FINAL DENTAL FRICATIVES IN CORNISH

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1) INTRODUCTION

In English, the two dental fricatives [θ] and [ð] are both denoted by the digraph <th>, which was introduced in the 15th century. The two sounds have never been distinguished in writing, because in Old English they were allophones of the /θ/ phoneme.[2] This convention was largely followed in writing Cornish. Which historical phoneme is meant can usually be deduced from cognates in Breton and Welsh, but this does not guarantee that the actual realization corresponded to the historical phoneme.

The same sounds are found in Welsh, and are separate phonemes, as is shown by the minimal pairs *byth* 'always' [-θ] v. *bydd* [-ð]. Their cognates in Middle Cornish (henceforth MidC) are both spelled *byth.* We suppose that they were pronounced ['bɪːθ] and ['bɪːð] respectively, but without sound-recordings, we cannot be sure. Their reflexes were probably heard by the Welsh linguist Edward Lhuyd, however, when he visited Cornwall in 1701 (Table 1).

Table 1		Lhuyd's evidence concerning ***byth*** and ***bydh***		
Lhuyd's spelling	**Reference**	**Lhuyd's English meaning**	**Lhuyd's Latin meaning**	**Remarks by the author of this paper**
Cognate of Welsh *byth*				
BŶTH	LV026[3]	For ever	perpetuo	Re-spelling of MidC *byth*
Bêth[4]	AB244c[5]	none		Showing the Late Cornish pronunciation
Bŷth ni	AB249a	never		Re-spelling of MidC *byth ny*
Cognate of Welsh *bydd*				
Bŷdh	AB245c	He will be		Re-spelling of MidC *byth*
Bedh	AB251c			As actually heard by Lhuyd

Lhuyd's evidence rests on his use of different digraphs to denote the unvoiced and voiced sounds: he kept <th> for [θ], as in Welsh, and introduced <dh> for [ð]. This useful innovation has been followed by almost all of the orthographies devised for revived Cornish, showing the contrast between /θ/ and /ð/ in initial and medial positions.

The case of final syllables is another matter, however. Some scholars have maintained that //-ð//[6] was realized as [-θ], especially when unstressed, and that today's spelling should reflect this idea. This paper examines rhymes to throw light on this question.

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1 The views expressed in this paper are those of the author, not necessarily those of the Board.
2 This is a great problem for learners of English as a foreign language.
3 LV = Lhuyd's Vocabulary, i.e. his notebook.
4 By Lhuyd's time, the [ɪː] in these words had been lowered to [ẹː]; the contrast would have been ['bẹːθ] *v.* ['bẹːð].
5 AB = *Archaeologia Britannica*, i.e. Lhuyd's printed book.
6 Pairs of double slanting lines are used to denote historical phonemes, based on etymology.

2) TREATMENT OF DENTAL FRICATIVES IN THE REVIVAL

In this section, the spelling of four type-words is examined. The words are listed in Table 2, and subsequently printed in boxes, in the format used by various dictionaries and other works.

Table 2	Four type-words				
Kernewek Kemmyn	**English meaning**	**Historical phoneme**	**Stress**	**Welsh**	**Breton**
dydh	day	*//-ð//*	yes	*dydd*	*deiz*
menydh	mountain[7]	*//-ð//*	no	*mynydd*	*menez*
kath	cat	*//-θ//*	yes	*cath*	*kazh*
haneth	tonight	*//-θ//*	no	*henoeth*	*fenoz*[8]

2.1 Robert Williams' *Lexicon Cornu-Britannicum*

This Cornish-English dictionary aimed to include all the words in the then known texts[9] in Middle Cornish, with examples of lines where they are found. Williams did not hestitate to re-spell words according to his own ideas about Cornish phonology; in particular, he re-spelled <-th> as <-dh> in words with //-ð//. Examples are:

	STRESSED	UNSTRESSED
//-ð//	DEDH, s.m. A day. DYDH, s.m. A day.	MENEDH, s.m. A mountain.
//-θ//	CATH, s. f. A cat.	HANETH, adv. This night, to-night.

2.2 Whitley Stokes' edition of *Pascon agan Arluth*

The idea that final //-ð// was realized as [-θ] rather than [-ð] appears to have been introduced by Stokes (1868). Here his argument is reproduced in full:

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7 The conventional translation is 'mountain', but in place-names ***menydh*** is often used for small hills (George 2017). One can argue that there are no mountains in Cornwall.

