TENSE/LAX, THE VOWEL SYSTEM OF ENGLISH AND PHONOLOGICAL THEORY

JACQUES DURAND
ERSS-UMR5610 CNRS & Université de Toulouse II*

* This is the prefinal version of an article published under the same title in Carr, P., Durand, J., Ewen, C. (eds) *Headhood, Elements, Specification and Contrastivity*, (eds) Amsterdam: John Benjamins, pp. 77-98.

"Obviously no demonstration that existing arguments are flawed 'disproves' the feature itself. As William Wang has appositely remarked (1969 : 21; cf. Chen 1972: 465) 'We cannot prove that the platypus does not lay eggs with photographs of a platypus NOT laying eggs'. But it is clearly up to the champions of the oviparous platypus to produce some eggs (as of course they have); at the very least I am claiming in what follows that the champions of tenseness have not been so successful." (1976 : 40.)

1. *Introduction*

In this paper I assume that the goal of phonological theory is to determine the dimensions along which the sound systems of the world's languages are organized and the principles that regulate these systems.[1] While phonemes have provided the cornerstone of much phonological thinking in the early part of the twentieth century, most modern researchers have argued – correctly, in my view - that the basic units of sound structure were not segments but 'distinctive features' (or 'components', 'particles', 'elements' in other theories) and that the search for a universal inventory of distinctive features was central to the construction of a theory of phonology. There are, of course, differences between the various approaches as to the status of such primitives and the different names adopted in competing models partially reflect important theoretical assumptions. But, for the purpose of this paper, we will mainly concentrate on one simple question : should a feature such as tense/lax (whether binary, unary or scalar) be part of our universal inventory?

I will provide a negative answer to this question (at least on the assumption that the feature is defined as in the Jakobsonian tradition) on the basis of English or, more precisely, on the basis of the non rhotic British accent known as RP (Received Pronunciation) [2], although other accents of English will also be mentioned later. The first reason for choosing English is that it is usually presented as a prime example of the need for a feature such as tense/lax (or Advanced Tongue Root [+/-ATR] in recent times, but I shall argue that this feature, while well-established cross-linguistically, is not motivated for English either). The second reason is that varieties of English, and in

[1] Earlier versions of this paper were presented at various seminars and conferences : Université de Paris XIII (ALOES), University of California at Santa Barbara, Université Laval à Québec, Université de Toulouse-Le Mirail, and I received helpful feedback from many colleagues and friends during the meetings in question. Special thanks to John Anderson, Philip Carr, Fran Colman, Colin Ewen, Carole Paradis, Darlene La Charité and Jean-Pierre Montreuil.

[2] Also known as BBC English or Standard Southern British English.

particular RP, are extremely well documented. Of course, one cannot ascend from the particular to the general as the quotation from Lass (1976) reminds us. But if we can refute the claim that tense/lax, as classically defined, is not required for a number of languages which were seen as particularly good exemplars of the need for such a feature, we will have considerably reduced its plausibility. In this context, I refer the reader to Durand (2003) who argues that the complex system of Danish is better handled by the primitives of Dependency Phonology (e.g. Anderson and Jones 1974, 1977, Anderson and Durand 1986, Anderson and Ewen 1987, Ewen and van der Hulst 2001) than by systems inherited from *Preliminaries to Speech Analysis* and *The Sound Pattern of English* which have recourse to tense/lax or Advanced Tongue Root.

2. *Three approaches to vowel systems: a brief historical sketch*

In the nineteenth century, the descriptions of vowel systems converged on the idea that the most common dimensions were height, backness (or frontness) and lip-shape. Regarding vowel height, two positions, which have remained important to this day, were clearly delineated. The first one is what we shall refer to from now as the IPA position. The second one was adopted by Alexander M. Bell and Henry Sweet and anticipates the binary systems which have figured prominently in the literature ever since Jakobson, Fant and Halle's (1952) groundbreaking contribution: *Preliminaries to Speech Analysis.* The third position I shall consider is a more recent one in the form presented here (although the insight is no doubt a traditional one): it is the idea advocated in Anderson and Jones (1974[1972], 1977) that there are three primitives labelled I, A, U which provide the cornerstone of the various systems attested in the world's languages.

2.1 *The IPA tradition*

As soon as the International Phonetics Association gained momentum, its members agreed on a descriptive scheme which treated the vowel space as a kind of trapezium organized in terms of two main axes – close/open and front/back - with lip-shape acting as a supplementary parameter allowing further distinctions. This tradition finds its most precise definition in the scheme of 'Cardinal Vowels' put forward by Daniel Jones in *An English Pronouncing Dictionary* (1917) and *Outline of English Phonetics* (1918) and integrated thereafter in fundamental texts such as the 1949 *Principles of the International Phonetic Association* and the 1999 *Handbook of the International Phonetic Association*. In this scheme, the close-open axis (high-low from now on) was seen as a dimension merging two different physiological actions: tongue raising/lowering and jaw closing/opening. These were correctly identified as concomitant from a phonological point of view and, given that tongue movement was needed on the front/back axis, the tongue was taken as the 'prime mover' providing the phonetically relevant physiological actions.

Interestingly, the three main parameters forming the cornerstone of this traditional approach are not dealt with in the same way by the IPA. While high/low and front/back are treated as continua, lip-shape is not. For most vowel symbols we have a partner with opposite lip-shape and the diacritic for lip-rounding is not used to express a scale but rather over- or under-rounding for a given vowel height as in the 1999 IPA *Handbook*: "In some forms of English, e.g. Standard Southern British, over-rounded [ɔ] is found, e.g. *caught* [kɔ̹t]" (p. 24). The most quoted examples which might require varying degrees of rounding are languages like Swedish or Norwegian where there are three vowels which are all high and all front but with different lip gestures; but the IPA notation offers no particular help here. Furthermore, even high/low and front/back are

not dealt with in exactly the same way by the IPA. Height is diagrammatically seen as a 'wider' dimension than backness. On the height axis, four main divisions are posited: high (CV [i y u ɯ]), mid-high (CV [e ø o ɤ], mid-low (CV [ɛ œ ɔ ʌ], low [a ɶ ɑ ɒ]). On the other hand, the backness axis gives rise to only three main divisions: front, central and back. Of course, the use of diacritics for advanced/retracted, centralized/mid-centralized and raised/lowered allows more fragmentations of the two continua but the fact remains that they are not considered as fully equivalent. If we look at the symbols offered, the height dimension provides more potential contrasts than front/back. As Ladefoged and Maddieson stress: "The full set of vowel symbols recommended by the IPA (1989) implies that there are seven levels. We doubt that any language uses this full range; but there are clearly more than three levels of the auditory property Height" (1996: 289).

The IPA account of vowel structure has remained relatively stable over the years. With the rise of acoustic phonetics, some specialists have argued that it was not articulatorily but auditorily based. But this does not really affect the implicit theory in IPA-based descriptions, i.e. that vowel systems are projected from a roughly quadrangular space with height as the more extensive of all parameters. The number of possible distinctions on this continuum is presumably set by perceptual boundary conditions. While speakers can raise their tongues in an indefinite number of steps, hearers cannot make phonological (lexical) distinctions which involve more than **n** dimensions. Ladefoged and Maddieson (1999: 289-290) quote a study of the Bavarian dialect spoken in Amstetten (Austria) by Traunmüller (1982) which would appear to require five levels of vowel height and which does present similarities with the Danish system discussed in Basbøll (to appear) and Durand (2003). If this is correct **n** would therefore be maximally set at the value **5** (but see Schane this volume).

