a suffix that has been the object of special treatments in most extensive works on English stress. Then, we will present how we constituted our corpus (§4) and how we analysed it, subset by subset (§5-6). Eventually, the overall results will be discussed and compared with the classical weight-based analysis of this suffix's stress behaviour (§7).

## 2. Theoretical Approach

### 2.1 The Guierrian School

2 The "Guierrian School" is an approach which was introduced in the seventies by Guierre (1979). Its two main characteristics are the use of pronouncing dictionaries<sup>3</sup> to study the phonology of English and the use of orthography when necessary (e.g. elements such as consonant geminates, vocalic digraphs or final mute <e> are taken into account).<sup>4</sup>

3 Within that approach, only three levels of stress are acknowledged:

- primary stress (annotated ['] or /1/)
- secondary stress ([,] or /2/)
- no stress (/0/)

4 English stress is also described as being regulated by the following four general stress principles (Fournier 2007, 2010):

1. Every lexical unit<sup>5</sup> has one and only one primary stress.
2. There can be no sequence of two stresses within a lexical unit.
3. No lexical unit can begin with two unstressed syllables.
4. Syllables which receive neither stress /1/ nor stress /2/ are unstressed.

5 In this paper, we will make a distinction between derived and non-derived entries, and therefore need to specify what we mean by derivation. Following Fournier (2010: 39), we will consider that the "base is the closest form attested in the English vocabulary". This means that, even though the base and its corresponding derivative are usually connected semantically, it may not be the case (e.g. *universe* → *university*). In the rest of the paper, "derived entries" will refer to suffixed units formed by suffixation to a free base. In the case of suffixation, two types of derivation are acknowledged:

- juxtaposition (e.g. *origin* → *original*; *mayor* → *mayoral*; *nature* → *natural*)
- substitution (e.g. *colossus* → *colossal*; *inferno* → *infernal*; *puberty* → *pubertal*)

6 Suffixes can be attached to free bases (e.g. *continent* → *continental*) or bound bases (e.g. *infern-* + *-al*). Therefore, words like *mortal* are seen as being non-derived but suffixed. Such cases raise the question of how far suffix recognition should go. How can we distinguish a suffix from an ending that just happens to look like a suffix? We adopt the view that suffixes

are categorisers (Aronoff 1976: 71; Marchand 1969) and therefore that it is the association of a specific sequence of phonemes (or graphemes) with a specific category<sup>6</sup> which allows us to identify whether we are dealing with a suffix or an ending.

## 2.2 Vowel Qualities and Values

7 In the analyses below, we will use the terminology displayed in Table 1.

**Table 1. Correspondences between orthography and pronunciation for stressed vowels (after Fournier, 2010: 98)<sup>7</sup>**

V <sup>r</sup>	V̂	Monographs	V̄	V̄ <sup>r</sup>	Digraphs
r-coloured vowel	checked vowel	<V>	free vowel	r-coloured free vowel	<V̄V̄>
[ɑ:]	[æ]	<a>	[eɪ]	[eə]	<ai, ay / ei, ey>
[ɜ:]	[e]	<e>	[i:]	[ɪə]	<ea, ee / ie**>
[ɜ:]	[ɪ]	<i>	[aɪ]	[aɪə]	<ie*, ye>
[ɔ:]	[ɒ]	<o>	[əʊ]	[ɔ:]	<oa**, oe*>
[ɜ:]	[ʌ (o)]	<u>	[(j)u:]	[(j)ʊə]	<e(a)u, ew/ ue**>
			[ɔ:]	[ɔ:]	<au, aw>
			[u:]	[u:]	<oo>
			[ɔɪ]		<oi, oy>
			[aʊ]	[ɔ: (aʊə)]	<ou, ow>

\* : final \*\* : non-final

8 The table shows that each orthographic vowel can have:

- four<sup>8</sup> different *values* when it is a monograph (e.g. r-coloured, checked, free and r-coloured free);
- two different *values* when it is a digraph (e.g. free and r-coloured free).

9 The possible realisations of a given orthographic vowel (e.g. [ɑ:], [æ], [eɪ], [eə] for <a>) are said to share a *quality*. The value of a given vowel is conditioned by the context in which it appears, the detailed rules are given in Fournier (2010).<sup>9</sup> A reviewer points out that the terms “checked” and “free” are often used to describe syllable structure. This is not what Fournier’s (2010) system does, even though these different values are often correlated with syllable structure. In his system, values correspond to a specific relationship between spelling and pronunciation, e.g. V̂: <a> - [æ], <e> - [e]; V̄: <a> - [eɪ], <e> - [i:]...

10 Crucially, the Guierrian School sees vowel values as being predictable from the context surrounding vowels (mainly the right-hand consonantal context). Therefore, vowel values are phenomena that the theory seeks to predict along with the position of stresses. This means that stress patterns cannot be argued to depend on the presence of long vowels, contrary to what is proposed in most generative approaches which see vowel values as lexical (see §7 for further discussion).

## 2.3 Strong Suffixes and Strong Endings

### 2.3.1 Strong Suffixes vs. Neutral Suffixes

11 In the literature on English stress, it is commonly admitted that English has two types of suffixes. The names, descriptions and lists of these suffix classes vary considerably between theories, but there are constants.

12 Some suffixes affect the position of stress, and have other properties which differ from suffixes which do not affect stress. After Fournier (2007), we shall call these suffixes “strong suffixes”, but they are called “stress-imposing suffixes” in pronouncing dictionaries, “stress-placing suffixes” (Burzio 1994), “Class I suffixes” (Siegel 1974), “Level I suffixes” or “stem-level suffixes” in Lexical Phonology (Kaisse & Shaw 1985; Kiparsky 1982) and the theories preserving the idea of stratification like Stratal OT (Bermúdez-Otero & McMahon 2006; Bermúdez-Otero 2012). In generative phonology, this distinction was based on the distinction

made in early works like Chomsky & Halle (1968) between suffixes associated with the “+” boundary (stress-affecting suffixes) and those associated with the “#” boundary (stress-neutral suffixes). Strong suffixes can be attached to bound roots and free roots alike and they tend to be vowel-initial whereas stress-neutral suffixes attach only to free roots and tend to be consonant-initial.

- 13 The formal description of what these suffixes “do” and the theoretical apparatuses which have been proposed vary considerably. That variation can partly be explained by the range of phenomena that a theory is trying to account for and many phenomena can be linked with affix classes (e.g. alternations, allophony, semantic compositionality, affix ordering; see Benua (1997: §5.2.2) and Giegerich (1999: Ch. 2) for discussion of some of these phenomena). The Guierrian School mainly seeks to account for two phenomena: the placement of stresses and the values taken by stressed<sup>10</sup> vowels. Let us consider two definitions, from two Guierrian authors, which show where part of the problem lies.

Some final sequences apply an absolute constraint by fixing primary stress immutably on a given syllable” (Trevian 2003: 55).