8 On the grounds that Cornish <th, dh> often corresponds to Breton <zh, z>, one might expect **fenozh* here, but the <zh> spelling in Breton is used to denote [h] in Gwenedek and [z] elsewhere, rather than being based on the historical phonemes.

9 These were Old Cornish Vocabulary (OCV), *Pascon agan Arluth* (PA), *Origo Mundi* (OM), *Passio Christi* (PC), *Resurrexio Domini* (RD), *Creacon of the World* (CW).

> In inlaut I have written *dh* for *th*, where the change is justified by etymology or the authority of the *Passion*, in which poem ȝ is, as a rule, written for *dh* (ð). But I have invariably written *th* in auslaut. In this respect Mr. Williams has throughout his Lexicon been misled by Welsh analogy, and failed to see that at the end of a word an old *dh* (ð) has always been sharpened into *th* (þ). In the *Passion*, with the single exception of *molloȝ*, P. 66, 3, (ȝ = *dh*) never occurs as a final, but only a *th*. Moreover, words which, in Old Cornish, may have ended in *dh*, rhyme in the Middle Cornish poems with words which unquestionably end in *th*. See, for example, the *Passion*, stanza 49, 4, where *beth* 'erit' (W. *bydd*) and *feth* (W. *ffydd*, from *fides*), rhyme with *haneth* (W. *henoeth*, Ir. *innocht*) 'to-night,' and *tergweth* (W. *teirgwaith*) 'thrice.' So in P. 52, 3, *aseth* (W. *eistedd*, O.W. *estid*) 'seat' rhymes with *haneth*. I conclude from this that in *all* words ending, according to the MSS., in *th*, that combination was pronounced sharp, as in Welsh, and should be so printed.

Stokes rightly notes that <ʒ> is used for //ð// in PA, but only initially and medially. In his exception from stanza 66, *molloʒ* 'curse', <ʒ> rather stands for //-θ//, since the word comes from Latin *maledictio*. Otherwise <-th> is used everywhere in PA for both //-θ// and //-ð//, but this does not necessarily mean that both phonemes were realized as [θ] in final position.

Stokes also mentions rhymes in PA, and takes examples from two stanzas. He knows that *haneth* has //-θ//from its Welsh cognate *henoeth*, and then argues that because *veth* with stressed //-ð// and *aseth* with unstressed //-ð// are rhymed with *haneth*, then they must have been pronounced with [-θ]. As we shall see in section 3, Stokes' idea that visual rhymes imply phonetic rhymes is mistaken. Nevertheless, this false premise affected the spelling (and by implication the pronunciation) of words with //-ð// for over a century of the Cornish revival.

2.3 <u>Morton Nance's Unified Cornish</u>

Nance did not expressly state that final //-ð// was pronounced [θ], but it is implied in the spelling of his Unified Cornish. In his 1938 dictionary, he states that <dh> "as final ….. becomes hard *th*", and gives as an example "*dewedha*, inf. : *dewedhes*, adj.: *deweth* 2.s. imp. and 3 s. pres.-fut."

Smith (1955) was more explicit, giving in brackets the "imitated pronunciation" of a number of words, using his own "phonetic spelling". This shows how Unified Cornish was intended to be pronounced, and includes words with final //ð// and //θ//, e.g.

	STRESSED	UNSTRESSED
//-ð//	*dēth* (dayth), day	*meneth* (men′-eth), mountain
//-θ//	*cath* (kath), f. cat	**haneth,** *adv.* to-night[10] *kyfyth* (kiff′-ith), jam

Unified Cornish therefore accepted Stokes' ideas in full.

2.4 <u>The author's *Kernewek Kemmyn*</u> (George 1986)

Kernewek Kemmyn (KK) is a largely morphophonemic orthography, strongly influenced by etymology; as such it spells //ð// as <dh> and //θ// as <th> in all phonetic environments, e.g.