Although a feature such as tense/lax has been used in phonetic research for quite a long time, it has never managed to be accepted in the IPA notational system. Jones, in his famous *Outline of English Phonetics* (1918[1964]) notes that some specialists describe the difference between the long and short vowels of English (e.g. /iː/ vs. /ɪ/ or /uː/ vs. /ʊ/) as a matter of 'muscular tension'. "It is by no means certain", he argues, "that this mode of describing the sounds really corresponds to the facts" and, in any case, "it is extremely difficult to determine in the case of the opener vowels whether the sensation of 'tenseness' is present or not" (1964: 39-40). For instance, he himself describes short /æ/ as involving "a contraction in the pharyngal region", which is "too vague to describe precisely, though it appears to be an inherent characteristic of this sound" (1964: 72). The nearest thing that we now have in the IPA tradition to tense/lax is Advanced and Retracted Tongue Root (see IPA 1999) but, as we shall see, this feature does not cross-classify sounds in exactly the same way as tense/lax and it remains to be shown that it is phonetically justified in English.

2.2 *The Bell/Sweet tradition*

In the 19th century, another influential account of vowel height was to gain ground. Both Bell (1867) and Sweet (1877) offer a description of the vowel space as basically organized along two axes with three divisions each (high-mid-low and front-central-back) to which lip-shape can be added. Given that vowel systems appear to present more contrasts on the height axis than the backness axis, the question arises of how to handle oppositions such as e/ɛ or o/ɔ or ø/œ which are well-attested in the languages of the world. The Bell/Sweet account has to have recourse to other parameters. Bell used primary/wide which refers to the opening between the back of the

mouth and the throat. Sweet modified this to narrow/wide which "depend on the *shape* of the tongue. In forming narrow sounds there is a feeling of tenseness in that part of the tongue where the sound is formed, the surface of the tongue being made more convex than its natural 'wide' shape, in which it is relaxed and flattened" (1877: 8-9). As can be seen in Fig. 1, taken from Sweet's *Handbook of Phonetics,* such a supplementary feature allows 36 vowel qualities to be distinguished.

NARROW			WIDE		
" high-back	**ih** high-mixed N. Welsh tag*u*	**i** high front F. f*i*n*i*	**A** high-back	***i*h** high-mixed Occ. E. pretty	***i*** high-front E. b*i*t
ɐ mid-back E. b*u*t	**eh** mid-mixed G. gab*e*	e **mid-front F. *été***	**a** mid-back E. f*a*ther	***e*h** mid-mixed E.*e*ye (*e*h[ih])	***e*** mid-front Danish træ
ɒ low-back Occ. Sc. B*u*t	æh low-mixed E. b*ir*d	æ low-front E. *ai*r	ɑ low-back Sc. F*a*ther	**æh** low-mixed E.how (æh[oh])	æ low-front E. m*a*n
NARROW-ROUND			WIDE-ROUND		
u high-back F. s*ou*	**uh** high-mixed Swedish h*u*s	**y** high front F. l*u*ne	***u*** high-back E. f*u*ll	***u*h** high-mixed Swedish *u*pp	***y*** high-front G. schützen
o mid-back G. s*o*	**Oh** mid-mixed	ə mid-front **F. p*eu***	***o*** mid-back N.G. st*o*ck	***o*h** mid-mixed F. h*o*mme	ə mid-front N.G. schön
ɔ low-back E. s*aw*	ɔh low-mixed	**œ** low-front E. *ai*r	ɔ low-back E. n*o*t	ɔh low-mixed	***œ*** low-front

Fig. 1 Sweet's (1877: 16) basic organization of the vowel space

Both Jakobson, Fant and Halle (1952) and Chomsky and Halle (1968) have followed the Bell/Sweet tradition. That is, they offer schemes in which vowel height allows for only three positions. The explicit adoption of binary features does however change the perspective since the notion of a continuum is abandoned. If we follow Chomsky and Halle, in the *Sound Pattern of English* (SPE hereafter), the relevant features are [+/-high] and [+/-low]. While these authors are committed to the view that distinctive features are binary at the classificatory level and within the phonological component but scalar at the phonetic level, it is far from clear how the notion of vowel height would be handled phonetically since it would involve the merger of two independent binary parameter into a single dimension. Leaving this problem aside, the prediction is made that no language would truly oppose more than three vowels in terms of height. Rather, what appears like an opposition between four or more degrees of height has to be handled in terms of other features and, in particular, [tense/lax] whose definition is usually close to that initially put forward by Jakobson, Fant and Halle:

"Stimulus. In contradistinction to the lax phonemes the corresponding tense phonemes display a longer sound interval and a larger energy (defined as the area under the envelope of the sound intensity curve) [...] In a tense vowel the sum of the deviation of its formants from the neutral position is greater than that of the corresponding lax vowel. (1952 : 36)

Production. Tense phonemes are articulated with greater distinctiveness and pressure than the corresponding lax phonemes. The muscular strain affects the tongue, the walls of the vocal tract and the glottis. The higher tension is associated with greater deformation of the entire vocal tract from its neutral position. This is in agreement with the fact that tense phonemes have a longer duration than their lax counterparts. The acoustic effects due to the greater and less rigidity of the walls remain open to question." (1952 : 38)

While tense/lax is used in the generative treatment of a wide sample of languages, many scholars have expressed worries about its use as "contentless dichotomizing operator" (Lass 1976: 9-10). If features are supposed to have cognitive content and to be grounded in phonetics (two central claims of the SPE tradition), we should be wary of using features in a purely diacritic way and then circuitously arguing that they are part and parcel of a universal framework which reflects the biological endowment of human beings.

2.3 **I, A, U systems: Dependency Phonology**

Dependency Phonology (DP hereafter) is a phonological model which was initiated by Anderson and Jones' seminal work (1974[1972], 1977) and was developed thereafter by various researchers (notably, Anderson and Ewen 1987 and van der Hulst in numerous works: cf. Ewen and van der Hulst 2001, Anderson 2002 for references). This is not the place to review various developments around the core notions of DP or its relationship to similar models such as Particle Phonology or Government Phonology[3] and we shall content ourselves with a brief overview of the main concepts.

DP assumes that phonological features are unary and therefore always present the positive pole of a property. Features are called components in classical DP but, since components have also been assumed to be structural 'ensembles' (the phonological component, the syntactic component, etc.), I will use here the term 'element' adopted in Government Phonology. The elements adopted in DP are not necessarily the same as classical features such as those put forward in the IPA or in the SPE tradition. In particular, it is claimed that the vowel system is structured around three basic elements, labelled A (low/compact), I (palatal/acute) and U (grave/round). Once again, like Government Phonology, I use capital letters to distinguish as clearly as possible the symbols representing elements from the symbols representing various sounds. To illustrate our basic assumptions, if a language has only three vowels /i a u/, this can be represented by appealing to the I-A-U primitives alone: /i/ = {I}, /a/ = {A}, /u/ = {U}. A system such as /i e a o u/ can be represented by combining elements in a simple way (copresence is indicated by a comma): /i/ = {I}, /e/ = {I,A}, /a/ = {A}, /o/ = {A,U}, /u/ = {U}.

(1) /i e a o u/ systems in DP

{I} {U}
{I,A} {U,A}
{A}

[3] Cf. Schane, 1984 a, b, Kaye, Lowenstamm & Vergnaud 1985, Rennison 1896, Harris 1994.