Strong endings impose direct computation, i.e. the relevance of the unit’s structure and only that structure” ( Fournier 1998).<sup>11</sup>

- 14 Based on the common observation that words derived with these strong suffixes share properties with non-derived words (e.g. Luick’s rule<sup>12</sup> applies to them), it has been proposed that the rules regulating stress in both derivatives with strong suffixes and non-derived words take place at the same “level” or in the same phonological domain, either because of idiosyncratic properties of suffixes or because of their segmental structure (Raffelsiefen 2015). Some suffixes are associated with stress patterns which are not typical of simplex words (e.g. “French” auto-stressed suffixes like *-eur/euse*, *-aire*, *-ette*, *-esque*, or words in *-ic*<sup>13</sup>, which are always stressed on their penultimate syllable), whereas other words with different strong suffixes have stress patterns which are comparable to those of simplex words (e.g. adjectival suffixes associated with penultimate stress when preceded by a consonant cluster: *attentive*, *elemental* ≈ *adventure*, *coriander*, antepenultimate stress for a number of suffixes such as *-ity*, *-ify*, or *-(at)ion*: *acidify*, *vanity* ≈ *ambassador*, *seminar*). Strong suffixes with non-typical stress patterns should most likely be accounted for in terms of idiosyncratic suprasegmental properties of suffixes, which is compatible with Trevian’s (2003) definition or Selkirk’s (1980) proposal that some suffixes have a lexically stored stress foot structure. However, this analysis cannot be extended to strong suffixes which are associated with stress patterns that are typical of simplex words.

- 15 Fournier (1998) analyses all strong suffixes as sharing the property of triggering what he calls “**direct computation**”, i.e. the fact that the placement of primary stress for derivatives is not influenced by the position of stresses in their base. In contrast, neutral suffixes trigger “**computation by reference**”, i.e. stress preservation from the base. Moreover, he argues that when the resulting stress pattern is the same as that of simplex words with a comparable structure, it is not possible to demonstrate that strong suffixes do anything but trigger a direct computation of stress. This contradicts Trevian’s (2003) view that they would fix stress on a given syllable, which seems to be based on the observation of a correlation, not on a demonstration. The two definitions differ when analysing a case such as *pro'cedure* [i:] → *pro'cedural* [i:]. Even if the derivative’s stress pattern conforms to the general proparoxytone pattern proposed by Trevian, his model does not account for the difference between this case and a case for which Luick’s rule applies (e.g. *'nature* [eɪ] → *'natural* [æ]). Therefore, the definition of a strong suffix which is adopted here will be Fournier’s (1998, 2010).

### 2.3.2 Suffixes and Endings

- 16 We can only demonstrate that direct computation applies if there is a suffixation, but it does not mean that the trigger is necessarily suffixation. As Guierre (1979) points out, certain “endings” constitute such triggers. For example, some adjectival suffixes are associated with a penultimate stress pattern when they are preceded by a consonant cluster and may not have any effect on pronunciation when this is not the case. Additionally, and this is of particular

relevance to our study of *-al*, some suffixes trigger direct computation when they are preceded by a certain suffix (e.g. *-ival*, *-inal*, *-iacal*, *-inous*, *-ulous*). Therefore, direct computation is triggered by the association of two elements (the suffix and either a consonant cluster or another suffix) and not one alone. Henceforth, these structures have been referred to as “strong endings” (Fournier 2007; Guierre 1975).

17 A structure such as  $\{-i, e, u\}+V(C_0(e))$ , which is regularly associated with a proparoxytone stress pattern can be made of suffixal and/or non-suffixal material (e.g. endings in *-ious*, *-ual* or *-eal* in which the first vowel can be analysed as being part of the root or as an extender, see Bauer et al. 2013: 181). In other words, suffixation creates the environment which triggers direct computation but it does not mean that suffixation alone causes that phonological behaviour. It can either be the presence of both a certain suffix and certain elements preceding it (e.g. a consonant cluster, a vowel or another suffix) or simply the fact that the addition of the suffix creates a certain sequence that triggers direct computation.<sup>14</sup>

### 3. Why *-al*?

18 This paper is far from being the first dealing with this suffix, but the question which we will try to answer is one that has not often been asked. In the literature, we can find discussions about *-al*'s combinatorial properties, especially when it follows *-ment* (Aronoff 1976: 53-56; Giegerich 1999: 78-81; Hay 2002). We can also find the mention of *-al* among a special subclass of suffixes which are associated with not one but two stress patterns. Wells (2008) describes this suffix as “impos[ing] stress one or two syllables back”. We can most often find the stress patterns of adjectives in *-al* described as being regulated by the following two generalisations (Burzio 1994: 202; Chomsky & Halle 1968: 81; Marchand 1968: 244)<sup>15</sup>:

- if it is preceded by a heavy syllable, the word is stressed on that syllable.
- if it is preceded by a light syllable, it is stressed on the antepenultimate syllable.

19 The main goal of this paper is to analyse *-al* within the framework of the Guierrian School but this weight-based analysis will be discussed in §7. Let us now consider the Guierrian analyses of this suffix.

20 Trevian's (2003: 113) analysis is close to the classical weight-based analysis. He divides the first rule into two: words for which *-al* is preceded by a consonant cluster (e.g. *e'ternal*) or whose base has a long vowel in their final syllable (e.g. *'anecd[æʃ]te* → *'anec'dotal*) are stressed on their penult. He adds a rule for words ending in *-val*, which also have penultimate stress (e.g. *adjectival*, *medieval*).<sup>16</sup>

21 Fournier (2007, 2010) does not give a comprehensive analysis of this suffix, but proposes the following rules<sup>17</sup>:

- $-C_2 + \text{adjectival suffix} \rightarrow /(-)10/$
- *-oidal*, *-ival* →  $/(-)10/$
- *-ical*, *-acal*, *-inal* →  $/(-)100/$

22 Words which are not subjected to these rules are implicitly treated by more general rules which are not specific to *-al* (e.g.  $\{i, e, u\}+V(C_0(e)) \rightarrow /(-)100/$ , neoclassical compounds, neutral derivation, Normal Stress Rule). This means that he probably does not consider *-al* to be a strong suffix in itself, but only in these specific environments. Therefore, our study seeks to corroborate this intuition empirically.

23 We can see that the analyses of *-al*, even if they have some common points, diverge considerably. It seems that Fournier's analysis is the most detailed, even though some parts of his analysis need to be made explicit. This paper will attempt to do so and to answer the following questions:

- How can we describe the phonological effects of *-al*? In other words, what can be attributed to *-al* itself, to combinations of parameters (e.g. presence of the suffix and number of preceding consonants) or to wider generalisations?
- Is it accurate to describe the stress pattern of *-al* adjectives as being determined by the weight of the preceding syllable?

## 4. Corpus

### 4.1 Constitution

24 In the tradition initiated by Guierre (1979), we contend that the best way to analyse and understand the behaviour of this suffix is a corpus study. The different steps which we followed to constitute this corpus are described below, and they attest to our will to compile a corpus that was as complete, representative and reliable as possible.

25 We started with a search in the online *Oxford English Dictionary* (OED) for non-obsolete adjectives ending in *<-al>* in order to be able to access semantic and historical information for all entries in later steps of the study. This search gave 5729 results.

26 Then, we kept only the entries which were present in at least one of the two pronouncing dictionaries that we decided to use for the study: the *Cambridge English Pronouncing Dictionary* (CEPD), 17th edition, and the *Longman Pronunciation Dictionary*, 3rd edition (LPD).<sup>18</sup> At that point, the corpus contained 1563 entries.

27 This paper does not aim to study rare or specialised words, which led us to use a frequency threshold using the *Corpus of Contemporary American English* (COCAE): we adopted a threshold of one occurrence in the COCAE. The reason for choosing this threshold (which is arbitrary and therefore debatable) is that if an entry has at least one occurrence (out of the over 400 million words contained in the COCAE), we can reasonably assume that it is used at least to some extent, whereas when no occurrence can be found in the COCAE, it is impossible to know whether the entry is rarely used or not used at all in contemporary English.<sup>19</sup> This choice led to the exclusion of 295 entries.