	STRESSED	UNSTRESSED
//-ð//	***dydh*** ['dɪːð]	***menydh*** ['mẹ·nɪð]
//-θ//	***kath*** ['kaːθ]	***haneth*** ['ha·nɛθ]

2.5 <u>Nicholas Williams' ideas</u> (these are printed in blue)

For //-ð//**,** Williams (1995: 65) observed that in Lhuyd's version of ***Jowann Chi an Hordh***, "it appears that there is a strong tendency to generalise the voiced form everywhere". Influenced by this, he spelled unstressed //-ð// as <dh> in his first version of Unified Cornish Revised (UCR), but only in certain words:

	STRESSED	UNSTRESSED
//-ð//	**dedh**: day:	**menedh**: mountain
//-θ//	**cath:** cat	**haneth**: tonight

10 This word does not appear in Smith (1955), so it has been taken from Nance (1938); interesting that its English translation was still written with a hyphen in 1938.

Williams changed his mind[11] about unstressed //-ð//, because in a second version of UCR (Williams 2000), these four words were spelled as follows:

	STRESSED	UNSTRESSED
//-ð//	**day** *n.* dēdh,	**mountain** *n.* meneth,
//-θ//	**cat** ***n.*** cāth *f.*,	**tonight** *adv.* haneth

This pattern was imported into Williams' later orthography, Kernowek Standard. His rationale for the stressed spellings is found in Williams (2016: 16): that Lhuyd consistently spelled //-θ// as <-τ> and //-ð// as <-δ>. He bases his spelling <-th> for both final unstressed dental fricatives on the case of final <-k> and <-g>. Whereas the early MidC texts used <-k> for both stressed and unstressed //-g//, the Tregear Homilies (TH) showed a strong tendency to spell stressed //-g// as <-g> and unstressed //-g// as <-k> (Williams 1995: 62). The same pattern is found in Late Cornish.

2.6 <u>Standard Written Form (SWF)</u>

In the original specification for SWF (Bock and Bruch 2008), the rules for spelling fricatives are laid out: "Word-finally, the graphs of <f v> and <th dh> are distributed etymologically in unstressed syllables" (p. 24). That the same goes for stressed syllables goes without saying. Here are examples from the specification:

	STRESSED	UNSTRESSED
//-ð//	**dydh** ~ **dedh**[12] (m.) day	**menydh** (m.) mountain, hill
//-θ//	**kath {cath}**[13] (f.) cat	**haneth** (adv.) tonight

A notable exception to the rules was the word for 'new'. As the <dd> in the Welsh cognate *newydd* shows, etymologically the Cornish word for 'new' contains the voiced consonant /-ð/**.** However, "the word **nowyth** is so spelled to reflect that it is found spelled with a <τ> (indicating [-θ]) in Lhuyd's *Archæologica Brittanica*." (p.30 of the specification). The spelling of this word may be been influenced by Williams' hypothesis that unstressed /-ð/ was unvoiced to [-θ]. After much argument, this anomaly was corrected to **nowydh** as a result of the review of SWF in 2013.

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11 Williams (2006: 167) criticizes me for thrice changing my ideas about assibilation and palatalization. I do not reciprocate here, even though I believe that Williams has changed his mind from a correct to an incorrect view. Kepler had seventy tries at the laws of planetary motion before finding the correct solution.

12 In an "attempt at pluricentricity" (Davies-Deacon 2020), for some words, SWF has two different spellings, based on Middle Cornish and Late Cornish.

13 Likewise, for some words, SWF has two different spellings, based on "modern" and "traditional" forms.

2.7 Summary

Table 3 summarizes the approaches taken by various scholars. At first there was disagreement (highlighted in red) for both stressed and unstressed //-ð//, but now there is general agreement (green) for the stressed sounds: that //-ð// was [-ð] and //-θ// was [-θ]. The continuing disagreement concerns unstressed //ð//: was this unvoiced to [-θ], or not?

Table 3	Summary of supposed sounds					
			Stressed		**Unstressed**	
Authority	**Date**	**Orthography**	**//-ð//**	**//-θ//**	**//-ð//**	**//-θ//**
R. Williams	1865		[θ]	[θ]	[ð]	[θ]
Stokes	1868		[θ]	[θ]	[θ]	[θ]
Nance	1938	Unified	[θ]	[θ]	[θ]	[θ]
George	1986	***Kemmyn***	[ð]	[θ]	[ð]	[θ]
N. Williams	1995	UCR	[ð]	[θ]	[θ]	[θ]
	2001	UCR	[ð]	[θ]	[θ]	[θ]
	2007	KS				
Bock, Bruch	2008	SWF	[ð]	[θ]	[ð]	[θ]

In order to make progress, a different approach is adopted, one which examines rhymes in great detail.