One further crucial assumption made by DP is that the relation of government/dependency is available within phonological systems and is, indeed, necessary as soon as phonological systems reach a certain degree of complexity. In a system like /i e ɛ a ɔ o u/, while it is not denied that tongue root retraction may be involved, it is claimed that, for many of the world's languages, the evidence favours a representation based on government/dependency (symbolized here by a semi-colon): i.e. /i/ = {I}, /e/ = {I;A}, /ɛ/ = {A;I}, /a/ = {A}, /ɔ/ = {A;U}, /o/ = {U;A}, /u/ = {U}, where the semi-colon indicates that the element on the left governs/dominates the element on the right. The use of dependency allows us to model the notion of a scale: as we go from {I} to {A} in the previous example, we follow steps which decrease the presence of I and increase that of A. The maximum allowed by the theory is 5 levels as in : /i/ {I}, /e/ = {I;A}, /ɛ/ = {A:I}, /a/ = {A;I}, /ɑ/ = {A}. Note that in the middle position (/ɛ/ = {A:I}), A and I mutually govern each other. One basic consequence of the approach defended here is that the basic structure of vowel systems is triangular not quadrangular as in the IPA and the Bell-Sweet tradition. If we came across a system like /i e æ ɑ o u/, it would be modelled as inherently symmetrical in the SPE tradition:

	-back	+back
+high -low	i	u
-high -low	e	o
-high +low	æ	ɑ

Fig. 2 SPE /i e æ ɑ o u/ system

By contrast, it would be inherently skewed in a DP approach:

(2) DP /i e æ ɑ o u/ system

{I} /i/ /u/ {U}
{I;A} /e/ /o/ {A,U}
{A;I} /æ/
{A} /ɑ/

The I, A, U primitives are arguably not sufficient to handle all the phonological systems of the world (but see Schane this volume for an alternative view). An element of centrality or energy reduction is also required (see Anderson and Ewen 1987, Harris 1994, Harris and Lindsay 1995). This will be symbolized as @. At first sight, this element seems equivalent to a feature such as lax (or [-tense]). But this is not altogether the same as we argue in more detail in §5. Phonetically, the use of @ opposes centralized vowel to peripheral vowels. If therefore we combine @ and A, we obtain a vowel corresponding to IPA [ɐ] and not the sound [æ] (*ant*) assumed to be the lax equivalent of /ɑː/ (*aunt*) in RP for example. Various works, such as Anderson and Ewen (1987), argue that primitive for ATR-ness is also required in view of the many systems which oppose two classes of vowels in terms that do not seem directly relatable to

height or retraction. Anderson and Durand (1988b) argue, however, that recourse to the A component may yield an equally insightful analysis of a language like Nez Percé usually presented as strong evidence for ATR-ness. Whether all systems can be so reanalysed is another question on which I will not take a position here.

3. *Tense/Lax in English and phonetic evidence*

As was mentioned earlier, English has always been assumed within generative phonology to provide one of the fundamental examples of the need for the feature tense/lax. SPE made tense/lax the cornerstone of the vocalic system of English from which all allomorphic variation (in particular via the synchronic residue of the Great Vowel Shift) could be predicted. While Chomsky and Halle's account was based on their own dialect of American English, which was said to be "essentially that described in Kenyon and Knott (1944)", it will be recalled that they considered it "very likely that the underlying (or phonological) representations must be common to all dialects of English, with rare exceptions, and that much of the basic framework of rules must be common as well" (1968: ix-x). While many researchers no longer subscribe to the view of phonology advocated by Chomsky and Halle, the assumption that tense/lax is fundamental to the structure of all dialects of English is widespread both in theoretical and pedagogical discussions (see e.g. Giegerich 1992). The following assertion by two French phonologists describing RP is by no means untypical:

"Contrary to a widespread and rather tenaceous idea, the vowel system of English is not based on a contrast in length. If this distinction may have been active at an older stage of the language, it does not have any functional reality today. In fact, in pure durational terms, the “short” vowels are often as long, if not longer, than the so-called “long” vowels. [...] Rather than length, we propose to analyze the vowels of English in terms of an articulatory criterion of muscular tenseness or laxness which accompanies the vocal folds.

The test is fairly easy to implement : delicately place the fingers of one hand on the corners of your lips and those of the other on your Adam’s apple, and produce the vowels [ɪ] and [iː] in turn. You will feel the lips retract towards the back and the thyroid cartilages move under the stress of the muscular constriction. So, the criteria are above all muscular to differentiate, within the vowels of English, those that present a relative degree of laxness, and those which are accompanied, relatively speaking, with muscular tension. The vowels considered as lax are [ɪ e æ ʌ ɒ ʊ], and those considered as tense are the monophthongs [iː ɑː ɔː uː ɜː] and the diphthongs [eɪ aɪ aʊ əʊ ɔɪ eə ɪə ʊə]." (Duchet & Fryd, 1997: 19; my translation JD).

In modern generative work, the feature tense/lax is very often dropped in favour of Advanced Tongue Root (ATR) but the assumption that ‘tension’ is an obvious proprioceptive correlate often remains as in the following quote from the standard textbook of the nineties:

“After the airstream leaves the larynx, it passes through as many as three cavities whose specific properties excite it in particular ways. These are the *pharyngeal*, *nasal* and *oral cavities.* In the pharynx, the root of the tongue may be projected forward to create a greater pharyngeal opening or it may fail to be so advanced. This advancement of the tongue root is the basis of the distinction between the relatively tense-feeling, crisper vowels of *beat* and *bait* and the more lax vowels of *bit* and *bet*. Prolongation of the vowel in *beat* produces the sensation of a noticeable tensing of the tongue muscles; the tension reflects the advancement gesture. As we will see, *advancement* of the tongue

root (ATR) is significant not only in English but also in many African languages, which have a principle of vowel harmony that prohibits the mixture of advanced and nonadvanced vowels within a word." (Kenstowicz, 1994 : 14).

Now, the earlier quotation from Duchet and Fryd opposes two sets of sounds for RP: on the one hand, the 'lax' ones (eg. eg. *pit, pet, pat, putt, pot, put*) and, on the other, the 'tense' monophthongs (*bead*, *bard*, *boar*, *boo*, *burr*) and diphthongs (*bay*, *buy*, *boat*, *boy*, *bear*, *beer*, *boor*). The structural difference between these two sets is not being questioned here. One standard argument, and more shall be reviewed in §4, is that in monosyllabic words of English, it is not possible to have a lax vowel unless it is followed by a consonant. Thus, *[bɪ], *[be], *[bæ], *[bʌ], *[bʊ] are ill-formed whereas the same sequences followed by a consonant are acceptable (e.g. *bid*, *bed*, *back*, *buck*, *book*). On the other hand, the 'tense' vowels and the diphthongs can occur in monosyllables without problem (cf. *bee*, *bar*, *boy*, *buy*, etc.). The question at issue is whether tense/lax is the feature we need.

Pedagogical presentations of the feature tense/lax (or ATR), as illustrated earlier, usually ask the reader to perform some proprioceptive experiment but not everybody reports the same observations. The matter was put rather flippantly by Lass (1976) who was responding to Schane's 1973 invitation to check the features very much as Duchet and Fryd above.

"I tried Schane's 'verification'. Taking the 'tense' vowel of *beat* and the 'lax' vowel of *bit* (his examples), I tried 'pressing the fingers against the throat' while uttering them. After a little experimentation, I found two parts of the 'throat' where I could indeed feel something (other than vocal band vibration): the anterior belly of the digastricus, directly under the mandible, and an area right above and slightly posterior to the thyroid cartilage. If I pronounced [i] and [ɪ] (corresponding to *beat* and *bit*), I could feel something of a 'difference' : but ONLY WHEN PASSING FROM ONE VOWEL TO THE OTHER: there was no particular difference between the vowels themselves. Obviously, what I felt was simply the movement of the tongue from a close-front position to a half-close retracted one - certainly not a difference in 'tension'. I got almost exactly the same kind of effect by passing from one 'tense' vowel to another as might be expected. [...] After some further testing, I found that the effect that Schane calls 'difference in muscular tension' could be demonstrated with any pair of vowels where the second was either (a) opener, or (b) less peripheral than the first : I tried it with pairs like [e] : [ɛ], [u] : [ʊ], [ɨ] : [ə], [ɔ] : [ɒ], etc. ... They [the differences JD] have nothing to do with tension, but with the muscular movements defining two independent parameters, height and peripherality." (Lass 1976 : 41-42)