28 In order to avoid redundancy in our corpus, we decided to exclude two types of semantically transparent tokens:

- The ones whose first element is a prefix (e.g. *bi-*, *in-*, *pre-*,...)
- The ones whose first element is a neoclassical root (e.g. *bio-*, *equi-*, *psycho-*,...)

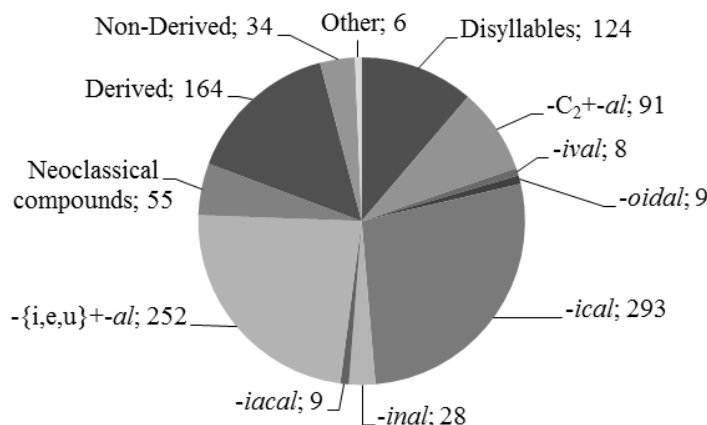
29 In these constructions, the second element (e.g. *natal* in *prenatal*) systematically preserves its pronunciation, which is why we left them out. Therefore, as long as its second element is already present in the corpus, the construction was excluded (196 entries). We kept only six cases for which the second element was not attested in our corpus at that point.

30 Eventually, our corpus contains a total of 1073 entries, out of which 938 are to be found only in LPD and 963 only in EPD, 828 entries being common to both dictionaries.

### 4.2 Organisation for Analysis

31 As mentioned above, our aim is to apply an explicit version of Fournier's (2007, 2010) analysis of *-al*. Therefore, we have preserved the rules that he has proposed and have split the remaining words into categories which are not specific to *-al*. Additionally, we chose to analyse disyllables separately. This is because their structure does not allow for the same method of analysis as for longer words. The division of the corpus is shown in Figure 1.<sup>20</sup>

**Figure 1. Division of the Corpus**



## 5. Analysis of disyllabic words

32 Following Trevian (2003: 140), we decided to analyse disyllables separately because they are systematically stressed on their first syllable and because the methods of analysis required for longer words do not apply to disyllables. Crucially, because of their length, they cannot be potential candidates for Luick's rule and there are no possibilities for stress to move with derivation.

33 This set contains 121 entries, to which we added three of the six semantically separable constructions that we preserved because the second element of the construction was absent from the corpus: *bipedal*, *extramural*, *intramural*. For these entries, the relevant part for analysis here is only this second element, i.e. *pedal* and *mural*.

34 51 of the entries are non-derived (i.e. they are composed of a bound root and *-al*) and all but one (*ba'nal*) are stressed on their first syllable. Fournier (2010: 136-137) notes that disyllables with the structure  $C_0VCVC_1$  do not follow any global generalisation with regards to the value of their stressed vowel<sup>21</sup>, i.e. there is a similar proportion of words with a free vowel (e.g. *agent*, *bacon*, *equal*, *icon*, *moment*) and words with a checked vowel (e.g. *atom*, *camel*, *damage*, *foreign*, *lizard*). However, this is not what we can see in our corpus: the 21 words with that structure are all pronounced with a free vowel, with the exception of *pedal* which has a variant in [e]:

(1) *chiral*, *feral*, *final*, *floral*, *legal*, *lethal*, *local*, *moral*, *natal*, *oral*, *oval*, *penal*, *plagal*, *primal*, *regal*, *renal*, *total*, *venal*, *vital*, *vocal* ©<sup>22</sup>

35 The remaining 73 entries are all derived, and all are stressed on their first syllable. They all preserve the pronunciation of their base when derived (apart from a few particular exceptions which will be discussed below).

36 We have three cases for which the orthographic vowel is modified (as well as the phonetic one), most likely because the base and the corresponding derivative have a different historic origin: *feast* → *festal*; *nose* → *nasal*; *pope* → *papal*. Additionally, the case of *cloister* → *claustral* could be described in a similar fashion, except that a "regular" derivative can be found in our corpus: *cloistral*.<sup>23</sup>

37 In sum, disyllables constitute a fairly regular set, both in terms of stress (one exception with final stress) and in matters of pronunciation (systematic free vowels where non-regulation could be expected).

## 6. Analysis of Words of Three Syllables or More

38 For longer words, we chose to divide the corpus into four subsets: words that have one of Fournier's (2010) strong endings (§6.1), neoclassical compounds (§6.2), derived (§6.3) and non-derived (§6.4) entries that do not belong to the first two sets. We expect the first set to mainly follow Fournier's (2010) generalisations. Neoclassical compounds are treated separately as they are known to have distinct phonological properties (Bauer et al. 2013: 18; Fournier 2010: 76-77; Fournier 2011; Guierre 1979: 737; Tournier 1985: 92). Most suffixes are strong when attached to these compounds so we expect to find cases of direct computation. As analyses diverge on the remaining two sets, we will start by reviewing the empirical facts first.

### 6.1 Fournier's Strong Endings

39 The method of analysis used in this part of the study is inspired by that developed by Fournier (1998) which follows from his definition of strong endings. This method consists in the analysis of preservation or non-preservation relationships between bases and their derivatives. In certain cases, the direct computation of stress and vowel values predict different results than computation by reference. These cases will be called **relevant cases**, as they are the only ones which allow us to determine whether a certain suffix or ending is strong. Cases for which the two modes of computation make identical predictions will be called **non-relevant cases**, as they do not provide any information which may be used to determine the nature of the suffix or ending's behaviour. In these cases, the stress pattern and the vowel values of derivatives may be predicted by preservation or direct computation, as in the examples in (2).



(2) *pla'centa* → *pla'cental*; *e'lector* → *e'lectoral*, *'margin* → *'marginal*

40 Relevant cases may behave in two ways. If it is direct computation that actually applies, then stress shifts (see (3)) or vowel shifts (see (4)) occur.

(3) *'origin* → *o'riginal*; *'maniac* → *ma'niacal*; *'industry* → *in'dustrial*

(4) *cr[ai]me* → *'cr[ɪ]minal*; *r[ai]te* → *'r[ɪ]tual*; *li'b[i:]do* → *li'b[ɪ]dinal*

41 However, if computation by reference applies, then no shifts occur. This may result in pre-antepenultimate stress (see (5)) or antepenultimate stressed vowels that are free<sup>24</sup> (see (6)).

(5) *'spirit* → *'spiritual*; *be'haviour* → *be'havioural*; *ˌaspi'ration* → *ˌaspi'rational*<sup>25</sup>

(6) *pro'cedure [i:]* → *pro'cedural [i:]*; *ʃ[er]tal* → *ʃ[er]talist*

42 If direct computation applies in the vast majority of relevant cases for a given suffix or ending, then we can conclude that this suffix or ending is strong. However, if computation by reference prevails, then we can conclude that this suffix or ending is neutral.

43 We applied this method of analysis to the sets of strong endings proposed by Fournier (2010), and the results of this analysis are shown in Table 2.

