The Rise and Fall of the New Quantity System in Welsh and Cornish

The following pages reproduce "The Rise and Fall of the New Quantity System in Welsh and Cornish," my keynote address from the 43rd Annual Harvard Celtic Colloquium, as it appears in the *Proceedings of the 43rd Annual Harvard Celtic Colloquium* (Cooper, Dylan R., Dolan Wells Gallagher, Samuel Ezra Puopolo, and Rory Yarter, eds.), Harvard University Press, 2026, pp. 39-93. In a few places, I have taken the opportunity to add corrections or clarifications to the published text of the address. Words to be deleted are indicated by a red strikethrough, while other changes are indicated by placing a red box around the text to be altered and supplying a corrected reading in a green box in the margin. On pp. 40, 42, 70, 79, and 83, I have inserted notes relating to the phonemic, phonetic, or graphic representation of English or Welsh words cited in the article. These notes are printed inside blue boxes, and blue boxes are also used to highlight the elements in the main text to which they refer.

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9 July 2026

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Keynote Address
43rd Annual Harvard Celtic Colloquium
Friday 11 October, 2024

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Cooper, Dylan R., Dolan Wells Gallagher, Samuel Ezra Puopolo, and Rory Yarter, eds.
Proceedings of the 43rd Annual Harvard Celtic Colloquium. Harvard University Press, 2026, 39–93.

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Benjamin Bruch

Introduction

Mahalo, meur ras, a diolch yn fawr to the students, staff, and faculty of the Department of Celtic Languages and Literatures. It is a tremendous honor to be invited to speak to you today at the 43rd Annual Harvard Celtic Colloquium. Many of you know me for my work on the Cornish language, which was the primary focus of my graduate studies here at Harvard and which has been the subject of all my previous Colloquium papers, but when I received the invitation to give the keynote address at this year's conference, I decided it was time to venture further afield.

For decades, scholars of Cornish historical linguistics have grappled with the problem of how to reconstruct the series of sound changes that reshaped Cornish prosody from the fourteenth to the eighteenth centuries. This was a topic I puzzled over as a language learner in the 1990s and returned to in the 2000s and early 2010s when I did more extensive research into Cornish phonology with my friend and colleague Albert Bock. However, despite considerable progress, Albert and I never achieved an explanation that could fully and clearly account for the complex and seemingly contradictory evidence preserved in Middle and Late Cornish texts.

In the 2020s, however, I returned to that project, now continuing the work alone following Albert's tragic death in 2018. While preparing a conference presentation on the rise of phonemic vowel quantity in Middle Cornish,[1] I became aware that the evolution of prosody in Cornish showed striking similarities to comparable phenomena that occurred in the northern dialects of Welsh. This in turn led me to explore further parallels in "The Rise and Fall of the New Quantity System in Welsh and Cornish," a topic

[1] Benjamin Bruch, "Digraphs, Diphthongs, and 'Diacritic <y>': Evidence for the Rise of Phonemic Vowel Length in Middle Cornish," (unpublished paper presented at the 45th 21st Annual Conference of the Celtic Studies Association of North America, Virginia Polytechnic and State University, 18 March 2023).

that I hope may prove equally interesting for scholars of Welsh historical linguistics as for Cornish specialists.

Most of what I am sharing today represents new research, some of which supersedes or even contradicts ideas I published in previous studies of Cornish historical phonology, including my collaborations with Albert.[2] While my understanding of the subject has altered, the guiding principles that underlie this work are the same ones that Albert and I always made the centerpiece of our Cornish scholarship: taking textual evidence at face value, trusting the scribes to know their native language better than we can hope to, identifying biases, questioning assumptions, and, above all, trying to explain the why and how of sound change rather than just the what and when.

For this reason, I would like to dedicate this keynote address to Albert's memory.

Note: Here and elsewhere in this paper, I have followed the traditional convention of representing stop consonant phonemes in English, Welsh, and Cornish as if the contrast between them is one of voiceless /p/, /t/, /k/ vs. voiced /b/, /d/, /g/, although it would be more accurate to represent the contrast as one of aspirated /pʰ/, /tʰ/, /kʰ/ vs. unaspirated /p/, /t/, /k/.

Terminology

Before proceeding further, it may be useful to define a few terms that will be essential in our subsequent discussion of the historical development of vowel sounds in the Brittonic (var. Brythonic) languages. Languages can distinguish between vowel sounds in several different ways, most commonly by varying the **vowel quality**: what the vowel sounds like or rhymes with. Distinctions in vowel quality are found in all languages; an example from English is the contrast between the vowels in *bed* /bɛd/ and *bid* /bɪd/, where the 'open-mid' vowel /ɛ/ and the 'near-close' vowel /ɪ/ are pronounced with the tongue, jaw, and lips in different positions, producing a different sound quality that English speakers use to tell the two words apart. In musical terms, distinctions in vowel quality are comparable to distinctions in timbre, like the difference between a middle C played on a piano and one played on a violin, flute, or trumpet. Most languages distinguish at least three different vowel qualities, and five- or six-vowel systems are typical. English is an outlier, as most varieties of modern English have around a dozen distinct vowel phonemes (counting only

[2] Albert Bock and Benjamin Bruch, "Nucleus Length and Vocalic Alternation in Cornish Diphthongs," *Die Sprache* 48 (2009): 34-43; Albert Bock and Benjamin Bruch, "New Perspectives on Vocalic Alternation in Cornish," *Keltische Forschungen* 5 (2010/2012): 55-97.

monophthongs). When a language has more than six or seven vowel phonemes, it tends to eliminate some of these distinctions over time through mergers or other sound changes, as it is difficult for new generations of speakers acquiring the language to reliably perceive so many fine contrasts between sounds that have similar articulatory features. To return to our musical analogy, while it is easy to distinguish a note played on a piano from the same note played on a trumpet, it is considerably more difficult to tell the difference between a note played on a violin and one played on a viola.

Another important way in which vowels can be distinguished from one another involves **vowel quantity**: how long the vowel takes to pronounce. Contrast between long and short 'versions' of vowels is a feature of many Indo-European languages, including Sanskrit, Greek, Latin, Old and Middle English, Continental Celtic dialects, Old Irish, and the modern Goidelic languages. An example of contrastive vowel length from Old Irish (and one that is maintained in Modern Irish) is the minimal pair *fér* 'grass' vs. *fer* 'man,' which differ only in terms of the length of the vowel: long é vs. short e. It is also generally agreed that the Celtic languages spoken in Britain around the time of the Roman occupation distinguished long and short vowels in much the same way that Latin or Old Irish did. In musical terms, the distinction in vowel quantity between a long and a short vowel can be compared to the difference between a whole note and a half note. In IPA transcriptions, long vowels are marked using the diacritic [ː], while short vowels are left unmarked; as we shall discuss later, some varieties of Welsh and Cornish also include vowels of intermediate duration, which are commonly called 'half-long' and transcribed using the diacritic [ˑ].

Yet another way in which languages distinguish between vowels relates to **tone** or **pitch contour**. We are perhaps most familiar with tone as a feature of East Asian languages like Mandarin, Vietnamese, or Thai, but many ancient and modern Indo-European languages like Punjabi, Swedish, and Classical Greek either had or developed a phonological system where differences in tone or pitch contour serve to distinguish one word from another. One pair of words from Mandarin that illustrate a contrast in tone are 妈 *mā* (high tone) 'mother' and 马 *mǎ* (falling-rising tone) 'horse.' In musical terms, this distinction can be compared to difference in pitch, as between a C and a D, or a difference between a rising and a falling sequence of notes.

Finally, at least for our discussion, are distinctions involving **dynamic** or **rhythmic stress**: the volume with which a particular vowel or syllable is spoken. One pair of English words that illustrate this contrast are *insult* (noun) [ˈɪnsʌlt] vs. *insult* (verb) [ɪnˈsʌlt], where the IPA [ˈ] diacritic precedes the syllable that receives primary stress. In musical terms, dynamic stress can be compared to the contrast between a note played *piano* and the same note played *forte*.

In examining the sounds of any language it is also important to consider how those sounds relate to the phonemes of the language. A **phoneme** represents a sound or set of sounds that native speakers of a language consider to be both equivalent to one another and distinct from all other speech sounds in their language. While they are aware of contrasts between phonemes, hearing them as different sounds, other, more subtle phonetic differences go unnoticed. Often, speakers use phonemic differences to distinguish one word from another, and a pair of words that differ only by the substitution of one phoneme for another are known as a **minimal pair**. Examples from English include the pair *bed* /bɛd/ vs. *bet* /bɛt/, which contrasts the consonant phonemes /d/ vs. /t/, and the pair *bed* /bɛd/ vs. *bid* /bɪd/, which contrasts the vowel phonemes /ɛ/ vs. /ɪ/.

However, a single phoneme may include several different sounds, called **allophones**, that can be distinguished phonetically even if native speakers do not perceive the differences between them. Such phonetic distinctions arise because speakers pronounce a sound differently depending on its environment, such as when a voiceless sound becomes voiced between two other voiced segments, or when a voiced sound becomes voiceless in word-final position. We call such allophonic variation 'conditioned,' because we can write phonological rules that describe the **conditioning environment** that determines which allophone will appear in a given context. Examples from English include *pit* [ˈpʰɪt] vs. *spit* [ˈspɪt], where the phoneme /p/ is realized as aspirated [pʰ] word-initially vs. unaspirated [p] following the consonant [s], and *bed* [ˈbɛːd] vs. *bet* [ˈbɛt], where the vowel phoneme /ɛ/ is realized as long [ɛː] before /d/ vs. short [ɛ] before /t/. Unlike situations where two sounds belong to different phonemes, substituting one allophone for another does not change the meaning of a word, since speakers are usually unaware of contrasts between allophones. While using the 'wrong' allophone of a phoneme—one that does not usually appear in a given conditioning environment—may sound

that

do not readily perceive

Note: The IPA transcriptions given for these examples reflect the traditional convention of representing the contrast in English stop consonants as one of voicing (e.g. [p] / [pʰ] vs. [b]) rather than one of aspiration (e.g. [tʰ] vs. [t]).

'odd,' 'foreign,' or incorrectly pronounced to a native speaker, it does not represent a significant barrier to communication.

Phonemic Differences	***Allophonic Differences***
Speakers are aware of contrasts between phonemes	Speakers are usually unaware of contrasts between allophones
Allow speakers to distinguish between words that would otherwise be identical (**"minimal pairs"**)	Arise because speakers pronounce a sound differently depending on its environment (**"conditioned"**)
bed /bɛd/ vs. **bet** /bɛt/: consonant phonemes **/d/** vs. **/t/** **bed** /bɛd/ vs. **bid** /bɪd/: vowel phonemes **/ɛ/** vs. **/ɪ/**	**pit** [ˈpʰɪt] vs. **spit** [ˈspɪt]: aspirated **[pʰ]** vs. unaspirated **[p]** **bed** [ˈbɛːd] vs. **bet** [ˈbɛt]: long **[ɛː]** vs. short **[ɛ]**
Minimal pairs: • Differ in **one phoneme** • Changing one phoneme changes the meaning of a word	***Allophones:*** • Involve a **phonetic** (not phonemic) difference • Substituting one allophone of a phoneme for another does not change the meaning of a word • Phonological rules describe the **conditioning environment** that determines which allophone appears

Table 1. Phonemes vs. Allophones

The Rise of the New Quantity System

The name 'New Quantity System' in the title of this paper may sound as if it refers to a recent linguistic development in the Celtic languages, but it is nothing of the kind. It is 'New' only in comparison to the vowel system of Late Common British, the Brittonic language spoken across much of

Britain in the sixth century CE. 'Quantity' refers to vowel quantity, more commonly known as vowel length: the duration of time that a given vowel is pronounced.

Before the rise of the New Quantity System, Late Common British had *phonemic* vowel quantity, meaning that all vowels were intrinsically long or short (e.g. ī vs. ĭ), as in Latin, Old and Middle English, or the Goidelic languages. While there may have been a slight difference in pronunciation between long vowels and their short counterparts, the primary contrast was originally one of vowel quantity (the amount of time it takes to say the vowel) rather than vowel quality (the specific sound it represents). Since the difference between them was phonemic, speakers would have perceived 'long *i*' and 'short *i*' as different sounds, such that altering the length of a vowel (as by substituting 'long *i*' for 'short *i*') would change the meaning of a word. The phonemic status of this quantitative distinction was reflected by the existence of minimal pairs of words that contrasted only in the length of one vowel segment.

However, after a series of sound changes that affected all British dialects in the middle of the first millennium CE, this distinction between phonemically long and short vowels broke down, and vowel quantity came to be *allophonic*. Under this New Quantity System, the length of any vowel depended on the stress pattern of the word containing it and the number and type of consonants that followed it, such that originally short vowels could be lengthened if stressed and followed by no more than one consonant and originally long vowels could be shortened if followed by more than one consonant, or by a phonemically long consonant. Because vowel quantity was no longer phonemic, but was instead conditioned by the vowel's phonological environment, speakers were no longer conscious of the difference in length between long and short vowels.[3]

if un-stressed, or if followed

It is easy for languages that make a distinction in vowel quantity to lose this contrast over time, due to a tendency for the long and short versions

[3] For further discussion of the rise of the New Quantity System, see Benjamin Bruch, "The Rise of Phonemic Vowel Quantity in Cornish: Evidence and Implications, Part I: Vowel Quantity in Stressed Monosyllables; Long Vowels and Heavy Diphthongs in Middle Cornish," *North American Journal of Celtic Studies* 9.2 (2025), 119-237 (hereafter, "Vowel Quantity, Part I") at 124-126 (§§1.4-1.6).

of a given vowel sound to diverge gradually in their pronunciation, so that speakers come to rely on qualitative differences rather than quantitative ones as the basis for distinguishing between vowel phonemes. Since short vowels are short in duration, they tend to be articulated less distinctly than longer vowels, as there is less time for the lips, tongue, and jaw to move fully into the configuration needed to pronounce the vowel sound in the brief interval between the preceding and following consonants. Over time, short vowels may thus become more centralized in their pronunciation, since speakers lack sufficient time to 'push' their speech organs to the edge of the vowel space. In addition, because their brevity makes them less acoustically prominent, children acquiring the language may mistake one short vowel sound for another, so that over time some of these sounds merge, reducing the inventory of short vowel sounds relative to the number of distinct long vowels in a language.