But, even if we do not agree with Lass's personal observations, it is interesting to note that the evidence from experimental phonetics is far from conclusive. For a start, doubts have regularly been expressed as to the relevance of 'tension' as a correlate of the feature. While Jakobson, Fant and Halle (1952) pointed out that "the acoustic effects due to the greater and less rigidity of the walls remain open to question", other phoneticians are more definite on the matter. As Mackay (1987) observes: "For basic acoustic reasons […], simply tensing a few muscles will not change a vowel sound unless the size and/or shape of the vocal cavities is changed". But, then, if tension is irrelevant, what are the correlates of this feature? Stevens, in his monumental *Acoustic Phonetics* (1999) deals with this question at length in his section 6.7 (pp. 295-299). He observes that starting with an ideal vocal tract of uniform shape, we can perturb the walls of this tube in particular way and this allows us to establish an opposition between "vowels that reside on the periphery of the quadrilateral represent extreme perturbations

from the uniform shape" (the so-called tense vowels) and "vocal tract configurations and acoustic patterns intermediate between these extreme or peripheral vowels and the central or schwa vowel" (the so-called lax vowels). But, when Stevens attempts to define this opposition more precisely, he oscillates between advanced/retracted tongue root and total pessimism as demonstrated by the following quote:

"In view of these potential multiple acoustic correlates of the tense-lax distinction (formant shifts, duration, diphtongization, glottal source characteristics, bandwith changes) this vowel feature has been the subject of some controversy, and one can question whether a single feature provides an adequate description of this contrast. For example, in some languages the use of an advanced tongue root seems to be the primary mechanism for implementing the contrast (Painter, 1973; Lindau, 1979), whereas in a language like English other attributes play a role. One convention is simply to describe the contrast as Open vs. Closed, reflecting the difference in mandible position and mouth opening for the contrasting vowels. More research is clearly needed on this topic."

Nowadays, the strategy of shifting from tense/lax to ATR/RTR is one followed by many phonologists and phoneticians (who point out that they use tense/lax merely for traditional reasons) but it won't do for at least two reasons. The first reason is that physiologically the tongue-root setting in a language like English is not an independently controllable variable in the way it is argued to be in West African languages like Akan where ATR-ness has an indisputable phonological function. Unlike Akan where ATR-ness can be shown to be separable from height and retraction, in English, the behaviour of the tongue root inferrable from statistical analyses of tongue-shape is not separable from height and retraction (see Ladefoged and Maddieson 1996 for an overview, and Harshman, Ladefoged & Goldstein 1977, Ladefoged & Harshman 1979, Jackson 1988, Tiede 1993 for detailed experimental investigations). A second reason is that while ATR might work for the non-low vowels it definitely gives the wrong result for the low unrounded vowels (and see §4.4 for other examples). In RP, phonetically, the back tense 'a' /ɑː/ of RP (*shah*, *bra*, *fast*, *farm*) is a prime example of a vowel pronounced with Retracted tongue root ([-ATR]) whereas the front /æ/ of *cat* has to be [+ATR]. But the classification we need if we want to oppose [ɪ e æ ʌ ɒ ʊ] and [iː ɑː ɔː uː ɜː] is exactly the opposite!

Of course, one last strategy is to ressuscitate SPE and to point out that many of the oppositions we are talking about at merely at the level of phonetic implementation (shift the blame!) and not part of the underlying system. For instance, some might argue that the tense [ɑː] of RP is really /a+r/ (cf. *bar*, *barring*, *bard*). In a period which has seen a reemergence of surface phonology (e.g. output-ouput constraints in OT), this strategy seems particulary unwarranted. But even if we accepted the possibility of deriving some long RP vowels RP from underlying VC sequences, it should be noted that in RP the opposition between the 'lax' and the 'tense' vowels is lexical and not derived unless one is willing to contemplate feature-switches on a massive scale. The examples limited to [ɑː] which are listed in (3), to which many more could be added, should convince any reader not familiar with RP that this escape hatch is simply not available.

(3) Some examples of non-derived lexical contrasts in RP:
a. < -- mple#>
/æ/ ample, trample
/ɑː/ sample, example

b. < --- (l)m#>
/æ/ Pam, ram, cam, Sam
/ɑː/ palm, balm, calm, psalm
c. < -- nt/nd#>
/æ/ rant, ant, hand, sand
/ɑː/ grant, aunt, demand, command
d. < --- ss#>
/æ/ mass, lass
/ɑː/ pass, grass
e. < --- sC>
/æ/ mascot, masculine, masticate, pasta
/ɑː/ mask, master, pastor

4. ***Revisiting length in English***

What I would like to argue now is that tense/lax is not needed as a feature to cross-classify the vowel phonemes of English. Contrary to the assertion of Duchet and Fryd quoted earlier, the fundamental dichotomy in English is one of length, whether interpreted in terms of skeletal, moraic weight or categorial weight (in the sense of Dependency Phonology). The two skeletal positions they share is what gives them the same weight as VC sequences in a number of contexts.

(4) Alternative characterizations of weight in English

a. /iː/ = x x /aɪ/ = x x /ɪ/ = x
\/ | | |
I A I I

b. / iː/ = μ μ /aɪ/ = μ μ / ɪ/ = μ
\/ | | |
i a I I

b. / iː/ = V V /aɪ/ = V V /ɪ/ = V
\/ | | |
I A I I

In classical dependency phonology, the vowels of RP can be characterized as follows leaving aside the weight structure:

(5) Possible dependency representations of English vowels
(a) Long ‘tense’ monopthongs
/iː/ = {I}, /ɑː/= {A} ʔɔː/ {A,U}, ʔuː/ {U}ʔɜː/ {@}
(b) Short ‘lax’ monophthongs
/ɪ/ = {I,@}, /e/ = {I;A}, /æ/ = {A;I}, /ɒ/ = {A,U} /ʊ/ = {U,@}, /ʌ/ = {A,@}
(c) Diphthongs

/eɪ/ = {A,I} + {I,@}, /aɪ/ = {A} + {I,@}, /aʊ/ = {A} + {U,@}, /əʊ/ = {A,U} + {U,@} (if interpreted as systemic /oʊ/), /ɔɪ/ = {A,U} + {I,@}}, /eə/ = {A,I} + {@}, /ɪə/ = {I,@} + {@}, /ʊə/ = {U,@},{@}.

In (5), the '+' indicates linear order between two gestures as, for simplicity, I have chosen to leave aside the fact that in the left-headed diphthongs of English the categorial gesture of the first vocalic element governs the second element. I have not pursued here the possibility of underspecifying or not specifying at all a number of these vowels. For instance, the difference between /iː/ = {I}(two units of weight) and /ɪ/ = {I,@} (one unit of weight) might be reducible to their weight difference, in which case they would be both be {I}. John Anderson in a series of papers published since the late eighties has argued, convincingly in my eye, that many advantages accrue to an analysis which pushes contrastivity to its limits (see Anderson 1988a,b, 1992, 1993, 1994, in press, as well as Anderson and Durand 1988a,b). By combining contrastivity and principles based on system geometry as illustrated in (5') below, a number of ongoing changes within varieties of English can be argued to be attempts at solving tensions within the system.

(5') A less specified dependency representations of English vowels
(a) Long 'tense' monopthongs
/iː/ = {I}, /ɑː/= {A} ʔɔː/ {A,U}, ʔuː/ {U}ʔɜː/ {_}
(b) Short 'lax' monophthongs
/ɪ/ = {I}, /e/ = {I,A}, /æ/ = {A}, /ɒ/ = {A,U} /ʊ/ = {U}, /ʌ/ = {A,_}
(c) Diphthongs:
/eɪ/ ={A,I} + {I}, /aɪ/ = {A}+ {I}, /aʊ/ = {A} + {U}, /əʊ/ = {A,U} + {U} (if interpreted as systemic /oʊ/), /ɔɪ/ = {A,U} + {I}, /eə/ = {A,I} + {_}, /ɪə/ = {I} + {_}, /ʊə/ = {U} + {_}.