44 Table 2. Results of the analysis of relevant cases for strong endings

	Stress pattern	Relevant cases			Variation /1/	Exceptions	Rule efficiency
		Stress shift	Vowel shift	No shift			
<i>-C<sub>2</sub>+al</i>	/(-)10/	52 + 3 var	0	2	4	2	89/91 (98%)
<i>-oidal</i>		8	0	1	0	1	8/9 (89%)
<i>-ival</i>		6	0	0	1	0	8/8 (100%)
<i>-ical</i>	/(-)100/	64 + 1 var	1 + 2 var	0	2	0	293/293 (100%)
<i>-iacal</i>		8	0	0	0	0	9/9 (100%)
<i>-inal</i>		7 + 1 var	3 + 1 var	0	5	0	28/28 (100%)
<i>-{i, e, u} +al</i>		116 + 7 var	1	1	8	8	244/252 (97%)

45 This table presents the numbers of relevant cases per ending. The numbers under the columns “Stress shift” and “Vowel Shift” refer to cases like those in (3) and (4), respectively. The column “No shift” contains both cases like (5) and (6). The column “Variation /1/” gives the number of words which have more than one stress pattern and it includes the cases of variation already mentioned in the “Relevant cases” columns. Likewise, the “Exceptions” column regroups the exceptions already counted in the “No shift” column along with other exceptions not included in the relevant cases. Finally, the “Rule efficiency” column gives the ratio of words with at least one regular variant on the total number of words with a given ending.

46 Table 2 shows that a description of these endings as being strong endings seems to be accurate. Let us detail the results for the ending *-C<sub>2</sub>+al* to explain why this is so. This set contains:

47 57 relevant cases, among which:

- 52 cases of shifts of primary stress to the penultimate syllable:

(7) *'autumn* → *au'tumnal*; *'document* → *ˌdocu'mental*; *'phantasm* → *phan'tasmal*,...

- 3 cases which also present an isomorphic variant:

(8) *'diphthong* → *diphthongal /(-)210/ ~ /100/*; *'matriarch* → *matriarchal /21010/ ~ /1000/*; *'prefix (n)* → *prefixal /(-)210/ ~ /100/ ©*

- no cases of vowel value modification (none are expected as vowels which are followed by C<sub>2</sub> are always checked);
- 2 cases where computation by reference applies:

(9) *'puberty* → *'pubertal*; *'sinister* → *'sinistral ©*

- one additional case of variation: *magistral /100/ ~ /010/*

- 34 non-relevant cases.<sup>26</sup>

48 Therefore, there are 55 (if we exclude variants) out of 57 relevant cases which do follow the mechanism of direct computation.

49 Moreover, we can see that throughout the whole set, 85 entries are strictly stressed on the penultimate (i.e. without variants). Thus, the generalisation  $-C_2 + -al \rightarrow /-10/$  can be formulated and its efficiency is of 93%. This efficiency jumps to 98% if we count all the words which have at least a regular variant.

50 All data sets in Table 2 present similar results and can thus be considered to contain strong endings.<sup>27</sup>

51 As adjectives in *-al* may have penultimate or antepenultimate stress and that the rest of the corpus may not be divided into somehow uniform sets, we cannot use exactly the same kind of evidence. Let us see why by looking at the example of the words in  $-C_2 + -al$ . If there was no general tendency towards penultimate stress in this set, how could we know whether *'puberty*  $\rightarrow$  *'pubertal* constitutes a relevant case in which computation by reference applies or a non-relevant case? We could not. Therefore, in the rest of the analysis, positive evidence for direct computation will only come from stress or vowel shifts and positive evidence for computation by reference will only come from cases of pre-antepenultimate stress (which is never found with strong endings) or antepenultimate stressed long vowels.

## 6.2 Neoclassical Compounds

52 The structure of these compounds can be described as being ABC Guierre (1975: §8):

	(A)		(B)		(C)
	root or prefix	+	root	+	suffix
Example:	fratri-		-cid-		-al

53 This set contains 55 entries, among which 38 are derived from a free stem and may potentially exhibit stress or vowel shifts. Such shifts do occur:

- Stress shifts to a penultimate stress pattern:

(10) *'genocide*  $\rightarrow$  *,geno'cidal*; *'menopause*  $\rightarrow$  *,meno'pausal*; *'ribosome*  $\rightarrow$  *,ribo'somal...*  
(18 cases)

- Stress shifts to an antepenultimate stress pattern:

(11) *'hexagon*  $\rightarrow$  *he'xagonal*; *'occiput*  $\rightarrow$  *oc'cipital*; *'architecture*  $\rightarrow$  *,archi'tectural...* (10 cases)

- One vowel shift: *trigon* [aɪ]  $\rightarrow$  *trigonal* [ɪ].

54 These shifts are typical of strong endings, but the patterns observed are not uniform. If we consider the whole set, both derived and non-derived, the following stress patterns can be observed:

**Table 3. Stress patterns of neoclassical compounds**

	/-10/	/(-)100/	/-10/ ~ /(-)100/	/-10/ ~ /(-)1000/	Total
Number of entries	29	21	3	2	55

55 The two main stress patterns, penultimate and antepenultimate, are found in similar proportions, and it could be assumed that an additional parameter is responsible for this distribution. In a similar study on words in *-ous*, Fournier (2011) found that the root B seemed to play a role in stress assignment in these compounds. He describes the roots that retain stress as “attractive” (penultimate stress), as opposed to “non-attractive” roots which let the NSR apply (antepenultimate stress).

56 Therefore, this parameter was tested and we found it to be relevant for *-al* as well. That can be evidenced by two things:

- **Uniformity of stress patterns for compounds with the same root B** (e.g. all compounds in *-cidal* are stressed /-10/; all those in *-gonal* are stressed /(-)100/);

- **Commutation of the root B:** following the principle of minimal pairs, Fournier (1997: 60) states that “if, in a defined class, a feature divides this class into two groups of units having a distinct behaviour, and that this feature is the only difference between these two groups, then it is necessarily this feature which is responsible for the difference in behaviour”.<sup>28</sup> In our case, if we can find pairs which are distinguished only by their root B and which present a different stress pattern (see (12)), then we can assume that it is this root B which determines this difference.

(12) *epi'dural* ~ *e'piscopal* ; *hexa'hedral* ~ *he'xagonal* ; *anti'dotal* ~ *an'tiphonal*

57 Guierre (1979) suggested that some orthographic factors may account for the stress behaviour of roots. He proposed that those which contain a vowel digraph or end in <Ch> or <Cr> should be attractive. However, as Fournier (2011: 312) points out, these elements cannot account for the behaviour of all roots. Therefore, the attractiveness or non-attractiveness of a root should probably be attributed to some form of lexical marking.

58 If we follow Fournier's terminology, we have the distribution shown in Table 4.

**Table 4. Distribution of roots B in neoclassical compounds**

Non-attractive roots	Attractive roots	Semi-attractive roots <sup>29</sup>
-gon-, -metr-, -op-, -pher-, -phon-, -pod-, -scop- -cipit-, -cultur-, -tetur-, -genit-, -enter-	-cid- <sup>30</sup> , -drom-, -dur-, -(a)ev-, -hedr-, -pau-, -som-, -typ-, -vir-,	-dot-, -fug-, -pet-, -voc-

59 Table 4 shows that Guierre's (1979) orthographic criteria for predicting the stress behaviour are not really satisfactory. The only two roots with a vowel digraph are indeed attractive roots but two roots end in <Cr>: one is attractive (-hedr-) and the other is non-attractive (-metr-). Interestingly, all disyllabic roots are non-attractive. Clearly, more research is needed to establish whether there are formal reasons why a root is attractive or if it is mostly lexical marking.

60 Overall, this set shows that the presence of -al alone does not allow us to predict the observed patterns. To do so, we need to take into account both the presence of the suffix **and** that of a certain type of root B.