Long vowels, by contrast, can be articulated very distinctly because of their greater duration. As a result, the long vowel phonemes of a language tend to occupy the edges of the vowel space rather than becoming centralized, increasing the phonological contrast between long and short vowels. In addition, due to their longer duration, long vowels can develop more complex articulatory patterns, and it is common for long vowels to develop an off-glide, perhaps as a transition between the original long vowel sound and the following consonant or word boundary. Over time, therefore, long vowels may break to diphthongs, and this is a mechanism whereby the inventory of long vowels in a language may be reduced.[4]

We can see both these processes in English, a language which, in most of its modern dialects, no longer has a phonemic distinction in vowel quantity, although such a distinction was a core feature of Old and Middle English, and indeed dates back through Proto-Germanic all the way to Proto-Indo-European. The vowel sounds we still describe in modern English as 'long' and 'short' essentially have the same phonetic length for most speakers: there is little if any difference in duration between the 'long *e*' of *beet* and the 'short *e*' of *bet*. The traditional short vowels (like the vowels of *bit, book*, and *but*) tend to be centralized, while the traditional long vowels are either pronounced as diphthongs (as with the vowels of

[4] The divergent development of short and long stressed vowels in Cornish is described in Bruch, "Vowel Quantity, Part I:" 222-223 (§15.4).

bite, *bait*, and *boat*) or articulated at the edges of the vowel space (as with the vowels of *beet* and *boot*).

Parameter	***Long vowels*** **[V:]**	***Short vowels*** **[V]**
Location	Peripheral	Centralized
Articulation	Often tense	Often lax
Phonological Development	May break to a diphthong	May be neutralized (> **[ə]**)

Table 2. The Relationship Between Vowel Quantity and Vowel Quality

Under the New Quantity System, Brittonic languages converted phonemic distinctions in vowel quantity to distinctions in vowel quality, while developing a new contrast between long and short allophones of each vowel phoneme. A similar process also occurred in English: in Middle English, as in Late Common British, vowels were intrinsically (phonemically) long or short by duration. However, the Great English Vowel Shift and other sound changes that took place from the fourteenth century onward transformed this into a distinction in vowel quality, so that in Modern English 'long *i*' is pronounced as [aɪ] (a diphthong) and 'short *i*' as [ɪ] (a 'lax', centralized monophthong), but both are uttered for essentially the same amount of time. At the same time, most Modern English speakers unconsciously apply a phonological rule that allophonically shortens all vowels before a voiceless consonant, so that 'bet' has a (quantitatively, as opposed to qualitatively) short vowel and 'bed' has a (quantitatively) long vowel, with the vowel in 'bet' being approximately half the duration of the vowel in 'bed.' For this reason, Kim McCone has described the comparable set of changes in Brittonic as the "Great British Vowel Shift," although it occurred some nine centuries earlier and the two shifts are not in any way directly connected.[5] Examples of sound changes associated with the Great English Vowel Shift are illustrated in Fig. 1:

consonants that are traditionally described as voiceless,

[5] Kim McCone, *Towards a Relative Chronology of Ancient and Medieval Celtic Sound Change,* Maynooth Studies in Linguistics I (Maynooth: Department of Old and Middle Irish, St Patrick's College, Maynooth, 1996), 145.

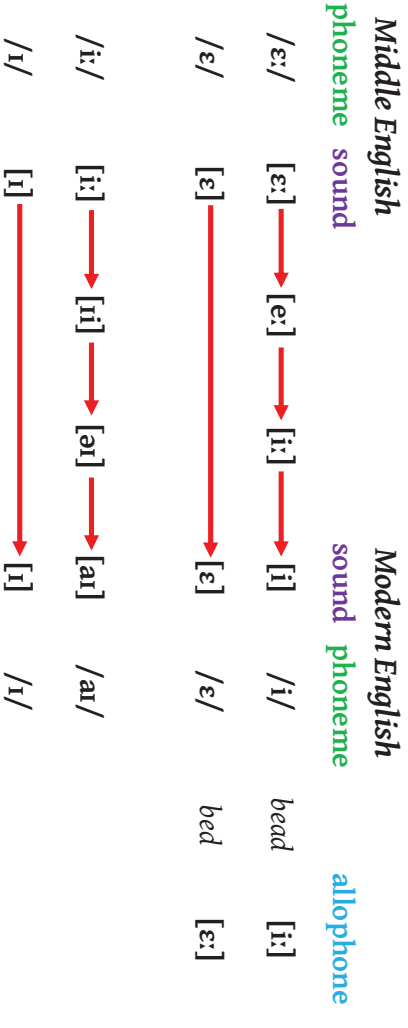

Fig. 1. The loss of phonemic vowel quantity and the rise of allophonic vowel quantity due to the Great English Vowel Shift

The New Quantity System in Breton, Cornish, and Welsh: Further Developments

The rise of the New Quantity System in Primitive Brittonic meant that each Brittonic dialect developed a system of allophonic rules that governed the distribution of long and short vowels in stressed syllables. These rules are understood, and have been presented in much the same form by scholars going back to John Morris Jones and Kenneth Jackson.[6] They can be summarized as follows:

1. All vowels in unstressed syllables were short. Vowels could only be long in stressed syllables.
2. In stressed syllables, vowels were short if followed by two or more consonants, or by a fortis, geminate, or unlenited consonant such as <m> (phonetically [mm] or [mː]), as such long consonants effectively counted as a sequence of two (albeit identical) consonant sounds.
3. In stressed syllables, vowels were long if followed by a single (lenis) consonant, another vowel, or a word boundary.

These rules are illustrated in slightly abbreviated form in the following flow chart, which shows the relationship between a given vowel phoneme—the input at the top of the chart, which has no intrinsic length feature—and its realization as one of three different allophones (short and unstressed [V], short and stressed [ˈV], or long and stressed [ˈVː]), each of which represents a possible output following the operation of the phonological rules represented by the diamonds in the chart below:

[6] John Morris Jones, *A Welsh Grammar, Historical and Comparative: Phonology and Accidence* (Oxford: Clarendon, 1913), 65-74; Kenneth Hurlstone Jackson, *Language and History in Early Britain: A Chronological Survey of the Brittonic Languages, First to Twelfth Century A.D*. (Edinburgh: Edinburgh University Press, 1953), 39.

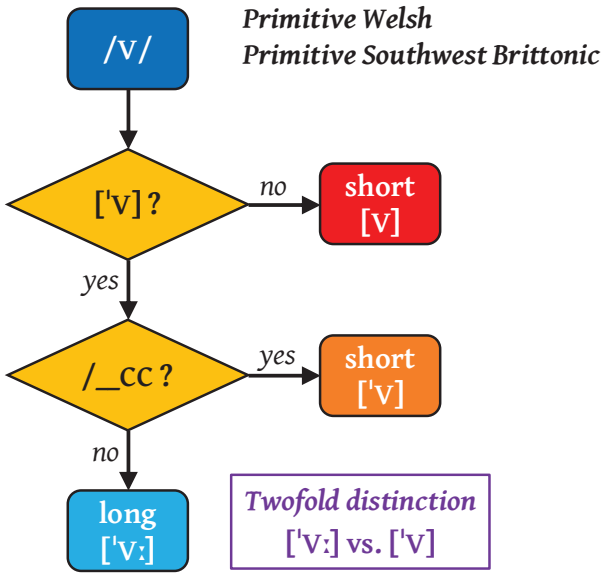

Fig. 2. Vowel Quantity: Allophonic rules under the New Quantity System (I)

This set of phonological rules would have applied to all the Brittonic dialects of the sixth through eighth centuries CE, what we now call Primitive Welsh, Cornish, and Breton. It still represents a reasonably accurate description of the rules governing the distribution of long and short vowels in the southeastern dialect of Modern Breton, Gwenedeg (Vannetais), which retains the final word stress that was common to all Brittonic languages during this early period. However, during the ninth to eleventh centuries, a second major phonological change occurred that affected Welsh, Cornish, and most varieties of Breton (although not Gwenedeg or some other eastern dialects, such as Goelo): the Old Brittonic accent shift, in which the stress accent moved back from the final syllable to the penultimate syllable of polysyllabic words.[7]

By this time Welsh, Cornish, and Breton had all emerged as separate languages, although they were probably still highly mutually intelligible. It is relatively easy to distinguish Old Welsh from the two southwestern

[7] Patrick Sims-Williams, "Dating the Transition to Neo-Brittonic: Phonology and History, 400-600" in Alfred Bammesberger and Alfred Wollman, eds. *Britain 400-600: Language and History* (Heidelberg: Carl Winter, 1990), 217-261 citing Jackson, *Language and History in Early Britain*, (Edinburgh: Edinburgh University Press, 1953), 339 n.2, 340, 342 and Kenneth Hurlstone Jackson, *A Historical Phonology of Breton* (Dublin: Dublin Institute for Advanced Studies, 1967), 85 n.3.

Brittonic languages based on differences in phonology and lexicon, but there are few phonological differences that serve to distinguish Old Cornish from Old Breton. The accent shift seems to have occurred independently in Welsh, Cornish, and those dialects of Breton that exhibit it, but while there is disagreement about the exact date at which it took place in each language, it is generally acknowledged that it occurred during the Old Brittonic period.[8]

As a result of the accent shift, the allophonic rules regarding the distribution of long and short vowels in stressed syllables were now applied based on the new pattern of word stress. Before the accent shift, all vowels in penultimate syllables were unstressed and therefore, presumably, short. After the accent shift, these vowels were automatically lengthened in cases where they were not followed by a long consonant or consonant cluster. Before the accent shift, all vowels in the final syllables of polysyllabic words that were followed by one or zero consonants were long. After the accent shift, these vowels all became short because they were now unstressed. The distribution of long vs. short vowels in stressed monosyllables was unaffected by the accent shift, however, because the stress accent did not shift in these words.

The reason why the allophonic vowel length rules of Primitive Brittonic would have automatically been applied based on the new distribution of stressed and unstressed syllables in Old Brittonic is that these rules reflected a distinction in pronunciation that speakers made entirely unconsciously. Ever since the rise of the New Quantity System in the sixth century, speakers of Brittonic dialects had been unaware of the length differences between vowels they heard or uttered. While this may seem surprising, the same statement can be made about most speakers of Modern English, where an allophonic length rule causes vowels to be pronounced short when followed by a voiceless sound (as with /ɛ/ > [ɛ] in *bet*) and long in other environments (as with /ɛ/ > [ɛː] in *bed*). In similar fashion, when speakers of Old Welsh, Cornish, and Breton shifted their primary word stress from the final to the penultimate syllable, it makes sense that they would have automatically and unconsciously applied their existing

[8] See Bruch, "Vowel Quantity, Part I," 126 (§1.7); Jackson, *Language and History in Early Britain*, 301, 684, 687, 699; Jackson, *A Historical Phonology of Breton*, 79, 847; Ken George, "Cornish," in *The Celtic Languages*, second edition, ed. Martin J. Ball and Nicole Müller (Routledge, 2009), 488-535 at 506.

allophonic length rule when pronouncing the vowels in newly stressed syllables.

The Old Brittonic accent shift took place independently in Breton and Welsh, and it is important to remember that the two languages were not even in direct contact during the period when it occurred. Because they underwent the accent shift separately it is not surprising that the accent shift took different forms in Breton and in Welsh. Only the northwestern dialects of Modern Breton show a straightforward development whereby the allophonic vowel quantity rules of Primitive Brittonic began to be applied in the same way to the penultimate syllables that came to be stressed following the Old Brittonic accent shift. As a result, modern Breton exhibits a simple twofold long vs. short opposition in stressed syllables, whether these are penultimate or final syllables, which can be represented by the flow chart in Fig. 3:

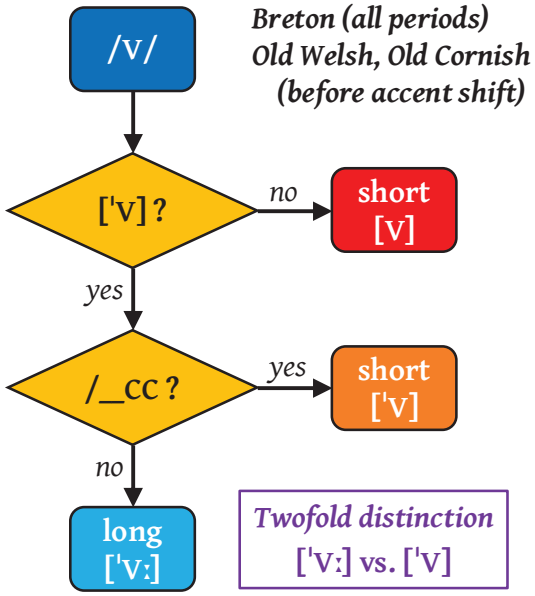

Fig. 3. Vowel Quantity: Allophonic rules under the New Quantity System (II)

Welsh, by contrast (at least in its southern dialects, which probably preserve the situation that obtained in Middle Welsh) makes a threefold distinction between vowel quantities that are traditionally described as long, half-long, and short. This threefold distinction arose through a further development of the allophonic rules governing vowel length inherited from Primitive

Brittonic. Alterations of or additions to the original allophonic rules are indicated in *italics*:[9]

1. All vowels in unstressed syllables were short. Vowels could only be long *or half-long* in stressed syllables.
2. In stressed syllables, vowels were short if followed by two or more consonants, or by a fortis, geminate, or unlenited consonant such as <m> (phonetically [mm] or [m:]), as such long consonants effectively counted as a sequence of two (albeit identical) consonant sounds.
3. In stressed syllables, vowels were long *or half-long* if followed by a single (lenis) consonant*; vowels were long if followed by* another vowel, *the consonant [h],* or a word boundary.
4. *Vowels could only be fully long in stressed final syllables except for cases where a vowel in the penultimate syllable was followed by another vowel or the consonant [h]; elsewhere a vowel could be at most half-long.*

As we shall discuss further below, it is widely accepted that Middle Cornish followed the same rules as Middle Welsh, and likewise exhibited a threefold opposition in vowel quantity between long vs. half-long vs. short vowels.[10] A summary of the rules for Middle Welsh and Middle Cornish is presented in Fig. 4:

[9] The northern and southern dialects of Modern Welsh have also introduced additional modifications to the system, beyond those discussed here. For a fuller treatment, see Morris Jones, *A Welsh Grammar*, 65-74; see also Bruch, "Vowel Quantity, Part I," 128-130 (§1.9, Table 1.2).