My argument, however, will not rest on a given analysis of the system of English in terms of dependency elements. Other analyses are possible within related frameworks (see e.g. Harris 1994, Schane 1984a,b, this vol.) but as far as I can see they would all make the same assumption that 'tension' is not the correct feature. Rather, I will concentrate on the arguments in favour of seeing length or moraicity as basic.

4.1 ***Distributional arguments.***

There are a number of distributional arguments in English allowing us to separate the 'lax' vowels from the 'tense' vowels and the diphthongs: e.g. only the 'lax' vowels are allowed before [ŋ] (cp. *sing – sang – sung - song* vs. *s[iː]ng, *s[aɪ]gn, etc.). The crucial generalization which is standardly mentioned is that only tense vowels and diphthongs (/iː ɑː ɔː uː ɜː eɪ aɪ aʊ əʊ ɔɪ eə ɪə ʊə/) are allowed under stress in open final position. Note the absence of possible monomorphemes of the form : */pɪ teː kʊ sʌ lɒ/ etc. However, under the assumption of ambisyllabicity which has been defended in DP from the earliest work (Anderson and Jones 1972, 1974), the surface generalization is that the strong syllable of a stressed foot must be either a 'tense' vowel, a diphthong or a 'lax' vowel followed by a consonant (*arena* [ə][riː][nə]), *saliva* [sə][laɪ][və], *pity* [pɪ[t]i]). The generalization is clearly one of weight: to be well

formed a morpheme must have a {V} head with a dependent whether the dependent is a {V} or a consonantal segment.

4.2 ***Lexical stress assignment***

The nature of lexical stress in English is controversial. Whereas some phoneticians such as Jones, in the various editions of his deservedly famous *Outline of English Phonetics* (first edition, 1918), have expressed reservations on the possibility of predicting stress in English, there is now a huge literature which assumes that a substantial part of the lexical stress system is predictable (e.g. Kingdon 1958, Chomsky and Halle 1968, Anderson 1975). Of course, to extract any regularities we need access to several types of information : syntactic, morphological and phonological (in the narrow sense of the featural make-up of the segments and their syllabic belongingness). One of the core assumptions of SPE, for instance, is that, for nouns, the same effect is triggered by a tense vowel, a diphthong and a heavy cluster of vowel + consonant (in effect, a closed syllable): provided the last syllable is not heavy, their presence in the penultimate syllable attracts the main stress. Otherwise, the stress is assigned to the antepenultimate syllable.The reader may recall Chomsky and Halle's examples:

(6) SPE (1968: 71) :

I	II	III
America	aroma	veranda
cinema	balalaika	agenda
asparagus	hiatus	consensus
metropolis	horizon	synopsis
javelin	thrombosis	amalgam
venison	corona	utensil
asterisk	arena	asbestos
arsenal	Minnesota	phlogiston
labyrinth	angina	appendix
analysis	factotum	placenta

Of course, there are counter-examples; but it is interesting to note that analyses resting on solid statistical information such as Lionel Guierre's work in France based on computer-readable versions of Jones' *English Pronouncing Dictionary* support such regularities (Guierre 1979, 1984). It emerges that, out of 3000 words (stems and opaque derivatives) examined, the grouping 'tense/long vowel (*albino*), diphthong (*horizon*), and VC (*agenda*) is largely confirmed. First of all, there appear to be no morphemes of the form */ˈærəʊmə/, /ˈkɒriːtə/, etc. Secondly, the exceptions to VC attracting stress in a closed syllable are less that 10% of the whole set and belong to two clear subclasses : i.e. a) stems ending in <-C_2y> : *amnesty*, *calumny*; (b) words such *ancestor*, *banister*, *barrister*, *calendar*, *carpenter*, *character*, *cucumber*, *cylinder*, *lavender*, *messenger*, *minister*, *passenger*, *register*, *orchestra*, *pimpernel*, *talisman* which often involve final clusters in <Cr#> as shown by related forms such as *calendrical*, *carpentry*, *cylindrical*, *ministry*, etc. (see Chomsky and Halle 1968: 85-86).

In underlining this link between 'tense' vowels, diphthongs and VC sequences we need not be committed to the view that the whole of the stress system is predictable from an underlying structure à la SPE. Other positions are possible. It may be that stress is lexically coded on a large scale but constrains the surface forms which may be linked to it (see e.g. Burzio 1994 for extensive discussion of these questions). The main point is that the correspondence between 'tense' vowels, diphthongs and VC sequences is

mysterious if we assume that what fundamentally characterizes the 'tense' vowels is tension rather than a complex weight structure.

4.3 ***Alternations***

Ever since SPE, phonologists have been used to considering a number of alternation patterns involving the grouping tense vowels and diphthongs as opposed to lax vowels. Alternations such as *divine - divinity*, *serene - serenity*, *insane - insanity*, *cone - conical* were part of the diet of the apprentice phonologist for a good many years after the publication of SPE. Very few linguists would nowadays countenance SPE-style analyses which derive the diphthongs from underlying [+tense] vowels through ordered transformational rules which have the power of a Turing machine. On the other hand, the patterns exhibited in SPE do exist and need accounting for in some manner or other. Anderson (1992, 1993, etc.) argues that while the vowel shift has to go as a rule one can incoporate many of its insights non-destructively but, once again, on the basis of weight and not on that of tense/lax. From a more concrete point of view, we could assume networks such as advocated in Hooper (2000) but these, if they are to be formulated in, or linked to, a symbolic vocabulary, are best dealt with in terms of weight. If it is agreed that such alternations are part and parcel of the phonology of English taken as a system which has access to morphosyntactic information, then clearly the argument in favour of bimoraicity is strong. Moreover, the alternations do not solely involve 'long' vowels (V:) and diphthongs (VV) but various adjustments seem to favour the correlation V: = VV = VC. This is, for example, the case of so-called laxing rules (e.g. *keep-kept*, *satisfy-satisfaction*, *detain-detention*, *abstain-abstention*) dealt with by Chomsky and Halle (1968) as examples of V --> [-tense] / ----C^2, the typical closed syllable context in SPE notation

It is, however, important to note that not all alternations are at a 'deep' morphophonological level. For instance, most varieties of English are argued to contain rules which affect a vowel which might potentially occur immediately in front of another vowel. Among these rules some are argued to be gliding rules (semi-vocalisation), others to be involve the formation of centering diphthongs, and others to be 'tensing' rules. Thus, the following examples would be assumed to reflect a tensing mechanism:

(7) Tensing rules in VV sequences
<i> alien, mania, various, Toryism, atheism
<u> arduous, annual, genuine, Hinduism altruism
<a> archaism, Hebraism, Judaism, Mosaism, Prosaism
<o> heroin, benzoin, jingoism, shintoism, echoism

But is tension what is involved here? Recent pronouncing dictionaries of RP such as Wells (2000) or Roach and Hartman (1997) transcribe these words /ˈeɪliən/ and /ˈɑːdjuəs/, which seems to point to a 'tense' vowel rather than a long one, and experimental measurements might well support such a view. Yet, in forms like *archaism* or *heroin*, what we observe is a diphthong which is considered by the same authors to be inherently complex and long. Note too that in VV sequences where the first V is stressed we have the same pattern conflating so-called tense vowels and dipthongs: e.g. *idea*, *gaiety*, *bruin*, *boa*, *bias*, *prowess*, *sequoia*, *skewer* (Hammond 1999: 210-211 et passim). The fact that in some varieties of (conservative) RP, the second syllable of *idea* is pronounced with a lax diphthong /aɪˈdɪə/ (reflecting a

neutralization of /ɪə/-/iːə/ in some positions) should not blind us to the fact that VV sequences give evidence for treating so-called tense vowels as structurally heavy: the same generalization is responsible for the [i] in *miasma* (i.e. /iː/ in a traditional notation) and the /aɪ/ in *Miami*.