### 6.3 Remaining Derived Entries

61 This set contains all the derived entries which do not belong to any of Fournier's (2010) strong endings (which were treated in §6.1) and that are not neoclassical compounds (which were treated in §6.2). It contains 164 entries, including 102 entries in -ional. These entries strictly preserve the pronunciation of the base from which they are derived, with the one exception of *'nation* [eɪ] → *'national* [æ], which also happens to be the only entry for which the sequence -at- belongs to the root, i.e. *nat-* (as in *native*, *innate*). In this case, the difference in morphological structure is reflected in the phonological behaviour of the derivative.

62 To interpret these results, one needs to determine whether -ion should be considered as a single phonological syllable or as two. Consider the alternations in (13).

(13) *ocean* ['æʃjən] à *oceanic* [ˌæʃjɪ'ænik]  
*partial* ['pɑːʃəl] à *partiality* [ˌpɑːʃi'æləti]

63 It can be argued that derivation “reveals” that two phonological vowels are compressed into one under reduction and synaeresis. However, -ion is very rarely suffixed with strong suffixes which would place stress on one of its two syllables so that these syllables could be revealed. A search in the OED gave us only two such cases: *regionic* [ˌriːdʒi'ɒnik] and *visionic* [vɪʒɪ'ɒnik].<sup>31</sup> These cases seem to show the phonological dissyllabic nature of -ion, but they are so marginal, and unattested in our pronouncing dictionaries, that there seems to be very few arguments for a dissyllabic interpretation of -ion apart from the fact that it belongs, orthographically, to the larger class of words in -{i, e, u}+V(C<sub>0</sub>(e)).

64 To test if a generalisation such as “-al → /(-)100/” applies in this set, we need to consider two options: either -ion is monosyllabic or it is disyllabic. We will not attempt to solve the issue

of the number of syllables in *-ion* here but we will simply consider how the two options lead to different interpretations.

65 If *-ion* is **monosyllabic**, then stress is antepenultimate in all the entries considered. Therefore, the only way to determine if *-al* is affecting their pronunciation is by considering vowel values. As stress is antepenultimate, we could expect Luick's rule to apply. However, this is not the case; free vowels in bases are systematically preserved, with the exception of *national*. There are 40 bases containing a  $\nabla \neq \langle u \rangle$ <sup>32</sup> which is preserved in their corresponding derivatives. These being the only cases for which the data can be interpreted (bases with  $\nabla$  being non-relevant), it would seem that *-al* is neutral in that set.

66 If *-ion* is **disyllabic**, then stress is ante-antepenultimate and *-al* is strictly neutral in the whole set.

67 Therefore, both interpretations lead to the same conclusion: *-al* is neutral after *-ion*.

68 After removing the 102 entries in *-ional*, we are left with 62 entries in this set. If we follow Fournier's (2010) implicit analysis of *-al*, we would expect it to be neutral in this set. However, the situation is more complex.

69 There are 42 cases for which stress does not shift, let us consider the 5 cases in (14).

(14) *procedure* [i:] → *procedural* [i:] *femur* [i:] → *femoral* [e]  
*nature* [eɪ] → *natural* [æ]  
*ephemera* [e]/[i:] → *ephemeral* [e]/[i:]  
*zenith* [e]/[i:] → *zenithal* [e]/[i:]

70 The first case indicates the neutrality of *-al*, as the vowel is not shortened to [e], contrary to Luick's rule. Now, incidentally, the following two cases behave in the opposite way, and Luick's rule seems to be applying. Finally, the last two cases present variation in both the base and the derivative when we could expect only a  $\nabla$  if Luick's rule was applying.

71 There are also cases where the fact that the position of stress does not shift seems to indicate the neutrality of *-al* if a rule  $-VCal \rightarrow /(-)100/$  was applying, as those in (15).

(15) *arch'duke* → *arch'ducal*; *au'roral* → *au'roral*; *clo'aca* → *clo'acal*; *de'cree* → *de'cretal*;  
*be'haviour* → *be'havioural*

72 If we now consider words for which stress does shift, the 20 entries can be divided into three groups<sup>33</sup>:

(16) shift to **penultimate stress**, with no variants: anecdotal, azimuthal, hormonal, paradisal, patronal<sup>34</sup> ©

(17) shift to **antepenultimate stress**, with an isomorphic variant with penultimate stress: artisanal, coronal or with pre-antepenultimate stress: prefectural, or both isomorphic and penultimate variants: pyramidal ©

(18) **no shift**, with a variant in which stress shifts to the penultimate syllable: apsidal, cantonal, cerebral, communal, doctoral, epochal, electoral, integral, mayoral, palatal, skeletal ©

73 These 62 entries are the only ones in which *-al*, by itself, could be held responsible for triggering direct computation if it were to occur. In the case of Fournier's (2010) strong endings or neoclassical compounds, we saw that stress is determined by the suffix and certain elements preceding it. In this last set, there is no common preceding element to be found. We do find some evidence for direct computation but it does not seem to be the general case in this set. Moreover, the only set which could really indicate what *-al* "does" by itself appears to be the most unstable set of all.

74 As suggested by a reviewer, the heterogeneity of the stress patterns of *-al* adjectives might be connected with the lack of productivity of that suffix. The lack of an active pattern could explain the lack of uniformity. The OED seems to confirm that *-al* is indeed unproductive, as it lists only 251 new adjectives between 1950 and 1999 and these are mostly specialised words (e.g. *ambilineal*, *audiological*, *contrafactual*). It also lists one new adjective between 2000 and 2016, *cissexual*, which a case of prefixation.

## 6.4 Remaining Non-Derived Entries

75 This set contains 34 entries, and we will also mention the 6 labelled “Other” in Figure 1, which are either compounds or opaque prefixed constructions.

76 Out of the 34 entries, 32 follow the NSR, i.e. are stressed on their antepenultimate syllable. The two entries in (17) present variation with a penultimate stress pattern.

(19) *decanal* /010/ ~ /100/  
*palpebral* /100/ ~ /010/

77 The set is fairly stable, and these entries are stressed just as regular non-derived items usually are.

78 We separated two minor classes: opaque prefixed constructions and compounds, as these structures usually entail specific stress patterns: the former may not receive primary stress on their prefix unless they are nouns (i.e. adjectives, verbs, prepositions, adverbs) whereas compounds tend to be stressed on their first element (Fournier 2007).

79 The corpus contains 4 inseparable prefixed constructions, and 3 of them do not violate the rule: *oc'clusal*, *i'naugural*, *re'ciprocal*. However, only the first one could present a potential conflict with the NSR, thus it seems to be the only relevant case showing that the rule does apply. The fourth entry does not follow the rule: *'conjugal*. Due to the small number of entries and of relevant cases of conflict with the NSR, it seems difficult to draw any conclusions regarding the rule of opaque prefixed constructions other than nouns.

80 Eventually, the corpus contains two compounds: *,tee'total* and *,vice'regal*, the stress pattern of which is not that of regular compounds (which are usually stressed on their first element). However, we will refrain from drawing any conclusions from just two compounds.

## 7. Discussion

81 We started with two questions regarding *-al*, let us now consider what answers the results provide.

82 How can we describe the phonological effects of *-al*? In other words, what can be attributed to *-al* itself, to combinations of parameters (e.g. presence of the suffix and number of preceding consonants) or to wider generalisations?