[10] As with Welsh, the original Primitive Brittonic system underwent further modifications in Middle Cornish; a full treatment can be found in Bruch, "Vowel Quantity, Part I," 128-130 (§1.9, Table 2).

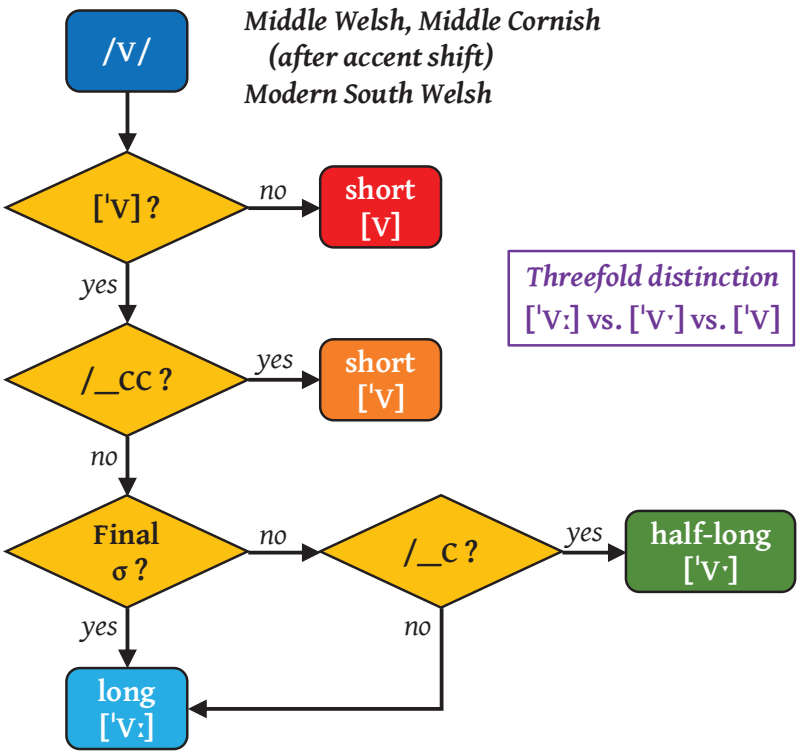

Fig. 4. Vowel Quantity: Allophonic rules under the New Quantity System (III)

Finally, it must be noted that neither Late Cornish (as recorded in texts dating from the seventeenth and eighteenth centuries) nor the northern dialects of Modern Welsh show a threefold opposition of long vs. half-long vs. short vowels, but rather a twofold distinction of long vs. short, like that of Modern Breton or the Goidelic languages. While it has been suggested this may be an indication that the threefold distinction never arose in North Welsh,[11] there is good reason to think that the twofold vowel quantity contrast in both North Welsh and Late Cornish represents a subsequent development in these languages, as the distribution of long vs. short vowels

[11] In his conference presentation "Towards a History of the Tenseness Contrast in Brythonic Vowels," paper presented at the Third Edinburgh Symposium on Historical Phonology, University of Edinburgh, 30 November 2017 (handout downloadable at https:www.anghyflawn.net/presentation/2017/esohph3) Pavel Iosad raises the possibility that "Vowel lengthening in South and Mid Welsh stressed penults (and Breton and Cornish?) is secondary," while North Welsh retains the original patterns from prior to the Old Welsh Accent Shift and thus never developed half-long vowels in penultimate syllables.

in penultimate syllables differs from that found in LTK Breton (the dialects of Leon, Treger, and Kernev), which have always had a twofold quantity contrast, and is most easily explained by theorizing that North Welsh and Late Cornish underwent a sound change whereby half-long vowels became short but fully long vowels (even in the penult) remained long. In Cornish, the sound change of [ˈV·] > [ˈV] in penultimate syllables is called the 'Prosodic Shift,' and has been dated to ca. 1600;[12] as discussed below, Wmffre has presented evidence that suggests that [ˈV·] > [ˈV] in North Welsh at approximately the same time.[13] A consequence of this is that North Welsh and Late Cornish generally have only short vowels in the penult, except where the vowel is followed by another vowel or a consonant like [h], in which case it is long. While this loss of half-long vowels seems to have occurred more or less simultaneously in Cornish and North Welsh, it is not clear that it occurred for the same reason in both cases, and—as with Welsh and Breton during the Old Brittonic accent shift—the two languages were not even in contact at the time it took place. The changes in the vowel length rules brought about by the Prosodic Shift in Cornish and the parallel loss of half-long vowels in North Welsh are illustrated in Fig. 5:

[12] Dating after George, "Cornish," 508; see also Bruch, "The Rise of Phonemic Vowel Quantity in Cornish, Part II: Vowel Quantity in Penultimate Syllables; a Relative Chronology of Phonological Change in Cornish, s. xiv – s. xviii" (forthcoming), (hereafter Bruch, "Vowel Quantity, Part II"), §16.

[13] Iwan Wmffre, *Language and Place-Names in Wales: The Evidence of Toponomy in* Cardiganshire (Cardiff: University of Wales Press, 2003), 133.

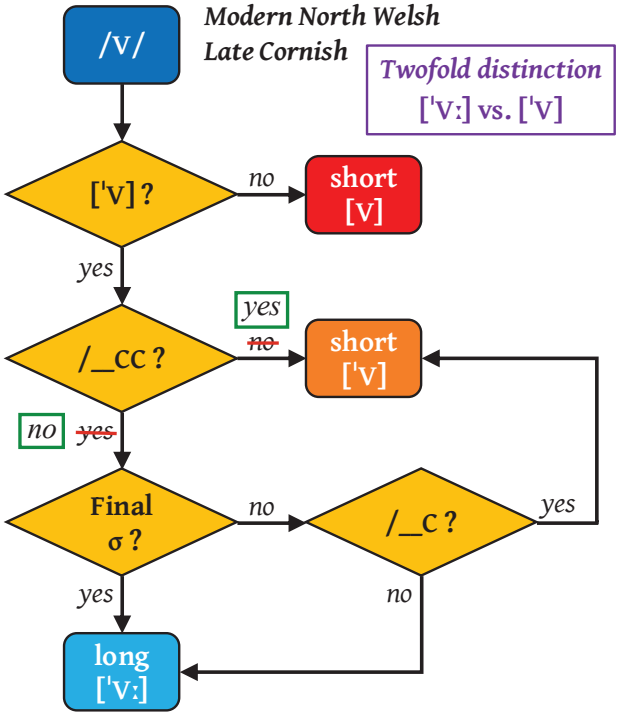

Fig. 5: Vowel Quantity: Changes following the loss of half-long vowels in Cornish and North Welsh

The development of vowel quantity rules in the Brittonic languages over the period from ca. 500 CE to the present day can therefore be summarized in the following diagram (Fig. 6):

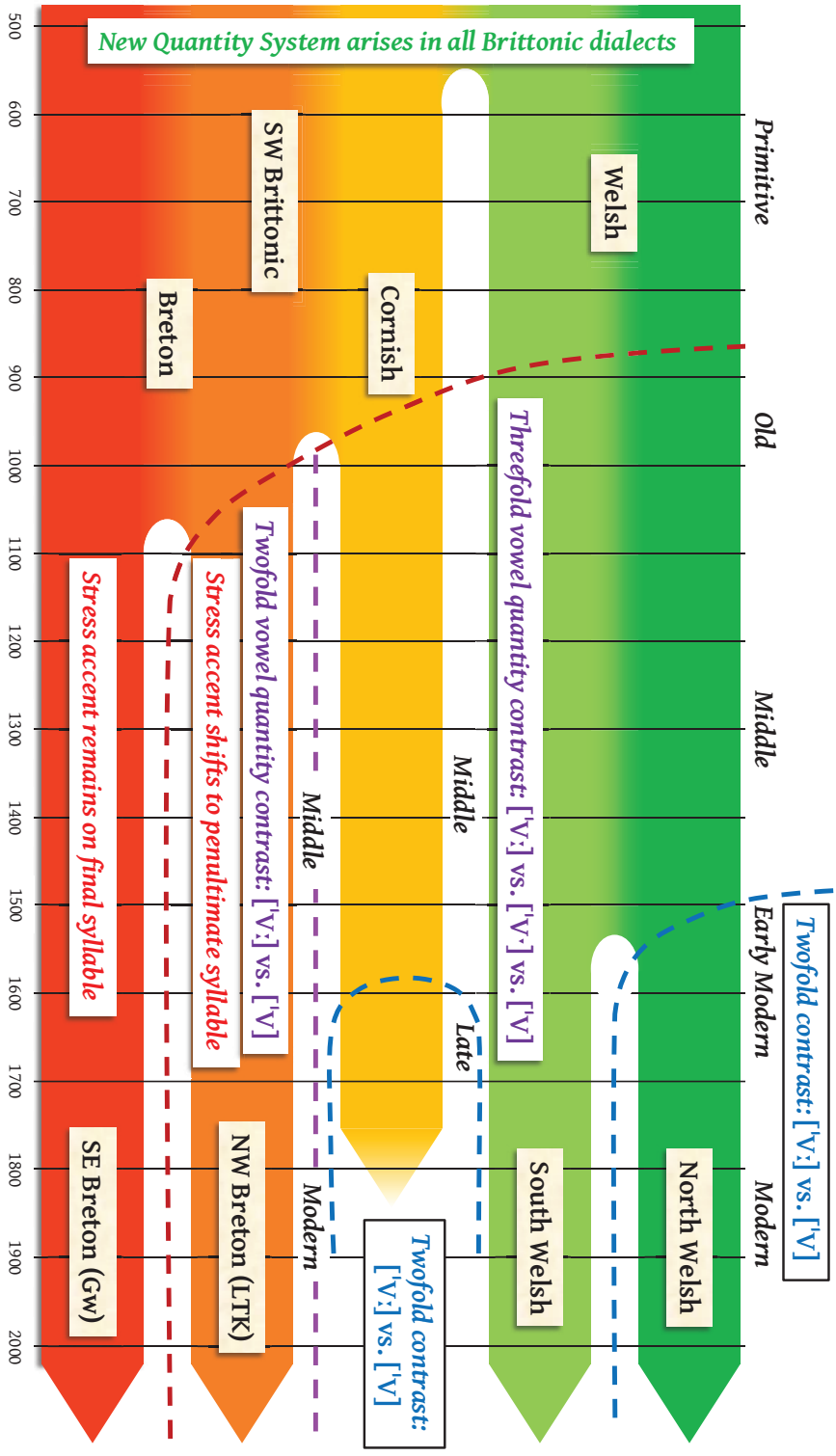

Fig. 6. Vowel Quantity in the Brittonic Languages: Chronology

While the chronology outlined above tells us a great deal about the 'what' and even the 'when' of the sound changes that took place in the medieval and modern Brittonic languages, it leaves several important questions unanswered:

1. Why did Welsh develop a threefold contrast in vowel quantity?
2. Did Cornish also develop a threefold contrast in vowel quantity (as scholars have generally assumed), and if so, why?
3. Why does North Welsh have a twofold contrast in vowel quantity?
4. Why does Late Cornish have a twofold contrast in vowel quantity?

In the following pages, we shall explore each of these questions in turn, starting with the first, which is in many ways the most difficult to answer.

Threefold Vowel Quantity Contrast in Welsh

While the threefold quantity contrast among stressed vowels in Welsh has often been described as a feature of the language's phonology, few attempts have been made to explain *why* such a contrast would have arisen in the first place. However, a contrast of [ˈV:] vs. [ˈV·] vs. [ˈV] is typologically very rare among languages,[14] and merits close investigation. In addition, any proposed explanation must account for the observed differences in vowel quantity rules between Welsh and LTK Breton; the latter also developed contrastive vowel quantity following the Old Brittonic accent shift, but only has a twofold opposition of long vs. short vowels in stressed syllables and none of the 'half-long' vowels that are characteristic of Welsh. If a threefold quantity distinction arose in Welsh after the accent shift, why did this not also happen in LTK Breton? As Schrijver remarks, "[i]t is impossible to decide whether Breton has innovated by lengtheningthe vowel of the penultimate or Welsh has innovated by lengthening the

[14] Bert Remijsen and Leoma Gilley, "Why are Three-level Vowel Systems Rare?: Insights from Dinka (Luanyjang Dialect)," *Journal of Phonetics* 36 (2008), 318-344 at 318-320 and 340-341.

shortening it."[15] Sims-Williams has suggested that Breton may have begun with a threefold opposition like that of Welsh but subsequently underwent a sound change of [ˈV˙] > [ˈV:] that converted half-long vowels in the penult to fully long vowels at some point between the Old Breton accent shift and the modern period, [16] but it remains to be explained why this would have occurred in Breton but not in Welsh or Cornish. Various answers to this question have been proposed:

The first of these is premised on the idea that 'Welsh is actually like Breton,' but has simply been analyzed in a more meticulous fashion. This theory follows from the observation that cross-linguistically, long vowels often have longer duration in monosyllables than in polysyllables, and hypothesizes that Welsh *really* has a twofold vowel quantity contrast that can be described as one of short vs. non-short, but that the long vowels in polysyllabic words are shorter in duration than those in monosyllables. Welsh grammarians, sensitive to fine distinctions in sound, have chosen to describe such vowels as 'medium' or 'half-long,' but this is an artificial distinction, or one that is allophonic rather than phonemic—a view that is supported by the fact that there are no minimal pairs contrasting 'long' vs. 'half-long' vowels.