4.4 ***Allophonic arguments***

I would like to assume that phonology has to account for a substantial portion of the allophonic forms of underlying elements. Too much of the 'surface' forms of morphemes is strictly unpredictable in general terms attributable to inherent mechanical constraints for it to be left out of the phonology (whether the latter is conceived in derivational terms or in declarative terms based on redundancy statements or constraints). If this assumption is correct, the allophonic forms of many of the underlying 'tense' vowels in English seem to be clearly problematical.

Let us start with the diphthongs. If we assume that the diphthongs are inherently [+tense], then it is rather odd that in English the starting point of many of the diphthongs is clearly non tense. The most telling example is the case of the RP <o> dipthong in *rose* whose starting point is schwa and which has been transcribed [əʊ] in the standard RP dictionaries and textbooks for several decades. On the same note, the starting-point of the diphthongs in *lied* and *loud* currently transcribed /aɪ/ and /aʊ/ in the same works, can have a range of qualities which show that [+/-tense] can switch quite happily in given idiolects or subvarieties of RP. For some conservative speakers, these can be [aɪ] (or even [æɪ]) and [ɑʊ] (cf. Gimson 1962), while in London English which is often considered as isomorphic with RP, these diphthongs would be more appropriately transcribed [ɑɪ] and [æʊ]. If we turn to the monophthongs, it is also well-known that, for a number of speakers, long /iː/ and /uː/ have diphthongal realizations with lax starting-points: i.e. [ɪi̯] and [ʊu̯]. More worryingly, the vowel /ɜː/ of *bird* in RP (transcribed by some as /əː/) seems to be an odd realization for a tense vowel: a more central and more lax realization seems hard to achieve. Our problems, however, do not stop there. The quality of the opposition between the two types of 'a' deserves some comment. While in RP, it is true that the opposition takes the form [æ] (or [a]) vs. [ɑː] (in their standard IPA values), it is interesting to note that some RP speakers have a marginal /æ/-/æː/ opposition (see 4.6 below) and some non-rhotic varieties of English are quite happy to distinguish *bad* and *bard* with just length. I have myself regularly observed Manchester speakers distinguishing these words as [bad]-[baːd]. To close this paragraph which could be extended, we should note that, in RP, the so-called lax 'o' of a word like *cot* is agreed to have the IPA value [ɒ], or be extremely close to it. This again is rather puzzling if one believes that the relevant feature is [+/-tense], or indeed [+/-ATR],: [ɒ] is nothing else than [ɑ] (the vowel of *car*) but without the length and with lip-rounding.

4.5 ***Projection problems***

In the traditional account, it is assumed that [+tense] vowels attract two skeletal positions; but, if the first element of diphthongs such as /eɪ, aɪ, aʊ, əʊ, ɔɪ/ is tense, how does one avoid overprojecting skeletal positions? This problem seems to be quite a severe one for all accounts which assume the central relevance of the feature [tense] or its recent alternative [ATR]. As far as I can see, these difficulties also face alternative

accounts which take bimoraicity as fundamental and automatically link it (either serially or in parallel) to tension.

4.6 ***Additional diachronic arguments***

Starting with Old English (OE), we have a great deal of evidence of the relevance of length in the phonology of English. One example, which Fran Colman reminded me of, is that of OE neutral nouns in *–a* which take a plural suffix only if the base is 'light' : *scip/scipu* 'ship', *hof/hofu* 'dwelling' as opposed to zero plurals such as *word* 'word', *hors* 'horse', dēōr 'animal', wīf 'wife'. It is well-known that a number of so-called tense vowels are the result of processes involving vowel-consonant sequences - the most obvious case being coda 'r' - where the loss of the consonant seems to have triggered the tension (in reality the compensatory lengthening) of the resulting vowel. However, in a number of cases this mechanism merely reinforced other processes best interpreted in terms of length and not tension. Let us consider briefly RP /ɑː/ and /ɔː/. If we believe Strang (1970), whom I follow closely here, at the beginning of the sixteenth century, English had no long /ɑː/ vowel. This gap was however soon filled. The ME diphthong /au/ (the sound as in current RP *house*, but occurring in words which now have /ɑː/ or /ɔː/), developed in some dialects to /ɒu/, perhaps only in certain contexts. Then, towards the end of the sixteenth century the diphthong, whether pronounced [au] or [ɒu], began to monophthongize. In certain varieties, this resulted in /ɑː/, but /ɔː/ in the standard. In the late 17c, there was an invasion of /ɑː/ forms in the standard. These two vowels remained in competition, and many words had alternative forms (e.g. *sauce*, *saucy*, *sausage* are attested with /ɑː/ variants), but Strang (1970: 111) argues that, in recent English, "spelling has taken a hand, so that the outcome has been /ɑː/ in such words as *dance*, *half*, *calm*, and /ɔː/ in such words as *fault*, *cause*, *author*; but with exceptions either way (*aunt*, *talk*, *walk* [with loss of *l* cf. §70]) and some divided usage (*launch*)". The other source of RP /ɑː/ results from the lengthening of 'lax' /a/ in certain types of syllables involving fricatives : *blast*, *casket*, *gasp*, *past*. If this is correct, the loss of post-vocalic (coda) r's, which probably started in the 16th century, can be argued to have merely contributed to the general pattern favouring an opposition between light and heavy nuclei in English, cf. *car* /kɑː/, *cart* /kɑːt/, *carter* /kɑːtə/ (see Durand 1999).

Our point here is that many 'processes' in the history of English show that length differences keep reappearing and reasserting themselves. A possible example is the marginally contrastive long /æː/ in pairs such as *bad* [bæːd] vs. *pad* [pæd] or *glad* [bæːd] vs. *lad* [læd] noted by Wells as characterizing some RP speakers (1982: 288-289). While this opposition seems limited to the environment of a following /d/ and is correlated with grammatical factors in not fully understood ways, it is nevertheless interesting evidence in seeing weight, and not tension, as the key player in the evolution of English. Since a lax quality, that of /æ/, can be so easily combined with length, it is up to the advocates of tension to provide the evidence that, at some point, weight stopped being central to let tension take over.

5. ***Is there a place for the feature tense/lax in English?***

If the arguments given above are accepted, the feature [tense] (or [ATR], for that matter), is not fully satisfactory either at the 'underlying' level or at the 'surface' level. If we assume that phonology defines an underlying system which is 'underspecified'

(where contrastivity is maximized) in the sense defended by John Anderson in much of his work, then 'tension' is not the relevant parameter. How do we account then for the cases where traditionally 'tension' has seemed more secure : i.e. the high vowel contrasts /iː/-/ɪ/ and /uː/-/ʊ/? If we leave aside 'deep' phonological arguments there is evidence that these vowels enter into neutralization patterns underlining a strong phonological affinity between them. Thus, in unstressed final position there is not contrast between /iː/-/ɪ/ and /uː/-/ʊ/. One generalization which has concerned phonologists is so-called Happy-tensing: i.e. the fact that in some varieties the final vowel in words like *happy* can either be 'lax' [ɪ] or tense [i] (sometimes said to be also long [iː] although length is this unstressed position is not easy to measure). One usual assumption in DP is that, structurally, the last vowel in *happy* words corresponds to a single slot or mora. If we maximize contrastivity, this slot is merely {{V}{I}}. The two main realizations follow naturally from this: an unmodified {{V}{I}} will be intepreted phonetically interpreted as [i]; otherwise a redundancy statement will add the central component to yield {{V}{I,@}}. In other words, *happy-tensing* is simply happy-laxing. The other alternative, which would be pursued in a government phonology approach is to consider that the final vowels are structurally different via the presence of the @ element or the so-called cold vowel according to the framework adopted.[4]