3) EXAMINING THE STATISTICS OF RHYMES

3.1 Rhymes in Middle Cornish verse

Rhyming in Middle Cornish verse was not as rigorous as Middle Welsh *cynghanedd* or Middle Breton internal rhymes. The verse was arranged in stanzas[14], for which there were three basic rhyme-schemes, in order of difficulty, from easy to hard:

S6 AABCCB
S8 ABABCDDC
A8 ABABABAB

There were many variations on these three types (Bruch 2009).

Having chosen a possible rhyming word, the poet needs to find another in which the rhyming sequence in the final syllable[15] is identical; if successful, the rhyme is said to be **perfect**. As in Welsh, perfect rhymes may be between stressed and unstressed syllables. If both rhyming words are stressed, or both are unstressed, then the rhyme is said to be **congruent**. If the poet cannot find a congruent or a perfect rhyme, then he will resort to an **imperfect** rhyme, in which the correspondence of vowels and/or consonants is approximate.

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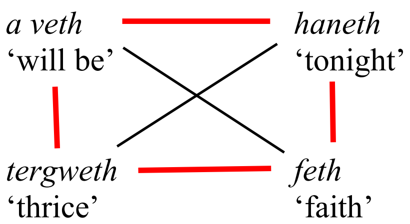
14 The arrangement of the verse in CW is different.

15 Usually only a single syllable is rhymed in Cornish verse, but there are also examples of double rhymes and even triple rhymes, especially in *Bewnans Ke* (BK).

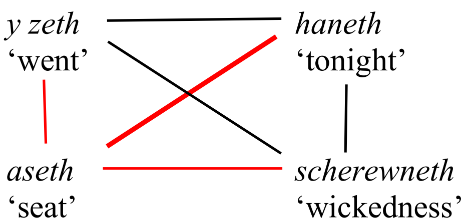
3.2 Application to Stokes' data

Of the three basic patterns, A8 is the most difficult because the poet has to find two sets of four rhyming words. Nearly all of the stanzas in PA are of the A8 type, including the two mentioned by Stokes. The rhyming words used by him may be illustrated thus:

PA.049 A-rhymes



PA.052 B-rhymes



Each example has six rhyming pairs (counting in just one direction). The seven lines in red feature //ð// rhyming with //θ//. Stokes chooses just five of these (those with thick red lines) on which to base his conclusion, that //-ð// was pronounced [θ]. He ignores the information from the other 121 rhyming pairs in PA which involving //ð// or //θ//, let alone all those in the other texts known by him.

In Table 4, the rhyming pairs in PA.049 are listed in both directions, so there are twelve of them.

Table 4	Rhyming pairs for A-rhymes in stanza PA.049						
First rhyming word				**Second rhyming word**			**Type**
Reference	**KKmod**	**Sound**		**KKmod**	**Sound**		
PA.0491a	a vedh	['ę:ð]	DS	haneth	[εθ]	TU	imperfect
PA.0491a	a vedh	['ę:ð]	DS	teyrgweth	[εθ]	TU	imperfect
PA.0491a	a vedh	['ę:ð]	DS	fedh	['ę:ð]	DS	congruent
PA.0492a	haneth	[εθ]	TU	a vedh	['ę:ð]	DS	imperfect
PA.0492a	haneth	[εθ]	TU	teyrgweth	[εθ]	TU	congruent
PA.0492a	haneth	[εθ]	TU	fedh	['ę:ð]	DS	imperfect
PA.0493a	teyrgweth	[εθ]	TU	a vedh	['ę:ð]	DS	imperfect
PA.0493a	teyrgweth	[εθ]	TU	haneth	[εθ]	TU	congruent
PA.0493a	teyrgweth	[εθ]	TU	fedh	['ę:ð]	DS	imperfect
PA.0494a	fedh	['ę:ð]	DS	a vedh	['ę:ð]	DS	congruent
PA.0494a	fedh	['ę:ð]	DS	haneth	[εθ]	TU	imperfect
PA.0494a	fedh	['ę:ð]	DS	teyrgweth	[εθ]	TU	imperfect

In Table 4, KKmod means the ***Kernewek Kemmyn*** orthography (George 2020), modified in the light of the observed rhymes. The sounds based on the etymology are indicated by two columns for each word, first using IPA and secondly using the code D = [ð], T = [θ], S = stressed, U = unstressed. Eight of the twelve pairs (those marked in red) are DS rhyming with TU, which are imperfect rhymes.