83 There are two sets for which it is not possible to determine the effects of *-al* because of a “conspiracy” of rules: non-derived entries and  $-{i, e, u}+al$ . In the absence of evidence to show that *-al* is indeed responsible for the stress patterns observed, we can assume that more general rules, respectively the NSR and the rule  $-{i, e, u}+V(C_0(e)) \rightarrow /(-)100/$ , apply.

84 We have also seen a number of sets where we found evidence of direct computation, but this seems to be the case only when *-al* is associated with an element preceding it. This element can be:

- a consonant cluster;
- another suffix in *-ival*, *-oidal*, *-ical*, *-iacal* and *-inal*;
- a root B in neoclassical compounds.

85 In these cases, *-al* is only one of the components of strong endings triggering direct computation, even if it is *-al* suffixation which makes the demonstration possible. What is striking here is the great regularity of “micro-paradigms” (Girard, 2007) such as *-ival* or *-oidal* (both comprise under 10 entries), even though their stress pattern (penultimate) is “marked” for this structure. Moreover, if there was a rule  $-VCal \rightarrow /(-)100/$ , these micro-paradigms would be exceptional.

86 We saw that *-al* was neutral after *-ion*. Can this be an argument to say that *-al*, by itself, is not a strong suffix? Two answers may be proposed:

- Yes: words in *-iac* and in *-ion* both have the structure  $-{i, e, u}+VC_0$ , which is part of the larger rule  $-{i, e, u}+V(C_0(e)) \rightarrow /(-)100/$ . In general, the last strong suffix or ending triggers direct computation, which means that *-al*, if it were strong, should trigger direct computation in both environments. However, this is not the case for *-ional*, which may suggest that *-iacal* is an exceptional micro-paradigm and that *-al* is stress-neutral after all.

- No: Fournier (2010: 34) points out the fact that some words with the structure  $\{-i, e, u\}+VC_0$  neutralise *-ate*, which is strong in other environments, as exemplified by *'alienate*, *'affectionate*, *com'passionate*, *'matriarchate*, *'passionate*,... Outside of this environment, *-ate* regularly shifts stress to the antepenultimate, e.g. *'origin* → *o'riginate*, *sa'liva* → *'salivate*. Therefore, it could be proposed that  $\{-i, e, u\}+VC_0$  is neutralising for (at least certain) suffixes attached to it and that *-al* may be strong but that it is simply neutralised here, with the exception of the micro-paradigm *-ical*.

87 Since there is no principle way to choose one of the proposed answers, this set will be considered irrelevant to determine whether *-al* is strong or not. However, in both cases, *-ical* should be analysed as exceptional.

88 Only the set discussed in §6.3 is left to determine *-al*'s status and it is that of the remaining derived entries. As we have seen, this set is the least regular of all. Therefore, we cannot say that *-al* is strong in that set, but we cannot say it is completely neutral either.

89 To sum up, the generalisations on Fournier's (2010) strong endings and the NSR do well when confronted with the data. Neoclassical compounds constitute a special set, whose stress patterns are constrained by the interaction between the root B and *-al*. However, the data do not allow a larger generalisation of the type  $-VCal \rightarrow /(-)100/$ .

*Is it accurate to describe the stress pattern of -al adjectives as being determined by the weight of the preceding syllable?*

90 In this section, we will consider the data discussed in this paper under a different angle than that which has been adopted so far. We cannot answer our second question without specifying whether we are trying to account for surface patterns or to predict stress patterns from underlying vowels.

91 The weight-based account of the stress patterns of *-al* adjectives works fairly well if we are only looking at surface patterns. Virtually all words in the corpus follow the generalisation stating that words with heavy penults have penultimate stress and that words with light penults have antepenultimate stress.<sup>35</sup> We only found the following 11 exceptions:

(20) words with closed penults that do not have  $/(-)10/$ : *diphthongal* /010/ ~ /100/, *matriarchal* /2010/ ~ /1000/, *prefixal* /100/ ~ /010/, *sinistral* /100/ and *magistral* /100/ ~ /010/;

(21) words with  $/(-)10/$  and 'V in open penults: *'azi'm[ʌ]thal*, *'arti's[æ]nal* (main pronunciation /0100/), *'pyram[ɪ]dal* (main pronunciation /0100/ + variant in /1000/), *can't[ɒ]nal* (+ variant in [əɪ] + variant in /100/), *e'p[ɒ]chal* (main pronunciation /100/), *in't[e]gral* (main pronunciation /100/) and *pal'p[e]bral* (+ variant in [i:] / main pronunciation /100/).

92 Clearly, these cases are marginal and present a great deal of variation. Therefore, the surface generalisation holds. Let us now consider what can be predicted. Let us first see if we can predict the stress behaviour of derivatives based on properties of their bases. We can reliably do so if they have a closed penult because of the strict permanence of consonants. However, as Guierre (1979: §2.5.9) points out, this strict permanence differs radically from the fundamental variability of vowels which can alternate between short and long or full and reduced. Burzio (1994: 54-55) illustrates this contrast by the asymmetry in the ability of vowels and consonants to retain stress, e.g. *as'sist* → *as'sistant* vs. *re'v[ɪə]re* → *'rev[ə]rent*.

93 Let us look at the vowel, in bases, which becomes the penult in derivatives and how the nature of that vowel can be linked with the stress pattern of derivatives. Let us assume that this vowel is underlying. In this part of the discussion, we purposefully ignore variants in  $/(-)1000/$  for clarity (which are mainly found in neoclassical compounds). We leave out *-ical* derivatives as the vowel we are looking at is often absent in the base or is that of the suffix *-ic*, in which case stress never shifts except in the case of exceptionally stressed *-ic* words.<sup>36</sup> We also treat separately the words in which the vowel under consideration is an unstressed orthographic <i> or <y> realized [ɪ], in which it is impossible to determine whether we are dealing with a reduced vowel or a full short vowel. We found 15 such cases, which are detailed in (22).

(22) The vowel is orthographic <i> or <y> realized [ɪ]:

- a. the four remaining *-ival* words, all with penultimate stress: *adjectival, gerundival, infinitival, substantival* ©  
 b. *doctrinal* /010/ ~ /100/ and *pyramidal* /0100/ ~ /1000/ ~ /2010/  
 c. 9 cases with antepenultimate stress: *aborigine, apocryphal, arbitral, digital, maximal, minimal, optimal, orbital, zenithal*

94 The rest of the results are detailed in (23-25).

(23) The vowel is long (and may have a reduced variant):

- a. 30 cases of stress shift to the penult: 9/10 words in *-oidal*, 12 in *-idal, anecdotal, archetypal, archival, hormonal, menopausal, ogival, paradisaal, prodromal, ribosomal* ©  
 b. 14 cases of stress preservation on the penult: 7 words in *-hedral, archducal, auroral, cerebral, cloacal, decretal, perineal* ©  
 c. 8 cases of variation between /(-)10/ and /(-)100/: *communal, corneal, coronal, duodenal, ideal, intestinal, tracheal, vaginal* ©  
 d. 2 cases of /(-)100/: *continual, residual* ©

(24) The vowel is short (and may have a reduced variant): *an 'tiphonal, 'cantonal* (+ variant /010/), *'synodal* and the 7 *-iacal* derived from words in *-iac* [-iæk] ©

(25) The vowel is reduced

- a. 4 cases of variation between /(-)10/ and /(-)100/: *doctoral, electoral, mayoral, palatal, skeletal* ©  
 b. 85 cases of /(-)100/: all the derivatives in *-{i, e, u}+VC<sub>0</sub>* in which the penultimate vowel of the derivative is present in the base, *augural, clitoral, conjectural, ephemeral, femoral, natural, pastoral, personal, procedural, sculptural...*

95 We summed up all those figures in Table 5.

**Table 5. Stress patterns of derivatives according to the nature of the penultimate vowel in the base**

Vowel in the base Stress pattern of the derivative	<i, y> - [ɪ]	∇	∇	Reduced V
/(-)10/	4	44	0	0
/(-)10/ ~ /(-)100/	2	8	1	4
/(-)100/	9	2	9	85

96 These figures show a relatively solid tendency towards weight-based stress assignment in *-al* derivatives as long vowels do seem to “attract” stress when the suffix is added and short or reduced vowels overall reject penultimate stress. The only cases that are problematic are the four *-ival* cases in (20a), whose bases do not have long vowels in their final syllable. To account for these cases, we could postulate underlying long vowels for these words only, which would be somehow ad hoc and would not offer any reason so as to why other words with reduced vowels should have underlying short vowels. A second option would be that adopted by Trevian (2003), who adds a rule *-val* → /(-)10/, which is a rather odd generalisation. What is so special about /v/? And if the cause for this behaviour is not phonological, then what is the status of *-val*?