There are some problems with this explanation, however. Most descriptions of other languages with a twofold contrast in vowel quantity do not use the term 'half-long' for long vowels in polysyllabic words, even though such long vowels presumably undergo the same shortening postulated for Welsh. While Welsh grammarians were undoubtedly very meticulous in their analysis of the sounds of their native language, it seems unlikely that they, and they alone, would have made such a precise (and, from a phonemic perspective, not particularly useful) distinction between 'longer' and 'shorter' versions of non-short vowel sounds. More importantly, Welsh grammars written by native speakers are clear on the contrast between [ˈV:] vs. [ˈV˙] vs. [ˈV], and their authors can describe the difference in pronunciation between these sounds.[17] This shows that in Modern Welsh the difference between 'long' and 'half-long' vowels is salient, and may even be phonemic, despite the lack of minimal pairs; two

[15] Peter Schrijver, *Studies in British Celtic Historical Phonology*, *Leiden Studies in Indo-European* 5 (Amsterdam: Rodopi, 1995), 253.
[16] Sims-Williams, "Dating the Transition to Neo-Brittonic," 217-261 at 251 n.131.
[17] See, for example, Morris Jones, *A Welsh Grammar*, 66.

sounds can be phonemically distinct from one another even if a language does not happen to have a minimal pair that contrasts them. In addition, polysyllabic words with final stress have a (fully) long vowel [ˈV:] in the stressed final syllable[18] and stressed vowels in hiatus (before [h] or another vowel) in the penultimate syllable are realized as long, not half-long,[19] neither of which would be the case if the difference between 'long' and 'half-long' vowels was determined solely by the number of syllables in a word.

An alternative proposal takes the opposite view: namely, that 'Breton is actually like Welsh,' but has not been analyzed meticulously enough. This idea is predicated on the hypothesis that Breton *really* has the same threefold quantity contrast of [ˈV:] vs. [ˈV·] vs. [ˈV] as Welsh, but that Breton speakers are unaware of, or unconcerned with, the length difference between non-short vowels in penultimate vs. final syllables, since this contrast does not give rise to minimal pairs.[20]

There are, however, some observations of Breton dialects that argue against the idea that vowel quantity follows the same distributional pattern in Breton as it does in Welsh. Iwan Wmffre, a phonetician who is also a native speaker of both Breton and Welsh, noted to me that in his experience, the long vowels of Breton seem closer in duration to the half-long vowels of Welsh.[21] In describing the Breton dialect of Plougrescant, Jackson notes that "[l]ong vowels are certainly not more than half-long, and short vowels are rather short."[22] While Jackson's observation is limited to a specific

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[18] Morris Jones, *A Welsh Grammar*, 70.

[19] Morris Jones, *A Welsh Grammar*, 72.

[20] Nicholas Williams expresses the view that the LTK dialects of Breton inherited the same threefold quantity system as Welsh or Cornish in *Cornish Today: An Examination of the Revived Language*, third edition (Westport (Cathair na Mart): Evertype, 2006), 2, where he observes that "half-long and long are really varieties of long and as such are usually grouped together, not only by linguists, but unconsciously also by speakers of the language concerned."

[21] Personal communication.

[22] Kenneth Hurlstone Jackson, "The Phonology of the Breton Dialect of Plougrescant," *Études Celtiques* 9.2 (1961), 327-404 at 330. Interestingly, on the same page Jackson also notes that "the long stressed vowel in a monosyllable is a little longer than the same in a polysyllable . . . but the difference is very slight and would only be observed in isolation," which might be seen as corroborating the theory (discussed above) that long vowels in penultimate syllables are really only half-long.

Breton dialect, it is interesting that both cases suggest that the duration of a 'long vowel' in Breton (or one form of Breton) is closer to that of a 'half-long' vowel in Welsh, suggesting that the (fully) long vowels of Welsh may represent a secondary lengthening that did not occur in Breton, an idea to which we shall return later on.

A third possibility is that vowel quantity in Middle Welsh relates to the shortening of pretonic penultimate vowels that occurred in Primitive Welsh. Schrijver notes that in Old Welsh, [ɨ] > [ə] and [u] > [ʊ] > [ə] in open pretonic (penultimate) syllables, while in Breton and Cornish these vowels remained distinct, as illustrated by Welsh *llydan* 'broad' vs. Breton and Cornish *ledan* and Welsh *byddar* 'deaf' vs. Breton *bouzar*, Cornish *bothar*. He further speculates that this neutralization of Primitive British [ɨ] and [u] as [ə] (a reduced vowel that resists lengthening) might be related to the way vowel quantity developed after the accent shift in Welsh vs. in (LTK) Breton.[23] This explanation is also problematic, however. In his analysis of Brittonic phonology, Schrijver postulates that Cornish also had a threefold quantity contrast like that of Welsh,[24] as we shall discuss further below. How could this have developed, given that Cornish did not undergo the same shortening of penultimate vowels as Welsh?

The fourth possible explanation, and the one I shall present here, is that differences in the rules governing vowel quantity in Welsh and Breton arose due to differences in the nature of word stress between these languages. These differences in word stress emerged as the result of the Old Brittonic accent shift, which occurred independently in Welsh, Cornish, and the LTK dialects of Breton.

The Old Welsh Accent Shift and the Rise of the Threefold Vowel Quantity Contrast in Welsh

Before embarking on a discussion of the details of the accent shift in Breton and Welsh, it is important to discuss what we mean by the term 'accent.' In English, as in the Brittonic languages, the most important feature of an accented syllable is dynamic stress: accented syllables are

[23] Peter Schrijver, "Old British," in *Brythonic Celtic-Britannisches Keltisch: From Medieval British to Modern Breton*, ed. Elmar Ternes, Münchener Forschungen zur Sprachwissenschaft 11 (Bremen: Hempen, 2011), 1-84 at 15; Schrijver, *Studies in British Celtic Historical Phonology*, 253.
[24] Schrijver, *Studies in British Celtic Historical Phonology*, 206.

pronounced louder than other syllables in a word. In addition, two other features also serve to mark word stress in English: stressed syllables are usually longer in duration then unstressed syllables, and they are often given a higher pitch. These three features correspond to three of the categories we outlined earlier for ways in which vowels may be distinguished from one another: through differences in dynamic stress, quantity, and tone or pitch. However, not every language combines all three of these elements (loudness, duration, and pitch) on the same accented syllable.

In Brittonic, as in English, word stress is also associated with a longer duration of articulation. In Brittonic languages, as in English, long vowels can only occur in stressed syllables; all vowels in unstressed syllables are short. On the other hand, the stress accent in Welsh does not correlate with the presence of higher pitch, as it does in English. The accepted explanation of this phenomenon is that when the accent shift took place in Welsh, the high pitch element of the accent remained on the final syllable, while the rhythmic stress moved back to the penult.[25] Even today, Welsh has a high pitch accent on the final syllable of each word regardless of whether this syllable is stressed or unstressed. In polysyllabic words with normal penultimate stress, this has the effect of producing two different accents that fall on successive syllables. The penultimate syllable bears the rhythmic stress and can therefore host a non-short vowel, but has a comparatively lower pitch than the final syllable and may also be pronounced with lower amplitude (loudness), such that "the ultima is very often more prominent in phonetic terms than the stressed penult."[26]

The fact that in Welsh, final vowels receive a high pitch accent regardless of stress is undoubtedly one reason why unstressed final vowels in Welsh have largely remained distinct from one another rather than falling together as [ə], as they did in Cornish and English. This feature of Welsh phonology may also help explain the prevalence of—or preference for—'mixed' rhymes between stressed and unstressed final syllables that we see in Welsh poetry, particularly in popular strict-meter verse forms like the *cywydd*, as these are rhymes between vowels that share the same high pitch accent, even if they do not match in quantity (and do not even belong to the

[25] Briony Williams, "Stress in Modern Welsh" (PhD diss., University of Cambridge, 1983), 233-237.
[26] B. Williams, "Stress in Modern Welsh," 25.

same phoneme, as vowel quantity has once again become phonemic in Modern Welsh).

In examining the terminology scholars have adopted to indicate the lengths of vowels in Modern Welsh, it is worth considering that rather than the established classification of Welsh vowels as short, half-long, and long, it might be better to describe them as short, long, and overlong—incidentally, the terms that are used in discussions of Estonian, another modern European language that has a threefold distinction in vowel length.[27] One reason to favor this change in nomenclature is that the relationship between the three vowel lengths is not like that of an eighth note, quarter note, and half note. 'Half-long' vowels in Welsh are not half as long as long vowels, but rather represent an intermediate quantity between short and long, and it is perhaps for this reason that Morris Jones prefers to describe them as "medium" vowels.[28] In his discussion of Cornish historical phonology, Williams describes short, half-long, and long vowels in Cornish as having respectively one, two, or three *morae* of vowel length: a relationship more like that of an eighth note, quarter note, and dotted quarter note.[29] I am thus inclined to favor the interpretation that the long vowels of Welsh are in reality overlong: long vowels that have been further extended since they occur in words where the stress accent and pitch accent both fall on the same syllable.

Let us imagine that before the Old Brittonic accent shift, the accentual pattern of Welsh, Cornish, and Breton was like that of English, with intensity or 'loudness,' duration or quantity, and higher pitch all concentrated on the same stressed (final) syllable. When the Old Breton accent shift took place in the LTK dialects of Breton, these elements all shifted together, such that the stressed penult in these dialects is pronounced with greater intensity, longer duration, and higher pitch, much as it is in

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[27] Remijsen and Gilley, "Why are Three-Level Vowel Systems Rare?", 319.

[28] Morris Jones*, A Welsh Grammar,* 66.

[29] Nicholas J. A. Williams, "Middle and Late Cornish," in *Brythonic Celtic-Britannisches Keltisch: From Medieval British to Modern Breton*, ed. Elmar Ternes, *Münchener Forschungen zur Sprachwissenschaft* 11 (Hempen, 2011), 237-357 at 242. *Mora* as a technical term is the unit of metrical time equivalent to an ordinary short syllable.

English.[30] In Welsh, by contrast, only the "rhythmic stress" shifted back to the penult, while the high pitch remained on the final, and the other elements (intensity and duration) either remained fixed on the final or moved back slightly to encompass the consonant (if any) that preceded it. As Bell et al. note in their discussion of Northern Welsh, "stressed [penultimate] syllables are shorter in duration and have lower amplitude than their following (unstressed) ultimate syllables" while "[c]onsonants following stressed vowels are longer in duration than consonants following unstressed vowels.[31] This partial or incomplete accent shift would account for why unstressed final vowels in Welsh are longer than other unstressed vowels, as well as why medial consonants following the stressed penult tend to lengthen or geminate,[32] probably at the expense of the penultimate vowel that precedes them. This in turn raises the possibility that the 'half-long' vowels in a stressed penultimate syllable are shortened because they precede the syllable containing the pitch accent just as the 'fully long' vowels in a stressed final syllable are lengthened by occurring in the syllable that receives the pitch accent as well as the stress accent. Tellingly, vowels in hiatus or before the consonant [h] (which can be thought of as a 'voiceless vowel' rather than a consonant) in words like lleol [ɬeːɔl] 'local' are not reduced and remain fully long,[33] presumably because they are not followed by a consonant.

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[30] Jackson, *A Historical Phonology of Breton*, 38 (§50), 55 (§87), 67 (§109) gives examples illustrating how higher pitch is associated with the stress accent on the penultimate syllables of words in the LTK dialects of Breton, as noted by Bruch, "Vowel Quantity, Part I," 143 n. 37 (§3.3); Albert Bock, "What the Fuss Is All About … Some Basics of the Cornish Reconstruction Debate," (unpublished paper), 1 (§1.1) remarks that, unlike in Welsh, "volume **(stress)**, pitch (**tone accent**), and length (**quantity**)" all "coalesce on the penultimate syllable" in Breton (emphases original).

[31] Elise Bell, Diana B. Archangeli, Skye J. Anderson, Michael Hammond, Peredur Webb-Davies, and Heddwen Brooks, "Northern Welsh," *Journal of the International Phonetic Association* 53/2 (2023) 487-510 at 506, citing Briony Williams, *The Phonetic Manifestation of Stress in Welsh* (Berlin: de Gruyter, 1991); and Kelly Webb, "The Realisation of Stress in Welsh English," *Proceedings of the 17th International Congress of Phonetic Sciences* (ICPhS XVII, 2011), 2106-2109.

[32] Bell et al., "Northern Welsh," 504-506.

[33] Morris Jones, *A Welsh Grammar*, 72.

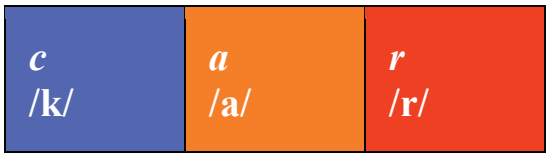
The table below summarizes these observations about the differences between Breton and Welsh in their treatment of accented syllables in the penult. It is interesting to note that Breton closely resembles English, as observed by Bock, while Welsh differs from both Breton and English.