3.3 Rhymes between stressed rhyming words in //-ð// and //-θ//

According to the currently accepted wisdom that stressed //-ð// and //-θ// were pronounced respectively [ð] and [θ], then we would expect to find many more DS ≡ DS and TS ≡ TS rhymes (the congruent ones, denoted by ≡ or C) than DS ≈ TS and TS ≈ DS rhymes (the imperfect ones, denoted by ≈ or I). Ideally there would be no imperfect rhymes at all. If, on the other hand, Stokes were right, then DS and TS words would be indiscriminately rhymed, since they would all have [-θ]. These two scenarios may be illustrated thus:

Stokes

	DS	TS
DS	C	C
TS	C	C

Present thinking

	DS	TS
DS	C	I
TS	I	C

A spreadsheet of all rhyming pairs in traditional Cornish verse, similar in layout to Table 4, was mined to extract all the pairs involving DS and TS words, giving Table 5.

Table 5	Numbers of rhyming pairs for DS and TS									
Rhyme	CE	PA	PC	RD	OM	BM	BK	CW	LC	Total	%age
DS ≡ DS	2	40	26	64	34	32	24	12		**234**	***46%***
DS ~ TS		28	13	7	10	8	2	2		**70**	***14%***
TS ~ DS		28	13	7	10	8	2	2		**70**	***14%***
TS ≡ TS		30	20	28	6	12	24	12	6	**136**	***27%***

Even without allowing for the frequencies of the potential rhyming words, it is obvious that priority was given to the congruent rhymes by the poets. The figures confirm that the sounds of //-ð// and //-θ// were different.

Looking at the texts individually, there is insufficient data in CE (Charter Endorsement) and LC (Late Cornish). The worst performer is PA, and this is because the poem consists almost entirely of A8 stanzas.

3.4 Rhymes between unstressed rhyming words in //-ð// and //-θ//

Unlike the stressed case in section 3.3, there is still a dispute about the pronunciation of unstressed //-ð//; Nicholas Williams (2016: 21) believes it was [-θ] and the author believes it was [-ð]. We apply the same method to throw light on this question, and present the results in Table 6.

Table 6	Numbers of rhyming pairs for DU and TU									
Rhyme	CE	PA	PC	RD	OM	BM	BK	CW	LC	Total	%age
DU ≡ DU		12	26	30	32	14	24			**138**	***55%***
DU ≡ TU		3	6	4	5	10	5			**33**	***13%***
TU ≡DU		3	6	4	5	10	5			**33**	***13%***
TU ≡ TU		10	10	6	2	4	14			**46**	***18%***

Surprisingly, there are no examples from CW, but all the other major texts show the same pattern: the congruent rhymes are clearly in the majority, with more cases of DU ≡ DU than TU ≡ TU. The small number of imperfect rhymes shows that unstressed //-ð// was pronounced differently from unstressed //-θ//. Williams' contention that //-ð// was voiceless appears to be mistaken.

3.4.1 Detailed analysis of unstressed //-ð// and //-θ// in *Bewnans Ke*

If unstressed //-ð// were pronounced [-θ], as Williams maintains, then words with unstressed //-θ// and unstressed //-ð// would form a single mixed pool from which poets could choose rhymes. We can calculate the likelihood of the four forms of rhyming pairs listed in Table 6, taking into account the frequency of each potential rhyming word. The procedure is analogous to the solution of the well-known problem of choosing two balls from a bag containing N_1 red balls and N_2 green balls, allowing replacement.

Let N_1 be the number of rhyming words with unstressed //-ð//,
and N_2 be the number of rhyming words with unstressed //-θ//.