At this point, it might be objected that we are not making a different claim from that of classical feature-theory since we recognize the need for a centrality component and for opposing 'peripheral' vs. 'centralized' vowels. The latter opposition is indeed justified but several things should be noted. First of all, opposing centrality to peripherality clears up much of the ambiguity of the tense/lax literature which usually (wrongly) includes physiological tension as a correlate of the feature. Secondly, the adoption of a centrality component and its integration to the system entails a different treatment of a number of reduction processes as argued by Harris (this volume). Finally, it is claimed here that the opposition between the tense and lax vowels of English is not one which can be *systematically* interpreted as 'peripheral' vs. 'centralized'. As was pointed out earlier, the so-called lax 'o' of a word like *cot* is agreed to be extremely close to the IPA value [ɒ], which designates a fully open back rounded vowel, by definition a peripheral vowel. Equally, front lax /æ/ (which for many RP speakers is in fact close to cardinal IPA [a]) is as peripheral as back tense [ɑː] and so on and so forth. The real difference is one of length or moraic weight. In some interesting work done by Clements (2003), which builds on Clements and Hertz (1996), it has been claimed that in some varieties of American English all the lax vowels are slightly diphtongized with a second schwa-like element, which would support the idea that they are [-tense]. My own feeling is that, in the literature quoted by Clements, the lax vowels of American English are not described as systematically diphthongized and centralized as assumed in his work. But if there are indeed such dialects, then the short vowels are phonetically light diphthongs and are redundantly linked to the @ component. This, however, is not a necessary feature of English and does not invalidate the arguments favouring weight.

[4] This account cannot cover all attested values of unstressed final *–y*. In Standard Scottish English, for instance, the final vowel used by many specialists in words like *pity* is assumed to be the midhigh /e/ used in words like *bait* /bet/ (and not the /ɪ/ of *bit* or the /ɛ/ of *bet* - see Durand 2004). If so, there might be no single way of characterizing the phenomenon in question.

6. ***Conclusion***

In this paper, it has been argued that a feature such as tense/lax (+/- tense), or indeed Advanced/Retracted Tongue Root (+/-ATR), did not receive particularly strong support from the phonology of English despite the fact that this language is probably the most frequently quoted as exemplifying an opposition in these terms. I outlined a different system based on primitives of the I, A, U type which are structurally monovalent (unary). A unary approach is inherently more restrictive since, as repeatedly pointed out in the literature, the space of possible generalizations is greatly reduced by comparison with a binary (equipollent) account. As noted in Harris and Lindsay (1995: 45) whereas the privative account countenances only two operations on a primitive P, the fully binary account allows six possibilities since we expect a priori that a generalization will be able to access, the positive value, the negative one and both values via the use of so-called Greek variables strongly defended in SPE:

(8)

Privative	Equipollent
Spread [P]	Spread [+P], [-P], [+/-P]
Delink [P]	Delink [+P], [-P], [+/-P]

Of course, the comparison is a difficult one since advocates of the privative approach do not necessarily adopt the same primitives as defenders of the equipollent approach. But there are enough cases where a comparison can be made. If for every binary feature, the privativists had to invent two unary elements then the game would be up and the unary approach would have been shown to be inadequate. If cases where both values are allegedly accessed within phonological generalizations cannot be adequately accounted for then the game would also be up. When Anderson and Jones deployed in the 1972 *Edinburgh Working Papers in Linguistics* an integrated version of phonological representations showing that the primitives of phonology were not the classical SPE binary features but primitives such as I, A, U relatable within infrasegmental dependency structures which were also motivated suprasegmentally, there was much scepticism in various quarters intent on defending the SPE heritage to the bitter end. The new primitives were argued to be not well grounded phonetically as if features like [high], [low], [anterior] or [covered] had an obvious, undisputed, physical grounding. Since then, the question of interpretation has been shown not to be one where classical features could claim superiority (see Harris and Lindsey 1995, Ingleby and Brockhaus 2002). As far as tense/lax is concerned, it is recognized here that we do need an element of centrality (but not of ‘tension’ as an independently controllable parameter) although this element plays a marginal role in RP. If my arguments are valid, given that most of them apply to a wide range of English accents (rhotic and non-rhotic), phonologists should be more careful in their use of ‘tense’-‘lax’. It is often initially used as a dichotomizing operator to label two classes of vowels which do have to be distinguished. When one looks at the generalizations carefully, their only consistent interpretation is in terms of ‘length’ (whatever its precise theoretical translation) but somehow the traditional label tense/lax is maintained as denoting a further property of the opposition in question and furthermore taken as evidence for the universal relevance of the feature in question. This circularity was convincingly denounced by Lass (1976) but continues to be widespread in the specialised literature. In linguistics too, “plus ça change, plus c’est la même chose”!

References

Anderson, John (1975) Principles of syllabification, *York Papers in Linguistics* 5: 7-20

Anderson, John (1988a) Segment structure and system geometry: A question of Scots economy, *Papers from the 18th Meeting of the North Eastern Linguistic Society* (Toronto), 22-37

Anderson, John (1988b) Segment structure and system geometry: a question of Scots economy, NELS: 22-37

Anderson, John (1992) Exceptionality and non-specification in the history of English phonology. In M. Rissanen, O. Ihalainen, T. Nevalainen & I. Taavitsainen (eds.) *History of Englishes: New methods and interpretations in historical linguistics,* The Hague: Mouton de Gruyter, 103-16

Anderson, John (1993) Morphology, phonology and the Scottish vowel-length rule, *Journal of Linguistics* 29: 419-30.

Anderson, John (1994) Contrastivity and non-specification in a dependency phonology of English, *Studia Anglica Posnaniensia* 28: 3-35

Anderson, John (1996) The representation of vowel reduction: non-specification and reduction in Old English and Bulgarian, *Studia Linguistica* 50: 91-105

Anderson, John M. (in press). Old English *i*-umlaut (for the umpteenth time). *English Language and Linguistics.*

Anderson, John. 2002. "Introduction to Dependency Phonology". http://www.fb10.uni-bremen.de/linguistik/dpng/pdf/Anderson2002IntroDependencyPhonology.pdf

Anderson John and Jacques Durand (1986) Dependency Phonology. In J. Durand (ed.) *Dependency and Non Linear Phonology*, London: Croom Helm. 1-54

Anderson, John and Jacques Durand (1987) *Explorations in Dependency Phonology*. Dordrecht: Foris.

Anderson, John and Jacques Durand (1988a) Underspecification and dependency phonology. In P.M. Bertinetto and M. Loporcaro (eds.) *Certamen phonologicum I: Papers from the 1987 Cortona phonology meeting*. Turin: Rosenberg & Sellier. 3-36.

Anderson, John and Jacques Durand (1988b) Vowel harmony and non-specification in Nez Percé. In H. van der Hulst and N.S.H.Smith (eds.) *Features, Segmental structure and Harmony Processes, II*. Dordrecht: Foris. 1-17.

Anderson John and Jacques Durand (1993) Segments non-spécifiés et sous-spécifiés en phonologie de dépendance: le yawelmani et les autres dialectes du yokuts. In B.Laks and A.Rialland (eds.) *Architecture et géométrie des représentations phonologiques* Paris: CNRS. 233-53.

Anderson, John and Colin Ewen (1987) *Principles of Dependency Phonology*. Cambridge: Cambridge University Press.

Anderson, John and Charles Jones (1974[1972]) "Three theses concerning phonological representations". *Journal of Linguistics*, 10: 1-26. Original version in *Edinburgh Working Papers in Linguistics*, 1972.

Anderson, John and Charles Jones (1977) *Phonological Structure and the History of English*. Amsterdam: North Holland.

Basbøll, Hans (to appear) *The Phonology of Danish*. Oxford: Oxford University Press.

Bell, Alexander M. (1867) *Visible Speech : the science of universal alphabetics.* London : Simpkin Marshall.

Burzio, Luigi (1994) *Principles of English Stress*. Cambridge : Cambridge University Press.