Parameter	***English***	***Northwest Breton (LTK)***	***Welsh***
Intensity/Amplitude	Louder	Louder	Lower amplitude
Duration/Quantity	Lengthened nucleus	Lengthened nucleus; Long vowels can only occur in stressed syllables (New Quantity System)	Shortened nucleus; Following consonant may be lengthened
Pitch	Higher pitch	Higher pitch	Lower pitch

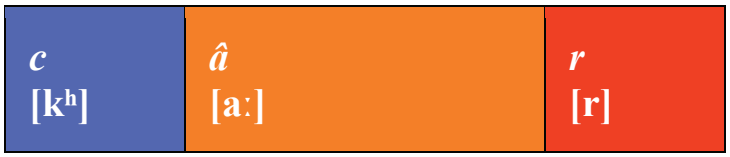
Table 3. Characteristics of Stressed Penultimate Syllables in English, Breton, and Welsh

We can visualize how the 'incomplete' or partial accent shift of Old Welsh (which left the pitch element on the final syllable) gave rise to the threefold quantity distinction in vowels observed in southern dialects of Modern Welsh by examining its differing effects on monosyllabic and polysyllabic words, using the examples of *câr* /kar/ 'loves (3. sg. present/future indicative)' and *caru* /karɨ/ > /kari/ 'love' (verbal noun).

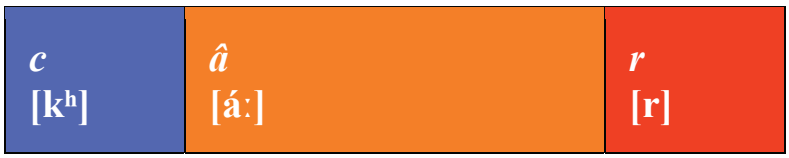
(1) Monosyllabic word *câr* /kar/



1. The stress accent falls on the final vowel, causing it to lengthen through the operation of the rules of the New Quantity System.



2. The high pitch accent[34] *also* falls on final vowel, causing it to gain prominence and lengthen further due to both types of accent coinciding on the same syllable.



Outcome: A long or 'overlong' final vowel with both rhythmic stress and high pitch: [ˈáː].

[34] Here and elsewhere in this paper, an acute accent [ˊ] placed over the vowel indicates a high pitch, while a grave accent [ˋ] indicates a lowered pitch.

(2) Polysyllabic word *caru* /kari/ > /kari/ in South Welsh

c /k/	*a* /a/	*r* /r/	*u* /ɨ/

1. The stress accent falls on the penultimate vowel, causing it to lengthen through the operation of the rules of the New Quantity System.

c [kʰ]	*a* [aː]	*r* [r]	*u* [ɨ]

2. The pitch accent falls on the final vowel, causing it to gain prominence and lengthen.

c [kʰ]	*a* [aː]	*r* [r]	*u* [ɨ́]

3. Because of the higher pitch on the final vowel, a lower pitch is assigned to the penultimate vowel, causing it to lose prominence and shorten.

c [kʰ]	*a* [àː]	*r* [r]	*u* [ɨ́]

4. The medial consonant lengthens at the expense of the penultimate vowel, shortening it further.

c [kʰ]	*a* [à˙]	*r* [r(˙)]	*u* [ɨ́]

Outcome:

- An acoustically prominent, unstressed final vowel with high pitch: [ɨ́]
- A lengthened medial consonant, which may develop a geminate pronunciation: [r(˙)].
- A half-long penultimate vowel with lower pitch and reduced acoustic prominence: [ˈà˙].

Evidence for Threefold Vowel Quantity Contrast in Middle Cornish

If this hypothesis explains the rise of the threefold quantity system in Welsh, what can we deduce about word stress, pitch accent, and vowel quantity in Cornish? Given the amount of rancor that often accompanies discussions of Cornish phonology, there is surprising consensus among linguists on this point: George, Williams, and Schrijver all postulate that after the accent shift, Cornish had a threefold vowel quantity contrast of [ˈV:] vs. [ˈV·] vs. [ˈV] like that of Welsh.[35] However, this is somewhat surprising, given that Cornish subgroups linguistically with Breton rather than Welsh, and should, on that basis, be expected to follow the pattern of LTK Breton, which features only a twofold opposition of [ˈV:] vs. [ˈV]. While Cornish has not been continuously transmitted as a spoken community language from medieval times to the present, orthographic evidence from Middle Cornish manuscripts nonetheless supports the idea that Cornish did, in fact, have long, half-long, and short vowels, perhaps as late as ca. 1600 or the early decades of the seventeenth century, as these three classes of vowels had become phonemically distinct from one another and were associated with distinctive spellings that indicated their phonemic length:[36]

[35] George, "Cornish," 507; N. Williams, "Middle and Late Cornish," 242; Schrijver, *Studies in British Celtic Historical Phonology*, 206; see also Bruch, "Vowel Quantity, Part I," 126 (§1.7).

[36] See Bruch, "Vowel Quantity, Part I," 156-217 (§§5-13) and "Part II," §16 for more detailed discussion of these spelling practices.

	Short vowel **[ˈV]**	***Half-long vowel*** **[ˈVˑ]**	***Long vowel*** **[ˈVː] > [ˈVˑɪ]**
Distinctive spellings	Vowel + double consonant or consonant cluster in the penult	Vowel + single consonant in the penult	Vowel + 'silent <e>' Digraphs <ea>, <oa> Digraphs <yy>, <ee>, <aa>, <oo> Vowel + <y> (where <y> indicates the off-glide of a heavy diphthong)

Table 4. Distinctive spellings used for short, half-long, and long vowels in Middle Cornish manuscripts

As noted earlier, Schrijver, Sims-Williams, and George have all suggested that Breton may have originally also had half-long vowels before lengthening them, but if so, it is unclear why such a shift of [ˈVˑ] > [ˈVː] would have occurred in Breton and not in Cornish. In Welsh, the presence of the high pitch accent on the following (unstressed) syllable likely played a role in the development and retention of half-long vowels, while such a split between the stress and pitch elements of the accent is not a feature of Breton, which lacks them, at least in modern dialects. If Cornish, like Welsh, developed half-long vowels, this suggests that it, too, had a high pitch accent on final syllables. According to George, Keith Bailey was the first person to propose that Cornish did have such a pitch accent.[37] This idea was also explored by Albert Bock in an unpublished paper, where he noted that Welsh:

> has stress and length on the **penultimate** (=second-last) syllable, but the highest tone on the **ultimate** (=last) one. Breton on the other hand has all three features coalesce on

[37] George, "Cornish," 506.

> the penultimate syllable, and Cornish English certainly does the same with Cornish names and dialect words. Up till now, spoken Revived Cornish has largely followed the English model, but it is by no means certain that this is also what the traditional language sounded like—Middle Cornish, at least, may well have sounded more like Welsh.[38]

It could be argued that the versification of the Middle Cornish *Ordinalia* plays and the poem *Pascon Agan Arluth*, works likely composed ca. 1400 or a bit earlier, reflects a period in the history of the language when final vowels still had a high pitch accent even when unstressed. As with many Welsh verse forms, these works feature a syllabic meter, suggesting that even though syllables may have differed in 'weight,' 'quantity,' or 'duration,' the overall difference in acoustic prominence between stressed and unstressed syllables was not so extreme as to favor the development of a stress-based meter (as we find in Old and Middle English texts). In Middle Cornish as well, unstressed final syllables could be rhymed with stressed syllables and with one another. This also favors the idea that unstressed final syllables were acoustically prominent enough to 'carry the weight' of creating an end rhyme, and raises the possibility that such rhymes sound like 'true rhymes' to the poets who composed them and the Cornish-speaking audiences who heard them spoken aloud, because they involved matching syllables that, despite difference in word stress and vowel quantity, shared the same high pitch accent.[39]

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However, there is good evidence from spellings and rhyming patterns in the plays *Bewnans Ke* (composed in the middle or second half of the fifteenth century) and *Beunans Meriasek* (known from a manuscript completed in 1504) that over the course of the fifteenth century and the early decades of the sixteenth century, the unstressed vowels [ɛ], [a], and [ɔ] fell together in final syllables in Cornish, probably merging as [ə]. This sound change is likely to have occurred after the vowels had lost acoustic

[38] Bock, "What the Fuss is all About," 1 (§ 1.1) (emphasis original).

[39] Further evidence suggesting that Middle Cornish still had a high pitch accent on final syllables at the time when it developed the system of versification exemplified in the *Ordinalia* and *Pascon Agan Arluth* is discussed in Bruch, "Vowel Quantity, Part II," §21.

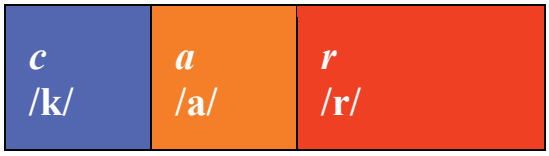
prominence, probably due to the loss of the high pitch accent on unstressed final syllables, a 'second accent shift' that may be due to English influence as Cornwall increasingly became a bilingual country in the course of the fifteenth century.[40]

I propose, therefore, that Cornish developed a threefold contrast between short, half-long, and long vowels for the same reasons as Welsh did, and that this contrast became phonemic by the first half of the fifteenth century.[41] The distinction between [ˈV:] vs. [ˈV·] vs. [ˈV] was subsequently maintained until ca. 1600, even after the second accent shift eliminated the high pitch accent on final unstressed syllables and brought the prosody of spoken Cornish closer to that of English.

The effects of the earlier pitch accent on fully long vowels in monosyllabic words can be clearly seen by comparing the Cornish monosyllables *tan* /tan/ 'fire' and *tas* /taz/ 'father' to the Welsh monosyllable *câr* /kar/ 'loves (3. sg. present/future indicative)' we examined earlier:

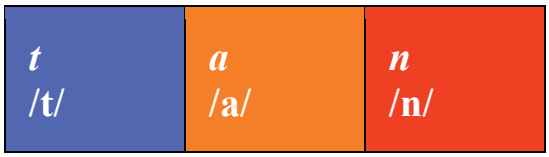
(1) Monosyllabic words *tan* /tan/ 'fire,' *tas* /taz/ 'father' compared with Welsh câr /kar/

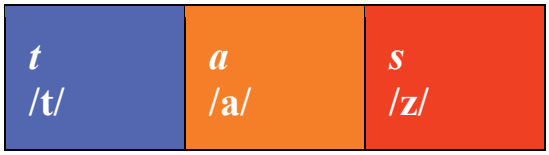
Welsh:



Note:
The dimensions of the three boxes in this graphic should be identical to those of the equivalent boxes in the two Cornish examples below.

Cornish:





1. The stress accent falls on the final vowel, causing it to lengthen through the operation of the rules of the New Quantity System.

[40] Bruch, "Vowel Quantity, Part I" 143 (§3.4); "Part II" §§24.6-24.8.
[41] Evidence for this dating is given in Bruch, "Vowel Quantity, Part I" and "Part II."

Welsh:

c [kʰ]	*â* [aː]	*r* [r]

Cornish:

t [tʰ]	*a* [aː]	*n* [n]
t [tʰ]	*a* [aː]	*s* [z̥]

2. As in Welsh, the high pitch accent *also* falls on final vowel, causing it to gain prominence and lengthen further due to both types of accent coinciding on the same syllable. The 'overlong' or 'fully long' nature of such vowels is reflected by distinctive 'long vowel' spellings in forms like *taan* 'fire' (*Origo Mundi*, line 1314):[42]

Welsh:

c [kʰ]	*â* [áː]	*r* [r]

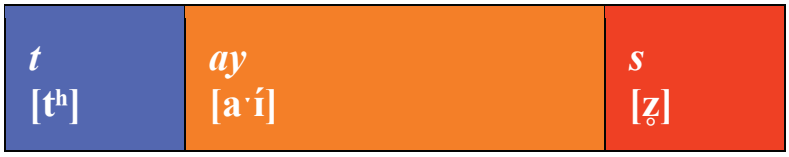
Cornish:

t [tʰ]	*aa* [áː]	*n* [n]

In some cases, particularly before a coronal fricative, fully long vowels develop an off-glide and break to heavy diphthongs: [áː] > [aˑí]. This vowel breaking is the reason for the distinctive 'vowel + <y>' spellings found in Middle Cornish texts with words that, according to the rules of the New

[42] See Bruch, "Vowel Quantity, Part I," 156-217 (§§5-13) for further discussion and examples of 'long vowel' spellings in monosyllabic words.

Quantity System, ought to contain a long monophthong, such as *tays* 'father' (*Beunans Meriasek*, line 325).[43]



It is possible that the breaking of trimoraic monophthongs to trimoraic diphthongs we see in monosyllables like *tas* > *tays* 'father' is a consequence of a pitch contour that resulted from the position of the pitch accent, which may have been localized on the final *mora* of the (over)long vowel in such words.[44]

Consequences of Phonemic Vowel Quantity in Polysyllabic Words

In polysyllabic words, the shift from allophonic to phonemic vowel quantity that had taken place by the first half of the fifteenth century also triggered a few sound changes that left orthographic evidence in Middle Cornish texts. Once vowel quantity had become phonemic, it rapidly became a more salient feature of Cornish phonology than consonant quantity, because, as in Welsh, any vowel in Cornish could be realized as long, half-long, or short, while only a small number of consonants (the sonorants /nː/ vs. /n/, /lː/ vs. /l/, and /rː/ vs. /r/) exhibited such a quantitative contrast.[45] This shift in phonemic salience led Cornish speakers to alter their pronunciation of some consonants to complement the phonemic length of the preceding vowel.