The probability of choosing DU ≡ DU pairs = $N_1^2 / (N_1 + N_2)^2$,
so if $(N_1 + N_2)$ pairs are chosen,
the expected number of DU ≡ DU pairs = $N_1^2 / (N_1 + N_2)$. Similarly,
The expected number of TU ≡ TU rhyming pairs = $N_2^2 / (N_1 + N_2)$
The expected number of DU ≈ TU rhyming pairs = $(N_1 \times N_2) / (N_1 + N_2)$
The expected number of TU ≈ DU rhyming pairs = $(N_2 \times N_1) / (N_1 + N_2)$

The 54 relevant rhyming pairs in BK contain the words listed in Table 7:

Table 7	Rhyming words in *Bewnans Ke*				
Words with unstressed //-ð//			**Words with unstressed //-θ//**		
Kernewek Kemmyn	**English meaning**	**No.**	***Kernewek Kemmyn***	**English meaning**	**No.**
anwostoedh	disobedient	1	***aneth***	miracle	2
arvedh	affront	3	***Beryth***	(name of god)	1
bugeledh	shepherds	1	***bythkweth***	ever	4
bydhydh	will be	1	***ewyth***	attention	1
degoedh	behoves	1	***furneth***	wisdom	2
diwedh	end	1	***haneth***	tonight	1
godhvedhydh	thou wilt know	1	***linyeth***	lineage	1
gorreydh	male	1	***marghogeth***	to ride	3
gostoedh	submissive	2	***molleth***	curse	1
gwelvydh	will see	2	***myghterneth***	kingdom	1
gyllvydh	will be able	2	***roweth***	importance	2
henedh	kindred	5	***sansoleth***	piety	2
klewydh	thou hearest	1	***skientoleth***	knowledge	2
Kristonedh	Christianity	5	***yredieth***	readiness	1
leverydh	thou sayest	1			
prederydh	thou thinkest	1			
truedh	pity	1			
	TOTAL = N_1	30		TOTAL = N_2	24

The expected numbers of rhyming pairs, if unstressed //-ð// were pronounced [-θ], are:

DU ≡ DU	30^2 / 54	=	17
TU ≡ TU	24^2 / 54	=	11
DU ≈ TU	(30 × 24) / 54	=	13
TU ≈ DU	(24 × 30) / 54	=	13
	Total	=	54

The actual numbers are:

DU ≡ DU	22
TU ≡ TU	16
DU ≈ TU	8
TU ≈DU	8
	54

There are substantially more congruent rhymes and markedly fewer imperfect rhymes than one would expect were the rhyming pool fully mixed. This again confounds Williams' hypothesis about unstressed //-ð// being pronounced as [-θ].

3.4.2 **Analysis of all texts taking frequency into account**

Next the same analysis is repeated for all the relevant texts, without giving the detail. The results are in Table 8. Exp = expected, assuming all final consonants are voiceless; Obs = observed numbers in the texts.

Table 8	Results for unstressed rhyming pairs										
				DU ≡ DU		**DU ≈ TU**		**TU ≈ DU**		**TU≡TU**	
Text	N_1	N_2	Sum	Exp	Obs	Exp	Obs	Exp	Obs	Exp	Obs
PA	15	13	28	8	12	7	3	7	3	6	10
PC	35	13	48	26	30	9	5	9	5	4	8
RD	34	10	44	26	30	8	4	8	4	2	6
OM	40	10	50	32	34	8	6	8	6	2	4
BM	26	14	40	17	16	9	10	9	10	5	4
BK	30	24	54	17	22	13	8	13	8	11	16
Sum	180	84	264	**126**	**144**	**54**	**36**	**54**	**36**	**30**	**48**

In five of the texts, there are more congruent rhymes and fewer imperfect rhymes than Williams' hypothesis would suggest (highlighted in gold). Only in BM is this not the case (shaded in pale blue).

So far the dismissal of Williams' hypothesis has been made on a superficial examination of the observed numbers of rhyming pairs. We can do better than this. Taking the figures for the ensemble of all six texts (bottom row in Table 8), in order for the hypothesis to fail, we require the observed number of DU ≡ DU rhyming pairs to be significantly greater than the expected number. The observed number (144) is indeed greater than the expected number (126), but is this significant? Could 144 come about by chance? To answer this question, the probability was calculated that from a mixed pool of 180 //-ð// rhyming words and 84 //-θ// rhyming words, at least 144 DU ≡ DU rhyming pairs would result. This was done by writing a computer program which simulated the selection of a rhyming pair from such a pool one million times. The results show that the total of 144 was equalled or exceeded 5294 times, i.e. 0.5%, i.e. the chance of Williams' hypothesis being correct is 0.5%. For DU ≈ TU and TU ≈ DU, the chance is 0.06%; and for TU ≡ TU, it is even less: 0.004%.