97 However, even though the weight-based approach is satisfying for derivatives, it presents issues for the rest of the corpus. We started by looking at derivatives, because it is the only thing we can do without postulating underlying vowels which are not attested elsewhere than in the derivative whose pronunciation we are trying to predict. Doing so would constitute an attractive solution, as it would directly predict the correct surface patterns. The view according to which vowel values are lexical is widely shared and it predicts for example that underlying schwas are unstressable. This seems rather strange because, if we see reduction as being a consequence of stresslessness, then how can it also be its cause? Additionally, postulating that all vowels are lexical along with a few generalisations accounting for vowel shifts like the Vowel Shift Rule, CiV Lengthening or Trisyllabic Shortening misses the fact that vowel values are widely conditioned by the environment in which vowels are found (see §2.2 and Dabouis, forthcoming; Deschamps, 1994; Deschamps et al., 2004; Fournier 2010: Ch. 2 for a model of this conditioning).

98 In sum, the classic view consists in assigning stress based on what one postulates to be the underlying vowels. This seems unsatisfactory because one can postulate any underlying representation to produce the correct surface form, which means this approach is non-predictive, and does not give a full account of vowel values. Therefore, the weight-based approach may offer a simpler solution with fewer generalisations even though it brings up what we regard as serious issues. The view developed in the Guierian School, and in this paper, seeks to predict both stress and vowel values and sees the latter as being, at least partly, conditioned by the presence or absence of the former. In that framework, an analysis of *-al* may include weight as we do find weight-related effects in words in  $-C_2 + -al$  or in derivation from bases which contain long vowels, but syllable weight cannot satisfyingly account for all the data.

99 Finally, if we consider all the entries of three syllables or more, excluding those in  $-C_2 + -al$ , *-oidal* and *-ival*, there are 658 entries out of 844 (78%) which have a proparoxytone stress pattern. If we consider that *-ion* is monosyllabic, then the 102 entries *-ional* can be added, which raises to total number of entries stressed on their antepenultimate syllable to 760 (90%). Therefore, a two-rule analysis of *-al* could be proposed with  $-C_2 + -al \rightarrow /(-)10/$  and  $VCal \rightarrow /(-)100/$  but this would be a very simplified view of the empirical record. Such a simple system is a fairly good description of surface patterns and could very well be used for teaching purposes. However, when it comes to demonstration, we have shown the need for more parameters to be taken into consideration.

## 8. Conclusion

100 The situation that our study reveals is more complex than what most descriptions have depicted. The stress patterns of *-al* adjectives seem to be regulated mostly by both the presence of the suffix and certain elements preceding it (e.g.  $C_2$ , suffixes like *-iac* and *-oid* or the root B in neoclassical compounds) and by larger generalisations, in which case the stress patterns cannot be attributed to *-al*. Overall, derivational relationships exhibit direct computation of primary stress, but we have shown that it is not possible to demonstrate that *-al* alone is responsible for this behaviour, given that:

- the most regular sets can be described as formal micro-paradigms, i.e. they share formal properties which may be held responsible for the regularisation of the set;
- the set of derived units which do not belong to any such micro-paradigms but to the larger paradigm of adjectives in *-al* is the most irregular set.

101 Finally, we saw that a weight-based analysis of the stress behaviour of this suffix comes with some heavy theoretical implications, namely the necessity of considering vowel values to be lexical. In any case, this paper has shown the necessity of using empirical data because it may allow us to discover that the empirical situation is far more heterogeneous than what the literature suggests.

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## Notes

- 1 I would like to thank Scott Dombrowski and two anonymous reviewers for their constructive comments. Responsibility for any mistake or omission is mine alone.
- 2 Such a lack of empirical backup seems to be the rule rather than the exception. As Domahs *et al.* (2014) puts it, studies on English phonology "suffer from a scarcity of systematic empirical evidence". Wenszky (2004: 12) also mentions that generalisations are often illustrated by "convenient samples", which could be accepted if guarantees that the samples are overall representative of the full empirical record were given, along with the description of that record. Unfortunately, such works are too scarce in the literature on English stress.
- 3 At the time, Guierre computerised Daniel Jones's pronouncing dictionary (35,000 words at the time), on which he based the work developed in his 1979 thesis.
- 4 For discussion about the phonological role of these elements, see Dabouis (2014).
- 5 Fournier (2010: 11-12) defines a lexical unit as semantically inseparable unit. He distinguishes two types of lexical units: those which are autonomous (words) and those which are not (prefixes). As a consequence, the second principle may forbid stress clashes within lexical units, but it is quite common to find such clashes in constructions made of two lexical units such as *re'do*, *un'finished* and *co'pilot*.
- 6 For certain suffixes, additional semantic information such as "agent" (e.g. *-or* in *lessor*, *donor*, *vendor*) can be taken into account.
- 7 Angle brackets are used for orthography.
- 8 That does not include foreign vowels (e.g. *ban[a:]na*, *alb[i:]no*, *blas[ei]*).
- 9 See also a summarised version of these rules in Dabouis (forthcoming).
- 10 Most Guierrian authors deal with stressed vowels only but Dahak (2011), Guierre (1979) and Trocmé (1975) also study unstressed vowels.
- 11 These are my own translations from French, here are the original quotations: "Certaines séquences finales exercent une contrainte absolue en fixant immuablement l'accent primaire sur une syllabe

donnée” (Trevian, 2003: 55). “Les suffixes contraignants imposent le calcul direct, c’est-à-dire la pertinence de la structure de l’unité et d’elle seule” (Fournier, 1998).

12 This phenomenon is often called Trisyllabic Shortening or Laxing, but Guierrian authors usually talk about “Luick’s rule” after Luick (1898), who first described the phenomenon.

13 A reviewer points out the fact that *-ic* can be analysed as ending in an onset followed by an empty nucleus (Harris & Gussmann 1998). An alternative analysis consists in considering that suffixes are generally extrametrical, but that *-ic* is not (Hayes 1981). Both analyses can capture the facts but neither proposes a reason why this suffix has these special properties and why other *-VC* suffixes such as *-al*, *-ive* or *-ous* do not.

14 In the case of words in  $\{-i, e, u\}+V(C_0(e))$ , the nature of the suffix involved (if there is one) is relevant. As Fournier (2010: 33) points out, if that suffix is a strictly neutral suffix, then the rule does not apply (e.g. *de'nial*, *'marriage*).