Under the New Quantity System, stressed vowels had been allophonically short before long consonants and consonant clusters, and allophonically non-short (long or half-long) before single, short consonants, giving rise to a distributional pattern of short stressed vowel + long consonant ([ˈVCC]) vs. long or half-long stressed vowel + short consonant ([ˈVːC] or [ˈVˑC]). However, there was one important exception to this pattern: in words where a short sonorant consonant ([n], [l], [r]) appeared between a stressed vowel and the glide [j], the resulting consonant cluster ([nj], [lj], [rj]) had caused the vowel to be pronounced as short, leading to a

[43] See also Bruch, "Vowel Quantity, Part I" 223 (§15.4); "Part II," §24.3.
[44] See also Bruch, "Vowel Quantity, Part I" 223 (§15.4); "Part II," (§ 243).
[45] Bruch, "Vowel Quantity, Part I," 132 (§2.2), 136-137 (§2.8).

sequence of allophonically short vowel + phonemically short [n], [l], or [r] + [j]. After vowel length became phonemic, the situation changed: phonemically short vowels were 'stronger' than phonemically short consonants, and could cause the latter to lengthen or geminate ([n] > [nn], [l] > [ll], [r] > [rr]), so that the sequence of vowel + sonorant would conform to the common distributional pattern of short stressed vowel + long consonant that had been established under the New Quantity System and was found in many other Cornish words. Cornish texts from the fifteenth century onward show evidence of this sound change, with etymologically single sonorants being written double following short vowels. That this doubling is not simply an orthographic device intended to show the length of the preceding vowel is made clear by the fact that words containing these historically short but now long consonants later underwent sound changes like [nn] > [^{d}n] and [ll] > [l^{h}] that only occurred in cases where the original consonant was phonetically long. I have described this process as a 'quasi-allophonic' change in consonant quantity, as it seems likely that consonant quantity was still at least weakly phonemic, if not as salient as vowel quantity for Cornish speakers during this period.[46]

This shift in "phonemicity" from consonants to vowels, as George describes it,[47] originally occurred because of changes in the lexicon of Middle Cornish that made speakers more aware of vowel quantity due to an influx of loanwords, mostly from English, that violated the vowel length rules originally established by the New Quantity System. When a 'critical mass' was reached that made it difficult for new generations of speakers acquiring Cornish to generalize a predictable rule for vowel quantity, children began learning vowel length as a regular component of every word, thus making vowel quantity phonemic, as illustrated in Fig. 7:[48]

[46] Bruch, "Vowel Quantity, Part I," 131-132 n.17 (§2.2), 139-141 (§§2.11-2.12); "Vowel Quantity, Part II," §§17-18 (esp. Tables 17.1 and 17.2), §§24.1-24.2.
[47] George, "Cornish," 503.
[48] Bruch, "Vowel Quantity, Part I," 132-135 (§§2.3-2.4).

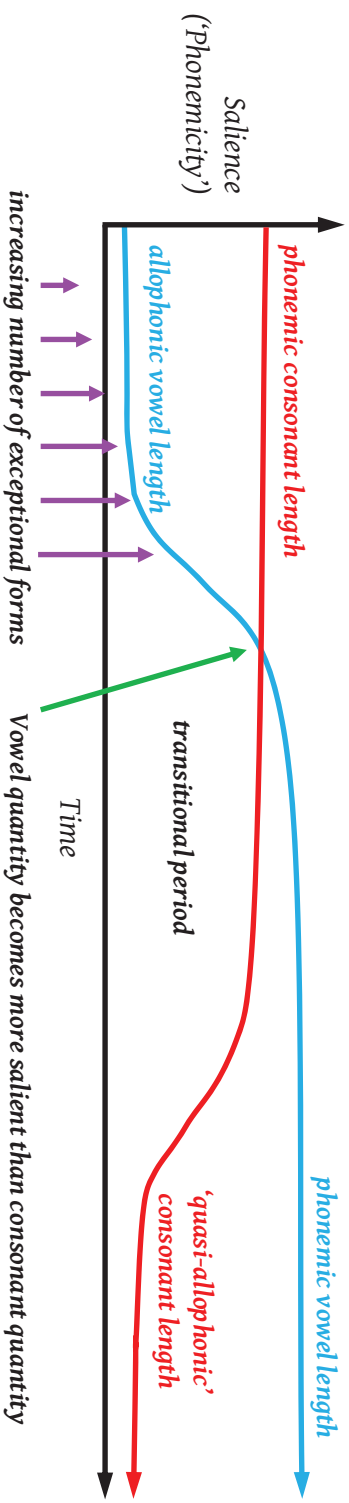


Fig. 7. The rise of phonemic vowel quantity in Cornish

The effects of this change in Cornish phonology can be seen in the following examples involving the polysyllabic Cornish words *henna* /hɛn:a/ 'that (one)' and *delyow* /dɛljoʊ/ 'leaves' (pl.):

(2) Polysyllabic words *henna* /hɛn:a/ 'that (one),' *delyow* /dɛljoʊ/ 'leaves (pl.)'

h **/h/**	***e*** **/ɛ/**	***nn*** **/n:/**		***a*** **/a/**
d **/d/**	***e*** **/ɛ/**	***l*** **/l/**	***y*** **/j/**	***ow*** **/oʊ/**

1. The long sonorant /n:/ in *henna* 'that (one)' is treated as a sequence of [CC] (an ambisyllabic long consonant, or even a geminate consonant) causing the preceding (penultimate) vowel to be realized as short under the rules of the New Quantity System. Likewise, <ly> /lj/ is treated as [CC], a sequence of two different consonants, [l] + [j], for the purpose of determining the quantity of the preceding vowel. These rules operate 'right to left,' with the (phonemic) quantity of a consonant (on the right) determining the (allophonic) quantity of the preceding vowel (on the left).[49]

2. As in Welsh, a high pitch accent falls on the unstressed final vowel, causing it to gain prominence and lengthen.

h **[h]**	***e*** **[ɛ̀]**	***nn*** **[nn]**		***a*** **[á]**
d **[t]**	***e*** **[ɛ̀]**	***l*** **[l]**	***y*** **[j]**	***ow*** **[óʊ]**

3. Vowel quantity becomes phonemic in Cornish, a change that must have occurred by the first half of the fifteenth century, if not earlier (as documented in Bruch, "Vowel Quantity, Part I" and "Part II.") This change

[49] See Bruch, "Vowel Quantity, Part I,"131, (§ 2.2, Table 2.1) and "Part II," §17, §24.2 for further discussion.

System

marks the shift from the New Quantity system (where vowel length was allophonic and dependent on the quantity of the following consonant) to what I have termed the Modern Quantity System (where vowel length is phonemic). Although consonant quantity does not immediately cease to be phonemic, it becomes less salient than vowel quantity and can be influenced by it.[50] The distributional pattern of [VCC] vs. [V·C] in penultimate syllables that had been established by the New Quantity System is retained, but now operates 'left to right,' so that the (phonemic) quantity of a vowel (on the left) determines the quantity of a following consonant (on the right). As a result, the medial [l] in *delyow* ~ *dellyow* 'leaves' lengthens to [ll]—and comes to be spelled with a doubled consonant graph, <ll>—following the phonemically short vowel [ɛ].[51]

4. Following the 'second accent shift' as described above, the high pitch accent of earlier Middle Cornish is lost or shifts back to the stressed (penultimate) syllable. This likely occurred under influence from English prosody, as in English, high pitch and rhythmic or dynamic stress coincide on the same syllable. As a consequence of this change, final vowels lose prominence, causing them to shorten and neutralize, with unstressed final [ɛ], [a], and [ɔ] all merging as [ə] over the period from the middle of the fifteenth century to the early sixteenth century.[52] This change did not occur in Welsh.

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[50] Bruch, "Vowel Quantity, Part I," 134-135 (§2.4) and 136 (§2.7); "Part II", §§17-18, §§24.1-24.2.

[51] Bruch, "Vowel Quantity, Part I," 139-141 (§§2.11-2.12, Table 2.4) "Part II," §17, esp. Tables 17.1 and 17.2, §19, §24.2; for an alternate explanation of this sound change, see N. Williams, *Cornish Today,* third edition, 56, and "Middle and Late Cornish," 274.

[52] Bruch, "Vowel Quantity, Part II," §§24.6-24.8.

h [h]	*e* [ɛ]	*nn* [nn]	*a* [ə]	
d [t]	*e* [ɛ]	*ll* [ll]	*y* [j]	*ow* [oʊ]

5. Over the course of the sixteenth century, further sound changes alter the pronunciation of long sonorants in Cornish: [nn] > [^{d}n], [ll] > [l^{h}].[53] The sounds resulting from these changes are no longer long sonorants, but rather sonorants with extra articulatory features like pre-occlusion or aspirate release; in medial position, they may be reanalyzed as consonant clusters, e.g. [^{d}n] > [dn]. The sequence [l^{h}j] is reinterpreted as [lk^{h}j] (probably due to devoicing of the [l]), yielding the Late Cornish form *delkioụ* 'leaves.'[54]

h [h]	*e* [ɛ]	*dn* [^{d}n] > [dn]	*a* [ə]	
d [t]	*e* [ɛ]	**lh > lk* [l^{h}] > [lk^{h}]	*i* [j]	*oụ* [oʊ]

As a result of these changes, there is no further evidence for quantity distinction in sonorants (or any consonants). This is turn breaks the distributional pattern of [VCC] vs. [V·C] that was originally established by the New Quantity System and largely preserved during the fifteenth and sixteenth centuries, even after vowel quantity became phonemic, such that vowel quantity is no longer tied to consonant quantity in a predictable way.

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[53] Bruch, "Vowel Quantity, Part I," 140-141 (§2.12); "Part II," §§24.10-24.11; N. Williams describes these sound changes in *Cornish Today*, third edition, 56-57 and "Middle and Late Cornish," 274, but considers them to be consequences of the Prosodic Shift, which he believes took place in the twelfth or thirteenth century rather than ca. 1600, as I suggest here. On Williams' dating of the Prosodic Shift see Nicholas Williams, *Towards Authentic Cornish* (Westport (Cathair na Mart): Evertype, 2006) and *Cornish Today,* third edition, 102, 117.

[54] Bruch, "Vowel Quantity, Part I," 141 (§2.12); "Part II," §17, §24.11; see also N. Williams, *Cornish Today,* third edition, 56 and "Middle and Late Cornish," 274.

The Rise of the Twofold Vowel Quantity Contrast in North Welsh

Both North Welsh and Modern Breton have a twofold opposition of [ˈV:] vs. [ˈV] rather than the threefold opposition of [ˈV:] vs. [ˈV·] vs. [ˈV] seen in South Welsh. However, there is a significant difference between the two languages in the distribution of long and short vowels in the penult. In the LTK dialects of Breton, penultimate vowels are regularly long before single consonants, whereas in North Welsh, such vowels are always short. If North Welsh, like South Welsh and Cornish, did originally have half-long vowels, it is necessary to explain when and how it lost them. Pavel Iosad has explored the possibility that North Welsh never developed half-long vowels, in order to avoid the "Duke-of-York scenario" (i.e., all penultimate lengthened vowels lenghtened in medieval Welsh, only to shorten again in modern North Welsh) that would otherwise apply;[55] however, the distributional pattern of long and short vowels in North Welsh is more easily accounted for by assuming it grew out of a threefold opposition between long vs. half-long vs. short vowels like that of South Welsh, which underwent a sound change of [ˈV·] > [ˈV], that converted all half-long vowels to short, as illustrated in Fig. 5 above.

[ˈV]

The best indirect evidence for this sound change comes from the fact that "[t]he only instances of long vowels arising in the penultimate syllable in north Wales are found in one specific context, namely in hiatus, i.e. when one vowel is immediately followed by another vowel in an adjacent syllable, e.g. in [ɬeːɔl] 'lleol' local and [soːar] 'Soar' (a place-name)."[56] Both southern and northern dialects of modern Welsh agree in having long vowels in this position, and it is plausible that this was a feature of vowel length in Middle Welsh at a time when both northern and southern dialects had a threefold distinction in vowel length. As penultimate vowels in hiatus were already long rather than half-long, they would not have been affected by a sound change that shortened half-long vowels only.

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[55] Pavel Iosad, "Bridging the Gap: Length and Tenseness in Brythonic Vowels," paper presented at "New Approaches to Brittonic Historical Linguistics," Dublin Institute of Advanced Studies, 31 August 2017 (handout downloadable at https://www/ anghyflawn. net/ presentation/2017/dias); see also Iosad, "Towards a History of the Tenseness Contrast in Brythonic Vowels."

[56] Iwan Wyn Rees, "Length and Quality in Welsh Mid Vowels: New Evidence from Mid-Wales," *Journal of Celtic Linguistics* 19 (1) (2018), 157-208 at 163-164.

Iwan Wmffre has provided more direct evidence of [ˈV·] > [ˈV] in the form of a document recording a period in the sixteenth century when northern dialects of Welsh were in transition from the original three-length system of Middle Welsh to the modern two-length system we find in North Welsh today. This evidence comes from Richard Langford of Trefalun, Sir y Fflint, who records that at a church service he heard a girl singing a song about holly (*celyn* [ˈkeˑlɨn], with a half-long vowel), and was grateful that she did not pronounce the word as [ˈkɛlɨn] (< [ˈkɛlːɨn] with short [ɛ] preceding historically long [lː]), as this is the word for 'penis.' These two words are homophones in modern North Welsh, but clearly in the late sixteenth century, they were still distinguished by many speakers (including Langford), even as half-long and short vowels were beginning to fall together in the penult. In his analysis, Wmffre points out that Langford describes the word for 'holly' as having a 'long' sound ("yn hir," referring to the half-long [eˑ]) and the word for 'penis' as having a 'short' sound ("yn vyrr", referring to the short [ɛ], which "demonstrates that he was thinking of the length of the vowel and not of the consonant,"[57] meaning that by this time, vowel quantity had not only become phonemic for Langford, but was more salient than consonant quantity, a change that, as noted above, also occurred in Cornish.

Note: For the initial [k] in each of these three phonetic transcriptions, please read [kʰ].