We conclude that //-ð// and //-θ// were pronounced [-ð] and [-θ] respectively when unstressed as well as when stressed. Poets tried to make congruent rhymes with either [-ð] or [-θ], but on occasion were obliged to mix the sounds in imperfect rhymes.

3.5 Rhymes between stressed and unstressed words with //-ð// and //-θ//

When all possible rhymes are considered, there are sixteen types of rhyming pairs instead of four (Table 9). Here C = congruent, P = perfect, both shaded green; and I = imperfect, shaded red.

Table 10	Types of rhyming pairs								
	10a **target**					*10b* **achieved in practice**			
	DS	DU	TS	TU		DS	DU	TS	TU
DS	C	P				C	P	I	I
DU	P	C				P	C	I	I
TS			C	P		I	I	C	P
TU			P	C		I	I	P	C

We would expect poets to avoid imperfect rhymes wherever possible, and perhaps to favour congruent rhymes over perfect rhymes.

3.5.1 Analysis of individual texts

Table 11 presents the numbers of rhyming pairs for each of the texts individually, using the same layout of 16 cells as in Table 10. Where the number in a cell exceeds 1/16 of the total, the cell is shaded green or red as appropriate; otherwise there is no shading. The total numbers of congruent, perfect and imperfect rhyming pairs are given in the bottom row of the table, and also the percentage of congruent + perfect pairs.

Table 11a	Status of rhyming pairs													
	CE					**PA**					**PC**			
	DS	DU	TS	TU		DS	DU	TS	TU		DS	DU	TS	TU
DS	2					40	18	28	5		26	25	13	8
DU			1			18	12	14	3		25	26	12	6
TS		1		1		28	14	30	9		13	12	20	8
TU			1			5	3	9	10		8	6	8	10
	C	P	I	C+P		C	P	I	C+P		C	P	I	C+P
	2	2	2	***67%***		92	54	100	***59%***		82	66	78	***65%***

Table 11b	Status of rhyming pairs													
	RD					**OM**					**BM**			
	DS	DU	TS	TU		DS	DU	TS	TU		DS	DU	TS	TU
DS	64	47	7	8		34	30	10	12		32	10	8	10
DU	47	30	6	4		30	32	7	5		10	14	9	10
TS	7	6	28	8		10	7	6	7		8	9	12	3
TU	8	4	8	6		12	5	7	2		10	10	3	4
	C	P	I	C+P		C	P	I	C+P		C	P	I	C+P
	128	110	50	***83%***		74	74	68	***69%***		62	26	74	***54%***

Table 11c	Status of rhyming pairs													
	BK					**CW**					**LC**			
	DS	DU	TS	TU		DS	DU	TS	TU		DS	DU	TS	TU
DS	24	10	2			12	3	2	1					1
DU	10	24	2	5		3								
TS	2	2	24	1		2		12	1				6	
TU		5	1	14		1		1			1			
	C	P	I	C+P		C	P	I	C+P		C	P	I	C+P
	86	22	18	***86%***		24	8	6	***84%***		6	0	2	***75%***

Leaving aside CE and LC, which have insufficient data, all of the texts have patterns (red and green shading) which are generally similar to that in Table 10b. The worst score is that of BM, at 54%; its author (Rad Ton) was not a good rhymester. PA is the second worst, because most of its stanzas are A8. The best score is that of BK, with 86% of the rhyming pairs being congruent or perfect; this is partly because there are no A8 stanzas in BK, but mainly because the author was skilled at rhyming.

3.5.2 **Processing all of the data**

Rather than treating each text individually, the data for all are now combined, as in the bottom row of Table 8, giving Table 12a. In order that the average number of rhyming pairs per cell is 100, in Table 12b the numbers have been scaled so that the total is 1600.