Bybee, Joan (2000) *Phonology and language use*. Cambridge: Cambridge University Press.

Chen, Matthew (1972) The time dimension: contribution toward a theory of sound change. *Foundations of Language* 8: 457-498.

Chomsky, Noam and Morris Halle (1968) *The Sound Pattern of English*. New York: Harper & Row.

Clements, George N. (2003) Les diphtongues brèves en anglais: fonction phonétique du trait tendu/relâché. In J.-P. Angoujard & S. Wauquier-Gravelines (eds.) *Phonologie: champs et perspectives.* Lyon : ENS Editions. 35-55.

Clements, George N. and Susan R. Hertz (1996) An integrated approach to phonology and phonetics. In J. Durand & B. Laks (eds) *Current Trends in Phonology: models and methods*. Vol. 1. Salford: European Research Institute. 143-174.

Cruttenden, Alan (1994) *Gimson's Pronunciation of English*. London: Edward Arnold.

Duchet, Jean-Louis and Marc Fryd (1997) *Manuel d'anglais oral pour les Concours.* Paris: Didier-Erudition.

Durand, Jacques (ed.)(1986) *Dependency and Non-Linear Phonology*. London: Croom Helm.

Durand, Jacques (1990) *Generative and Non-Linear Phonology.* London: Longman.

Durand, Jacques (1997) Linking r in English: constraints, principles and parameters, or rules? » *Histoire, Epistémologie, Langage* 19/I : 43-72.

Durand, Jacques (1999) R postvocalique et histoire de l'anglais. A tale of two countries. A tale of two cities. *Anglophonia* (*Sigma*), *French Journal of English Studies*, Presses Universitaires du Mirail, 6: 199-221.

Durand, Jacques (2003) The vowel system of Danish and phonological theory. In Henrik Galberg Jacobsen, Dorthe Bleses, Thomas O. Madsen and Pia Thomsen (eds) *Take Danish - for instance. Linguistic Studies in honour of Hans Basbøll presented on the occasion of his sixtieth birthday*. Odense: University Press of Southern Denmark. 41-57.

Durand, Jacques (2004). English in early twentieth century Scotland: a phonological perspective. *Tribune internationale des langues vivantes* 36: 87-105.

Durand, J. & Laks (eds.)(2002) *From Phonetics and Phonology to Cognition*. Oxford : Oxford University Press.

Ewen, Colin and Harry van der Hulst (2001) *The Phonological Structure of Words. An Introduction*. Cambridge: Cambridge University Press.

Giegerich, Heinz (1992) *English Phonology. An Introduction*. Cambridge : Cambridge University Press.

Gimson, A.C. (1962) *An Introduction to the Pronunciation of English* London: Edward Arnold.

Guierre, Lionel (1979) *Essai sur l'accentuation en anglais contemporain*. Paris : Université de Paris VII, Institut Charles V et Département de Recherches Linguistiques.

Guierre, Lionel (1984) *Drills in English Stress-Patterns*. 4th edition revised. Paris : Armand Colin-Longman.

Hammond, Michael (1999) *The Phonology of English : A Prosodic Optimality-Theoretic Approach*. Oxford : Oxford University Press.

Harris, John (1994) *English Sound Structure*. Oxford : Blackwell.

Harris, John and Geoff Lindsey (1995) The elements of phonological representation. In Durand & Katamba 33-79.

Harris, John and Geoff Lindsey (2000) Vowel patterns in mind and sound. In N. Burton-Roberts, P. Carr and G. Docherty (eds.) *Phonological Knowledge: Conceptual and Empirical Issues.* Oxford: Oxford University Press. 185-205.

Harshman, Richard, Ladefoged, Peter and Louis Goldstein (1977) Factor analysis of tongue shape. *Journal of the Acoustical Society of America* 62: 693-707.

Ingleby, Michael and Wiebke Brockhaus (2002) Phonological primes: cues and acoustic signatures. In J. Durand and B. Laks (eds.) *Phonetics, Phonology and Cognition*. Oxford: Oxford University Press. 131-150

International Phonetic Association. 1949. *The Principles of the International Phonetic Association*. London: Department of Phonetics, University College London.

International Phonetic Association. 1999. *The Handbook of the International Phonetic Association*. Cambridge: Cambridge University Press.

Jackson, Michel (1988) Phonetic Theory and Cross-Linguistic Variation in Vowel Articulation (UCLA Working Papers in Phonetics 69). Ph.D. Thesis, University of California, Los Angeles.

Jakobson, Roman, Fant, Gunnar and Halle, Morris (1952) *Preliminaries to Speech Analysis.* Cambridge: MIT Press.

Jones, Daniel (1917) *An English Pronouncing Dictionary*. First edition. London: Dent's Modern Languages Series.

Jones, Daniel (1918) *An Outline of English Phonetics.* Leipzig: B.G. Teubner Verlag and Cambridge: Heffer and Sons.

Kaye, Jonathan, Lowestamm, Jean and Jean-Roger Vergnaud (1985) The internal structure of phonological elements : a theory of charm and government. *Phonology Yearbook* 2: 305-328.

Kenstowicz, Michael (1994) *Phonology in Generative Grammar*. Cambridge, MA : Blackwell.

Kenyon, J.S. & Knott, T.A. (1953) *A Pronouncing Dictionary of American English*. Springfield : Merriam.

Kingdon, Roger (1958) *The Groundwork of English Stress*. London: Longman.

Ladefoged, Peter and Richard Harshman (1979) Formant frequencies and movements of the tongue. In B. Lindblom and S Öhman (eds) *Frontiers of Speech Communication*, New York: Academic Press. 25-34.

Ladefoged, Peter and Ian Maddieson (1996) *The Sounds of the World's Languages.* Oxford : Blackwell.

Lass, Roger (1976) *English Phonology and Phonological Theory*. Cambridge : Cambridge University Press.

Lindau, Mona (1979) The feature "expanded". *Journal of Phonetics* 7: 163-176.

Mackay, Ian (1987) *Phonetics : the science of speech production.* Austin, Texas : proed..

Rennison, John (1986) On tridirectional feature systems for vowels. In J. Durand (ed.) *Dependency and non-linear phonology*. London: Croom Helm. 281-303.

Roach, Peter and James Hartman (eds.)(1997) Daniel Jones' *English Pronouncing Dictionary*. Cambridge: Cambridge University Press.

Schane, Sanford A. (1973) *Generative Phonology*. Prentice Hall.

Schane, Sanford A. (1984a) The fundamentals of particle phonology. *Phonology Yearbook* 1: 129-155.

Schane, Sanford A. (1984b) Two English vowel movements: a particle analysis. In M. Aronoff and R.T. Oehrle (eds.) *Language Sound Structure*, Cambridge, Mass. MIT Press. 32-51

Strang, Barbara (1970) *A History of English*. London : Methuen & Co Ltd.

Stevens, Kenneth N. (1998) *Acoustic Phonetics.* Cambridge, Mass. : The MIT Press.

Stewart, J.M (1969) Tongue root position in Akan vowel harmony. *Phonetica* 16 : 185-204.

Sweet, Henry (1877) *A Handbook of Phonetics, including a popular exposition of the principles of spelling reform.* Oxford: Clarendon Press.

Tiede, Mark K. (1993) An MRI-based study of pharyngeal volume contrasts in Akan. *Haskins Laboratories Status Reports on Speech Research* 113: 107-130.

Traunmüller, Hartmut (1982) Vokalismus in der Westniederösterreichischen Mundart. *Zeitschrift für Dialektologie und Linguistik* 2: 289-333.

Wang, William (1969) Competing changes as a cause of residue. *Language*: 45: 9-25.

Wells, John (1982) *Accents of English*. 3 volumes. Cambridge : Cambridge University Press.

Wells, John C. (2000) *Longman Pronunciation Dictionary*. Second edition. 1990. London: Longman.