[ɛ]),

However, consonant quantity did not long remain salient—or phonemic—in either North or South Welsh after vowel quantity achieved phonemic status. While some phonetic studies like that of Bell et al. describe consonant quantity in Modern Welsh as being allophonically determined by the quantity of the preceding vowel,[58] other analyses of Welsh phonology like that of Willis 2009[59] suggest that consonant quantity has been fully neutralized, a situation that we can represent as follows:

[57] Wmffre, *Language and Place-Names in Wales*, 132-133.
[58] Bell et al., "Northern Welsh," 504-505.
[59] David Willis, "Old and Middle Welsh," in *The Celtic Languages*, second edition, ed. Martin J. Ball and Nicole Müller (New York: Routledge, 2009), 117-160 at 125.

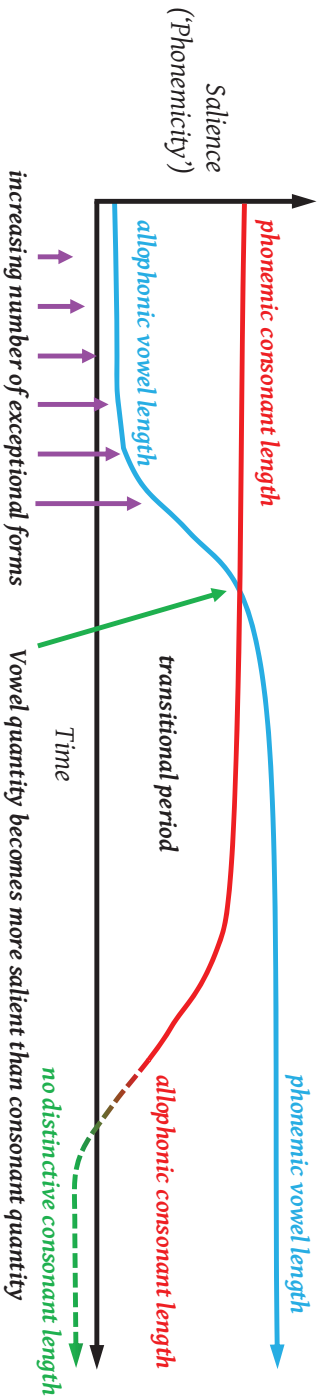

Fig. 8. The rise of phonemic vowel quantity and the loss of phonemic consonant quantity in Welsh

In addition to the loss of phonemic distinctions in consonant quantity, North Welsh has also lost phonemic vowel quantity in penultimate syllables. This change can be explained as a natural continuation of the process already examined when tracing the development of the threefold vowel quantity system in Middle Welsh and South Welsh, which resulted in the following phonological form for the disyllabic word *caru* /kari/>/kari/ 'love (verbal noun':

c	*a*	*r*	*u*
[kʰ]	[àˑ]	[r(ˑ)]	[ɨ́]

As noted above, this Middle Welsh form was characterized by:

- An acoustically prominent, unstressed final vowel with high pitch: [ɨ́]
- A lengthened medial consonant, which may develop a geminate pronunciation: [r(ˑ)].
- A half-long penultimate vowel with lower pitch and reduced acoustic prominence: [ˈàˑ].

It seems likely that the neutralization (through further shortening) of half-long vowels in North Welsh is connected to a neutralization (through further lengthening) of the following consonant, represented here by [r(ˑ)] > [rr], where [rr] indicates a long or even (in the case of stop consonants, at any rate) a geminate pronunciation.[60]

c	*a*	*r*	*u*
[kʰ]	[à]	[rr]	[ɨ́]

Following this sound change, the medial <r> in *caru* can no longer be distinguished from an original <rr>, leading to a complete phonetic (and phonemic) merger of short and long consonants. This lengthening of the

[60] In their description of modern "Northern Welsh," Bell et al., at page 504, observe that "[c]onsonants lengthen following a stressed short vowel and preceeding an unstressed vowel citing "/ɐtʰep-ion/ [ˈʔɐ.ˈtʰep.pion] *atebion* 'answers'" as an example of how "geminate consonants" arise in such cases. See Bruch, "Vowel Quantity, Part II," §17 for further discussion and comparison with similar lengthening processes in Cornish.

medial consonant likely occurs at the expense of the preceding (penultimate) vowel, causing half-long vowels to become short and eliminating the contrast of [ˈV·] vs. [ˈV] in penultimate syllables. As noted above, however, fully long vowels in hiatus are not affected, as there is no following consonant that can cause them to shorten, so that North Welsh retains [ˈVː] in words like *lleol* 'local.'

The Rise of the Twofold Vowel Quantity Contrast in Late Cornish

As noted earlier, Late Cornish of the seventeenth and eighteenth centuries has essentially the same distribution of long and short vowels as North Welsh, in that all vowels are short in penultimate syllables before a consonant (other than [h]), but long in words like *bîan* [piːən] 'small, little' where the vowel is in hiatus. This suggests that like North Welsh, Late Cornish began with a threefold contrast of [ˈVː] vs. [ˈV·] vs. [ˈV] but subsequently underwent a regular sound change of [ˈV·] > [ˈV], such that all (or most) half-long vowels became short. This change, known as the 'Prosodic Shift,' has been discussed at length in works on Cornish historical linguistics, although there has been considerable disagreement about the date at which it occurred; I here follow George in dating it to ca. 1600.[61]

This phonological change may have happened for the same reason that half-long vowels shortened in North Welsh, but if so, it is likely to be coincidental, since the two languages were not in close contact during the early modern period. The change of [ˈV·] > [ˈV] could also be attributed to the working out of shared inherited features, but it is unclear what those features would have been, given that the prosody of Cornish and Welsh diverged over the course of the fifteenth and sixteenth centuries, with Welsh retaining a high pitch accent on final unstressed syllables while Cornish adopted a prosodic system closer to that of English that led unstressed final vowels to fall together as [ə]. In Wmffre's discussion of the sound change of [ˈV·] > [ˈV] in Welsh, he notes that George implies that the loss of half-long vowels in Cornish might be due to English influence, but suggests that this is not likely to be the correct explanation for what happened in Welsh.[62]

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[61] George, "Cornish," 508; see also Bruch, "Vowel Quantity, Part II," §16, §24.12, §25.

[62] Wmffre, *Language and Place-Names in Wales*, 126; in n.3, he cites Ken George, "Mid-length Vowels in Cornish," *Journal of Celtic Linguistics* 6 (1997), 103-124.

Note: For the initial [k] in each of these phonetic transcriptions, please read [kʰ].

speakers often preserved

I agree with Wmffre that although the outcome in Late Cornish and North Welsh is the same (half-long vowels become short), the motivation for the change is different. Whereas in Welsh, consonant quantity was neutralized in medial position following stressed penultimate vowels and caused some minimal pairs of words like *celyn* [ˈkeˑlɨn] 'holly' and *celyn* [ˈkɛlɨn] 'penis' to fall together, Cornish speakers preserved the distinctions in medial position between short [n] and [l] vs. long [nn] and [ll] by converting the opposition from one of quantity to one involving quality or manner of articulation, via the sound changes [nn] > [ᵈn] and [ll] > [lʰ], as we saw in the cases of *henna* > *hedna* 'that (one)' and *delyow* > *dellyow* > *delkioụ* 'leaves (pl.),' which may be represented as follows:

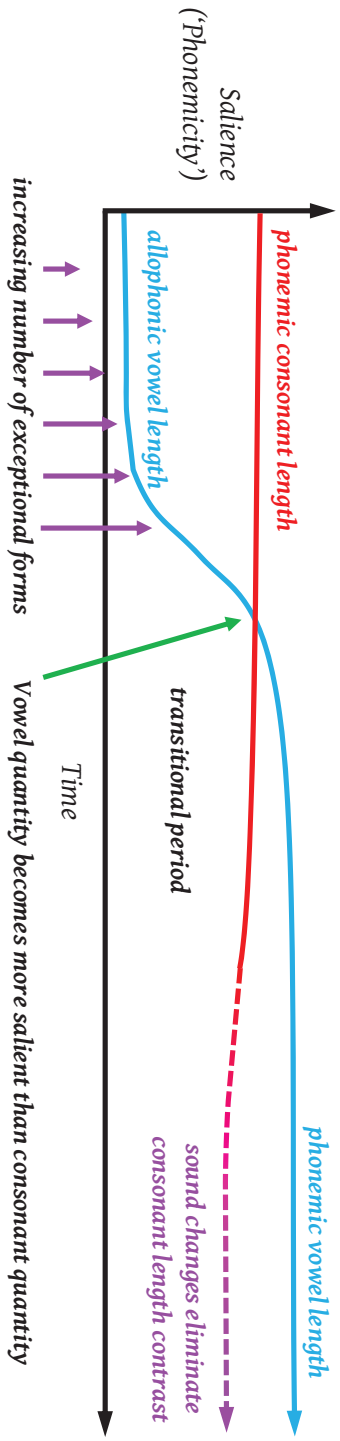

Fig. 9. The rise of phonemic vowel quantity and the loss of phonemic consonant quantity in Cornish

While these shifts in pronunciation kept minimal pairs distinct, they so greatly reduced the number of geminate or long consonants in the lexicon that subsequent generations of speakers acquiring Cornish did not construct a phonemic inventory that took account of consonant quantity. Because these historically long consonants had not fallen together with their short counterparts, there was also little need for speakers to pay attention to vowel quantity in the penult as a means of distinguishing between two phonetically similar words containing a sequence of vowel + sonorant. As in Welsh, vowel quantity continued to be contrastive in monosyllables, where it paralleled a contrast between long vs. short vowels that was also an important component of English phonology. However, it ceased to be distinguished in stressed penultimate syllables, where it was far less useful for disambiguating minimal pairs and had no parallel in English, a language whose phonemic inventory contained short vowels, long vowels, and diphthongs, but nothing comparable to half-long vowels. In a country where a majority of the population were now English monoglots or English-Cornish bilinguals who used English in more situations and with a greater number of people, it is likely that this degree of phonological interference from English—which would not have occurred in North Wales during the sixteenth and seventeenth centuries—was a major contributing factor to the Prosodic Shift of [ˈV·] > [ˈV].[63]

Questions About the Development of the New Quantity System in Welsh and Cornish

We may now propose answers to each of the four questions I posed earlier:

1. Why did Welsh develop a threefold contrast in vowel quantity?

Differences in vowel quantity between Welsh and Breton are related to differences in the outcome of the Old Brittonic accent shift in each language. In Welsh, a high pitch accent remained on final syllables, independent of rhythmic stress. As a result, long vowels were extended in final syllables (where the pitch accent and the rhythmic stress accent coincided) and shortened in penultimate syllables (because these had lower acoustic prominence due to the high pitch accent falling on the following syllable). This created the threefold quantity contrast of [ˈV:] vs. [ˈV·] vs. [ˈV] that we observe in Modern South Welsh, which was almost certainly a

[63] Bruch, " Vowel Quantity, Part II," §24.12, §25.

feature of all dialects of Middle Welsh until half-length was lost in the north.[64] In the LTK dialects of Breton, by contrast, the pitch accent shifted back to the penult along with the stress accent, so that the same quantity rules applied to both penultimate and final stressed syllables. As a result, Modern Breton retains the simple twofold opposition of [ˈV:] vs. [ˈV] that existed in all three Brittonic languages prior to the Old Brittonic accent shift.

2. Did Cornish also develop a threefold contrast in vowel quantity, and if so, why?

Orthographic and metrical evidence suggests that before ca. 1600, Cornish had a threefold quantity contrast like that of Middle Welsh and Modern South Welsh. As I describe in my study on "The Rise of Phonemic Vowel Quantity Length in Cornish, Part I," the long, half-long, and short reflexes of Old or Early Middle Cornish vowels were typically spelled differently from one another, suggesting that short vowels became 'lax' and centralized, half-long vowels became 'tense' and sometimes moved toward a more peripheral place of articulation, and fully long vowels tensed and occasionally developed an off-glide due to their (over)long duration (and possibly also due to the effects of a pitch contour on final syllables), breaking to heavy (trimoraic) diphthongs. This implies that the Old Cornish accent shift parallels the Old Welsh accent shift, with a high pitch accent remaining on final syllables. By the middle of the fifteenth century, when the poem *Pascon Agan Arluth* was copied, this high pitch accent on final syllables had been lost, probably shifting back to the penult so that all elements of the accent coincided on the same syllable, as in English (or Breton). This is probably a consequence of English influence and increasing bilingualism in Cornwall. As a result of this 'second accent shift,' unstressed final vowels fell together as [ə] over the course of the late fifteenth and early sixteenth centuries.[65]

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[64] Wmffre, *Language and Place-Names in Wales*, 133.

[65] For further discussion of the second accent shift in Cornish, see Bruch, "Vowel Quantity, Part I," 143 (§3.4) and "Part II", §24.6. The loss of distinctions between [ɛ], [a], and [ɔ] in unstressed final syllables in Cornish is a well-documented phenomenon, and is dealt with in Bruch, "Vowel Quantity, Part I," 143 (§3.4), 160-161, (§§6.3-6.5) and "Part II,: §§24.7-24.8; N. Williams, ("Middle and Late Cornish," 298) likewise discusses "the reduction of unstressed /e/, /a/ and /o/ to the neutral

3. Why does North Welsh have a twofold contrast in vowel quantity?

Evidence suggests that North Welsh had a threefold quantity contrast until some time in the sixteenth century.[66] The merger of long and short sonorants and lengthening of medial consonants before final vowels led to the elimination of contrastive vowel quantity in penultimate syllables: [ˈV·] > [ˈV]. However, long vowels in hiatus remained long, as they were not followed by a sound that could have triggered such shortening.

4. Why does Late Cornish have a twofold contrast in vowel quantity?

Unlike in Welsh, long and short sonorants in Cornish remained phonetically distinct until [nn] > [ᵈn], [ll] > [lʰ], and [rr] > [ɹ].[67] These three changes all seem to have occurred independently, in or around the sixteenth century. Of the three, the pre-occlusion of [nn] > [ᵈn] is the most easily datable, as it is not attested until 1538,[68] and is not found in the writings of John Tregear (written in or shortly after 1555) or Thomas Stephyn (written in or after 1576), suggesting that the change may have started in the 1520s or 1530s but likely was not a feature of Tregear's or Stephyn's Cornish, which they probably acquired as children in the early decades of the sixteenth century.