15 We could add Selkirk (1980) to the list, even though these generalisations are captured by general feet well-formedness principles in her model.

16 A surface-oriented approach could argue that the *-val* generalisation is not needed as they could fall into the “preceding heavy syllable” category formed by the two preceding generalisations. However, Trevian does not do so, presumably because he assumes, as we do, that vowel length is computed after the position of stresses. See discussion in §7.

17 Fournier’s (2010: 28) definition of functional consonant clusters ( $C_2$ ), which is adopted here, is the following: A consonant cluster is defined as:  $\langle x \rangle$ ; Every cluster of at least two consonants, except  $\langle Ch \rangle$ ,  $\langle Cr \rangle$  and  $\langle C + \text{syllabic } C \rangle$ , and that includes consonant geminates.

18 The initial study also included Australian English pronunciations from the Macquarie online dictionary and American English pronunciations from CEPD and LPD but, as minor variation was found and for the sake of the clarity of the presentation, the study presented here will be concerned only with British English. Therefore, all the phonemic transcriptions below will be British English pronunciations from CEPD or LPD.

19 We are aware that some rare or specialised vocabulary will still be present in our corpus after that step. However, part of it (neoclassical compounds) will be treated separately as it has been shown previously that this part of the vocabulary is subject to different rules (Fournier, 2010: 75-78). We believe that the differences between different parts of the lexicon should be acknowledged, for not doing so might bias the results. For example, the recurrent use of Amerindian names in the literature on English stress (e.g. either one or both of the two words *Ticonderoga* and *Monongahela* can be found in Burzio (1994), Chomsky & Halle (1968), Collie (2007), Hayes (1982, 1984), Kiparsky (1982), Liberman & Prince (1977), Pater (1995, 2000), Schane (1979), Selkirk (1980)) is never mentioned as such. We have no objection to the use of these names, but it would seem reasonable to acknowledge that they are borrowings and that, therefore, they might not be representative of the global phonology of English, but only of a special set of rules or constraints applying to borrowings or even, more specifically, to Amerindian borrowings. Theoretically, this can be achieved through the use of “cophonologies” (Anttila 2002; Bermúdez-Otero & McMahon 2006; Collie 2007; Orgun 1996). We can add that they are also proper nouns and Raffelsiefen (1993: 90-93) claims that names and nouns are subject to different restrictions and, therefore, confusion between them should be avoided.

20 Following Girard (2007), we refer to the double suffix *-iacal* and not *-acal* as can be found in Fournier’s work. This is based on the fact that the only word in *-acal* not in *-iacal* is *clo'acal* would be an exception to the rule *-acal* → *l(-)100l*.

21 To be exact, this variable set does not include (Fournier, 2010: 101-143):

words the first vowel of which is a digraph, which is always a  $\nabla$ ;

words the first vowel of which is  $\langle u \rangle$ , which is always a  $\nabla$ ;

words ending in *-ic*, which have  $\nabla$ ;

words ending in *-ic*, which have  $\nabla$ ;

#, which have  $\nabla$ ;

words ending in *-iC#*, which have  $\nabla$ .

22 Full sets will not always be given when too large, but full sets will be marked with ©.

23 As pointed out by a reviewer, these items can also be analysed as phonologically non-derived.

24 This shows that Luick’s rule (see note Erreur : source de la référence non trouvée) does not apply.

25 We consider *-ion* to be dissyllabic and therefore *aspirational* to have pre-antepenultimate stress. See §6.3 for discussion.

26 These include non-derived units, for only derivation makes the test possible.

27 The set of entries in *-inal* is less regular than other sets chiefly because of irregular stress variants, but all present a regular variant: *intestinal* /0100/ ~ /2010/; *doctrinal* /010/ ~ /100/; *matutinal* /2010/ ~ /0100/; *official* /2010/ ~ /0100/; *vaginal* /010/ ~ /100/.

28 This was translated from French: “si, dans une classe définie, un trait divise cette classe en deux groupes d’unités ayant un comportement distinct, et que ce trait est la seule différence entre ces deux groupes, alors c’est nécessairement lui qui est responsable de la différence de comportement.” (Fournier, 1997: 60).

29 Semi-attractive roots are roots that do not systematically retain stress.

30 *germicial* and *suicial* present stress variants in /1000/.

31 The phonemic transcriptions are from the OED.

32 <u> is not concerned by Luick’s rule as all cases of <’u> not followed by C<sub>2</sub> are free vowels, e.g. *’music*, *re ’juvenate*, *’purity*.

33 A reviewer questions the fact that *artisanal*, *cerebral*, *coronal* or *integral* are derived. The OED does list *artisan*, *cerebrum* and *integer* which all share a semantic relationship with their corresponding derivatives. However, it is true that the last three examples refer to specialised vocabulary and that all speakers may not be familiar with the bases. Consequently, the variation observed in the adjectives could be due to the fact that some speakers know their bases (and use the isomorphic variants) while others do not (and use direct computation, i.e. antepenultimate stress).

34 A reviewer points out the fact that the situation might be different in American English, as is the case for *patronal*, which has penultimate stress in British English but generally has antepenultimate stress in American English. As mentioned in note 18, our initial study included American and Australian pronunciations as well. We found very little variation, as only 27 words have variants across dictionaries or English varieties. Furthermore, sometimes that variation only consists in the reversal of the main pronunciation and the variant, e.g. *official*: EPD BrE /2010/ ~ /0100/ vs. EPD AmE /0100/ ~ /2010/. This is consistent with Martin’s (2011) finding that English stress is very stable across varieties, even in the most unstable parts of the vocabulary.

35 This is not surprising if we consider Dahak’s (2011) that vowels tend to reduce in penults when primary stress is on the antepenult 96.6% of the time.

36 For example, *’heretic* → *he ’retical*, *’politics* → *po ’litical* or *a ’rithmetic* → *,arith ’metical*.

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## Abstracts

Dans le cadre de l’approche introduite par Guierre (1979), cet article remet en question la classification communément admise selon laquelle le suffixe adjectival *-al* serait un suffixe contraignant. Pour cela, nous avons eu recours à l’étude d’un large corpus constitué à partir de dictionnaires de prononciation et complété par d’autres sources telles que l’*Oxford English*

*Dictionary*. Après avoir passé en revue les différentes analyses de ce suffixe dans la littérature, nous montrons que ces descriptions sont souvent inexactes. En effet, si l'on trouve bien *-al* dans plusieurs terminaisons contraignantes déclenchant un calcul direct du placement accentuel, ce comportement n'est observé que dans certains contextes spécifiques. Certaines sous-classes en *-al* se comportent de manière tout à fait régulière mais *-al* seul (c'est-à-dire lorsqu'il n'est pas associé à certains éléments spécifiques le précédant) ne déclenche pas le calcul direct de façon systématique.

Within the framework introduced by Guierre (1979), this paper challenges the commonly accepted classification of the adjectival suffix *-al* as a strong suffix through the study of a corpus of pronouncing dictionary data enriched with additional information from other sources such as the *Oxford English Dictionary*. After a review of the disparities between different analyses and classifications of that suffix in the literature, it is shown that most descriptions previously proposed are problematic. We do find *-al* in strong endings triggering a direct computation of stress placement, but only in certain specific subclasses. A number of sets ending in *-al* are highly regular, but *-al* by itself (i.e. when it is not associated with certain elements preceding it) does not trigger direct computation systematically.

#### ***Index terms***

***Mots-clés*** : corpus, accentuation de l'anglais, phonologie, morphologie, suffixation

***Keywords*** : corpus study, English stress, phonology, morphology, suffixation