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vowel /ə/ in all environments," but considers this sound change to be a consequence of the Prosodic Shift and therefore dates it to an earlier period. George ("Cornish," 503-504) describes this phonological process as a series of sound changes that occurred during the period from "c.1475" to "c. 1575" in which unstressed final /ɛ/ and /ə/ changed to /a/ rather than /ɛ/, /ɔ/, and /a/ reducing to /ə/.

[66] Wmffre, *Language and Place-Names in Wales,* 132-133.

[67] As noted in Bruch, "Vowel Quantity, Part I," 137-138 (§2.9) and "Part II", §24.11, [ll] > [lʰ] is not a universal change; there is evidence that [ll] remained a geminate [ll] in medial position for some speakers throughout the life of the language, long enough to be preserved in the English spoken in parts of Cornwall in the nineteenth and twentieth centuries (on which see also Albert Bock, "Representation of Intervocalic Single /l/ and Geminate /ll/ in Sacrament an Alter (2010), https://www.academia.edu/283409/Representation_of_intervocalic_single_l_and_geminate_ll_in_Sacrament_an_Alter). The sound change of [rr] > [ɹ] is speculative, but would account for the confusion between <rr> and <r> noted by Ken George, "A Phonological History of Cornish" (PhD diss., Université de Bretagne Occidentale, third print, June 1985), 431-433 and discussed in Bruch "Vowel Quantity, Part I," 137 (§2.9) and "Part II," §24.9. The pre-occlusion of [nn] > [ᵈn] is dealt with in Bruch, "Vowel Quantity, Part II," §24.10.

[68] Oliver J. Padel, personal communication.

The loss of a phonemic length contrast among consonants, combined with interference from English phonology in an increasingly bilingual—and, later, predominantly Anglophone—Cornwall, led to the loss of phonemic vowel quantity in the penult. This 'Prosodic Shift' of [ˈV·] > [ˈV] is essentially the same sound change that occurred in North Welsh, and arose in both cases due to the neutralization or loss of quantitative distinctions in the consonant that followed the penultimate vowel. In North Welsh, this occurred because all medial consonants geminated and lengthened at the expense of the preceding vowel, erasing previous distinctions. In Cornish, it happened because distinctions in consonant quantity were eliminated, either by merger (in the case of [ll] vs. [l] word-finally, and in the case of [rr] vs. [r] both medially and finally) or because the long sonorant changed to a sound with a different manner of articulation like [nn] > [^{d}n] or [ll] > [l^{h}], such that the quantitative distinction between e.g. [^{d}n] (< [nn]) vs. [n] became less salient than the qualitative distinction, and was therefore lost.

or

The Rise and Fall of the New Quantity System in Breton, Welsh, and Cornish: Conclusions

Based on this analysis, we may summarize the series of phonological changes governing the rise and fall of the New Quantity System in Breton, Welsh, and Cornish as follows:

I: Primitive Brittonic; Southeastern dialects of Modern Breton (Gwenedeg):

At the start of the Primitive Brittonic period, all Brittonic dialects (Breton, Cornish, Welsh) were subject to the New Quantity System, under which there was a twofold contrast in vowel quantity in stressed (final) syllables ([ˈV:] vs. [ˈV]) and vowel length was allophonic, determined by the number and nature of following consonants, such that it gave rise to a distributional pattern of [ˈV:C] vs. [ˈVCC]. This twofold quantity contrast can still be heard in the southeastern dialects of Modern Breton (Gwenedeg), even though vowel quantity subsequently became phonemic rather than allophonic, since Gwenedeg retains the original final word stress that was universal in Primitive Brittonic. However, in other dialects of Breton, as well as in Cornish and Welsh, the principal (rhythmic) stress later shifted from the final to the penultimate syllable in polysyllabic words. This accent shift occurred independently, but at roughly the same time, in all three languages, giving rise to the systems listed under II, III, and IV below.

II: Other dialects of Modern Breton (Leoneg, Tregerieg, Kerneveg)

In those dialects of Breton that underwent the Old Breton accent shift, the high pitch accent moved back to the penultimate syllable along with (or at roughly the same time as) the rhythmic or stress accent. As part of this shift, the allophonic vowel quantity rules that applied to stressed final syllables came to be applied to the newly stressed penultimate syllables of polysyllabic words. Consequently, the modern LTK dialects of Breton exhibit a more or less identical twofold contrast in vowel quantity in both stressed penults and stressed finals ([ˈV:] vs. [ˈV]), which in the modern language has become a phonemic rather than an allophonic contrast.

III/IV: Medieval Cornish and Welsh

In Cornish and Welsh, on the other hand, the pitch accent remained on the final syllable after the Old Brittonic accent shift, leading to 'tension' in polysyllabic words between the rhythmic stress accent on the penult and the pitch accent on the final. In cases where the rhythmic stress accent and the pitch accent coincided—specifically, in stressed monosyllables and in words that had an irregular stress on the final syllable—this 'double stress' gave additional prominence to the final vowel, and may have lengthened it as well; such vowels are termed 'long' in phonetic descriptions of Modern Welsh and Middle Cornish, but might be better described as 'fully long' or 'overlong.' The high pitch on the final vowel caused a lower pitch to be assigned to the (stressed) penultimate vowel, reducing its acoustic prominence, and this may have led it to shorten somewhat and become 'half-long,' at least in cases where it was directly followed by a consonant. The result of these changes was the establishment of a threefold contrast between [ˈV:] vs. [ˈV·] vs. [ˈV].

In poly-syllabic words, the

III: Modern South Welsh

Once vowel quantity achieved phonemic status in Welsh, it quickly became more salient than consonant quantity, as any vowel could be realized as long, half-long, or short, while only two consonants regularly exhibited a phonemic quantity contrast: [nn] vs. [n] and [rr] vs. [r].[69] As a result, the

[69] Alongside [nn] vs [n] and [rr] vs. [r], Welsh also developed a quantitative contrast of [ll] vs. [l], but [ll] only arose in a small number of cases through the simplification of an earlier consonant cluster or in loanwords where the vowel preceding the lateral consonant was phonemically short in the source language; the original long

long and short sonorant phonemes (/nː/ and /n/, /rː/ and /r/) fell together and consonant quantity became allophonic, with the choice of a long vs. short consonant being conditioned by the quantity (short vs. non-short) of the preceding vowel. Over time, even allophonic distinctions in consonant quantity like [ˈVːn] / [ˈVˑn] vs. [ˈVnn] may have been lost, as the medial consonant between the penultimate and final vowels developed a tendency to lengthen and even geminate. Today, the southern dialects of Modern Welsh preserve both the threefold contrast of [ˈVː] vs. [ˈVˑ] vs. [ˈV] as well as the high pitch accent on all final vowels regardless of stress.

IVa: North Welsh

In North Welsh, the medial consonant lengthened further at the expense of the penultimate vowel, so that half-long penultimate vowels became short ([ˈVˑ] > [ˈV]) while fully long penultimate vowels (those with no following consonant, or none other than [h]) were unaffected. As a result, northern dialects of Modern Welsh exhibit a twofold contrast of [ˈVː] vs. [ˈV] in both stressed finals and stressed penults, but in the latter case, long vowels can only occur in hiatus or before [h], representing a different distribution of [ˈVː] vs. [ˈV] in penultimate syllables than that found in the LTK dialects of Breton. Like South Welsh, North Welsh has also retained a high pitch accent on both stressed and unstressed final vowels.

IVb: Cornish

In Cornish, as in Welsh, vowel quantity became phonemic, with the shift from allophonic to phonemic vowel quantity taking place in Cornish sometime before the first half of the fifteenth century and possibly considerably earlier, in the fourteenth century.[70] As part of this process, the allophonically short, half-long, and long stressed vowels of Early Middle

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counterpart of Welsh lenis or single /l/ had become a fricative /ɬ/ centuries earlier. Consequently, the spelling <ll> is reserved for [ɬ] in Modern Welsh orthography while both short [l] and long [ll] are spelled <l>. See Morris Jones, *A Welsh Grammar*, 71-72.

[70] Orthographic evidence from Middle Cornish manuscripts copied in the first half of the fifteenth century supports the view that vowel quantity had become phonemic by this period, and is presented in Bruch, "Vowel Quantity, Part I" and "Part II;" evidence from place-name spellings that may point to an earlier date in the fourteenth century is discussed in §22 of "Part II."

Cornish became separate phonemes that developed in divergent ways. Short stressed vowels tended to become centralized, while half-long vowels tensed and in some cases acquired a more peripheral pronunciation, as with the reflex of Old Cornish /ɪ/, which came to be realized as [eˑ] in Middle Cornish. Fully long vowels in monosyllables and stressed final syllables tensed, sometimes developing an off-glide and breaking to diphthongs ([ˈVː] > [ˈVɪ]), particularly before coronal fricatives.[71]

[ˈVˑɪ]),

The advent of phonemic vowel quantity during the fourteenth and early fifteenth centuries led consonant quantity to become less salient, so that it could be altered in a 'quasi-allophonic' manner based on the quantity of the preceding vowel, following the distributional pattern of [ˈVːC] or [ˈVˑC] vs. [ˈVCC] that had been established by the New Quantity System. By the middle of the fifteenth century, a second accent shift eliminated the high pitch accent on unstressed final syllables or moved it back to the penult, which had effects ~~both~~ on the phonology of the language (unstressed [ɛ], [a], and [ɔ] began to fall together as [ə]) and, consequently, on the rhyming rules used by Cornish poets as well.[72] Over the course of the sixteenth century, sound changes like [nn] > [ᵈn], [ll] > [lʰ], [rr] > [r] or [ɹ] altered the pronunciation of many long sonorants, so that the phonemic quantity contrast in these consonants that had existed since before the rise of the New Quantity System ceased to exist, either because the long and short sounds had merged (as in [rr] > [r] ~ [ɹ]) or because the long sonorant had been reanalyzed as a consonant with different articulatory features that were more salient than quantity in distinguishing it from its short counterpart. While this weakened or disrupted the distributional pattern of [ˈVːC] or [ˈVˑC] vs. [ˈVCC], the loss of distinctive consonant quantity did not trigger a concomitant leveling of vowel quantity, particularly in stressed monosyllables where it remained useful as a means of distinguishing between the members of a minimal or near-minimal pair. However, interference from English prosody and the relatively small number of minimal pairs involving contrastive vowel length in polysyllabic words ultimately led to the 'Prosodic Shift' of [ˈVˑ] > [ˈV] ca. 1600, after

was eliminated

did not imme-diately trigger

[71] Bruch, "Vowel Quantity, Part I," 202-205 (§§12.8-12.11), 208-209 (§12.15).
[72] Bruch, "Vowel Quantity, Part I," 143 (§3.4), 163 (§6.5), 217-220 (§14) "Part II," §21.7, §§24.6-24.8.

which the

which,the quantitative contrast in Cornish vowels was reduced to one of [ˈV:] vs. [ˈV], much as in North Welsh.

The rise of the New Quantity System in Brittonic languages began in the sixth century CE when phonemic distinctions in vowel quantity were converted to distinctions in vowel quality, thereby creating a phonological system where the length of a vowel was allophonically determined by its position relative to the accent and by the number and type of consonants that followed it. As time passed, this system underwent further changes due to accentual shifts in Welsh, Cornish, and most dialects of Breton that caused these languages to diverge from one another in their application of the allophonic rules governing vowel quantity. Following these shifts, Breton retained the original twofold contrast between long vs. short vowels in stressed syllables that had characterized Primitive Brittonic, while Cornish and Welsh developed a threefold contrast between long, half-long, and short vowels that arose due to tension between the rhythmic stress and high pitch elements of the accent, which had separated from one another and now fell on different syllables in polysyllabic words. Over time, Cornish lost its distinctive pitch accent, and both Cornish and North Welsh lost half-long vowels, returning by separate routes to a twofold opposition of [ˈV:] vs. [ˈV] in stressed syllables, but one that did not correspond to the distribution of long vs. short vowels in Breton. By this time, however, vowel quantity had once again become phonemic in Cornish and Welsh (and likely Breton as well): a shift that we may describe as the ‘fall’ of the New Quantity System, as it heralds the transition to a ‘newer’ or Modern Quantity System in which vowel quantity was once more salient for speakers, and distinctions in consonant quality—which had played a key role in determining vowel length under the rules of the New Quantity System—became largely allophonic or were even wholly eliminated through sound changes and phonetic mergers.

Acknowledgments

This paper is the culmination of a journey I began many years ago in my scholarly collaborations with Albert Bock, a dear friend and a gifted linguist whose passing was a great loss to Celtic studies as well as to all who had the privilege to know him. Albert’s tremendous contribution to the study, preservation, and revival of the Cornish language will never be forgotten.

I am grateful to Dylan R. Cooper and Samuel Ezra Puopolo for their kind invitation to deliver the keynote address at the 43rd Annual Harvard Celtic Colloquium, as well as to the faculty, staff, and students in the Department of Celtic Languages and Literatures for their excellent job organizing and orchestrating the 2024 conference.

Mahalo nui loa to the PHCC editors for their advice and their patience with me as I prepared the text of this lecture for publication, and to the team at Fenway Group for their invaluable assistance in converting my PowerPoint slides to printable illustrations.

Thanks are also due to Joseph F. Eska, Iwan Wmffre, Oliver J. Padel, and Ken George for their willingness to share their expertise in Celtic historical linguistics with me through countless emails and Zoom meetings.

Finally, I would like to express my gratitude to my husband, Rüdiger Rückmann, my daughter, Ellen Ruckmann-Bruch, my students and colleagues at Pacific Buddhist Academy, and the participants in my Sunday Cornish language and literature course for all the support and inspiration they have given me through the years. Gonn meur ras dhywgh hwi oll!