Table 12	Status of rhyming pairs (all data)										
	12a **Observed**						*12b* **Scaled to a total of 1600**				
	DS	DU	TS	TU	Sum		DS	DU	TS	TU	Sum
DS	234	143	70	45	492		285	174	85	55	600
DU	143	136	51	33	363		174	166	62	40	443
TS	70	51	136	38	295		85	62	166	46	360
TU	45	33	38	46	162		55	40	46	56	197
	C	P	I	C+P	1312		C	P	I	C+P	1600
	552	362	398	***70%***			673	441	485	***70%***	

In Table 12, 13 of the 16 cells have shading which corresponds with that in Table 10b; in Table 12b these are the cells with over 100 entries. Those which do not correspond are TS ≈ TU, TU ≈ TS and TU ≡ TU in the bottom right of the table. The same pattern is evident in Table 11. The reason is that there are fewer rhyming words in //-θ// than in //-ð//. We can compensate for this by weighting the data. The numbers of rhyming words (scaled) are given in the rightmost column of Table 12. The weights are calculated using the argument given in §3.4.1, but extending it to 16 instead of 4 cells.
For example, the weight for DS ≡ DS is (1600 × 1600) / (600 × 600) = 7.11;
the weight for DS = DU is (1600 × 1600) / (600 × 443) = 9.63
All of the weights are given in Table 13.

Table 13	Weights to compensate for varying numbers of rhyming words				
	DS	DU	TS	TU	Sum
DS	7.11	9.63	11.85	21.66	50.25
DU	9.63	13.04	16.05	29.33	68.05
TS	11.85	16.05	19.75	36.10	83.75
TU	21.66	29.33	36.10	65.96	153.05
Sum					355.10

Next, the numbers in Table 12b are multiplied by the weights in Table 13 to give a set of figures (Table 14) unaffected by the varying numbers of rhyming words. These are in turn scaled to fit a total of 1600.

Table 14	Numbers of rhyming pairs, weighted										
	14a **Raw figures**						*14b* **Scaled to a total of 1600**				
	DS	DU	TS	TU	Sum		DS	DU	TS	TU	Sum
DS	2026	1675	1007	1191	5899		122	101	61	72	356
DU	1675	2164	995	1173	6007		101	130	60	71	362
TS	1007	995	3279	1661	6942		61	60	197	100	418
TU	1191	1173	1661	3694	7719		72	71	100	222	465
Sum[16]					26567						1600

The figures in Table 14b show the numbers of rhyming pairs if there were an equal number of rhyming words in each category DS, DU, TS and TU. The shading of the cells is in full agreement (just!) with the expected distribution, as shown in Table 10b.

If the numbers in each type of rhyming pair (C, P and I) are averaged, the result is presented in Table 15.

Table 15	Nos. of rhyming pairs, weighted and averaged			
	DS	DU	TS	TU
DS	**168**	101	66	66
DU	101	**168**	66	66
TS	66	66	**168**	101
TU	66	66	101	**168**

The remarkable feature here is the large difference between the congruent rhymes and the perfect rhymes. We need to modify the supposed *modus operandi* of the poets to:

- choose a congruent rhyme if at all possible;
- otherwise find a perfect rhyme;
- if still stuck, use an imperfect rhyme.

3.5.3 Applying Williams' hypothesis to the full ensemble of data

When Williams' idea that //-ð// was pronounced [-θ] is applied to the data, the distribution of C, P and I cells (Table 16a) is different from that in Table 10b. Material specific to his hypothesis is again printed in blue. The observed numbers of rhyming pairs (Table 16b) are the same as in Table 12a, but because the C, P and I cells are defined differently, the red and green pattern differs.

Table 16	The data according to Williams' hypothesis									
		16a **Types of pair**					*16b* **Observed nos. of pairs**			
		DS	DU	TS	TU		DS	DU	TS	TU
Williams' sound →		[-'ð]	[-θ]	[-'θ]	[-θ]					
DS	[-'ð]	C	I	I	I		234	143	70	45
DU	[-θ]	I	C	P	C		143	136	51	33
TS	[-'θ]	I	P	C	P		70	51	136	38
TU	[-θ]	I	C	P	C		45	33	38	46
							C	P	I	C+P
							618	178	516	***61%***

[16] The figures in the columns do not always add up to the printed sum, because of rounding errors.

More importantly, the percentage of rhyming pairs in the congruent and perfect categories is only 61%, compared with 70% in Table 12. This shows that Williams' model is a poorer fit to the data.

4) DISCUSSION

The confirmation that //θ// was not rhymed with //ð// except under duress causes one to seek other evidence which supports this. It is not easy to find, because <th> was the usual digraph for both //θ// and //ð//, especially in final position. Only when Lhuyd introduced <dh> do we get better evidence. Nevertheless, Lhuyd's testimony can be ambiguous; he takes words from Middle Cornish texts, sometimes respelling them, while other words are recorded from contemporary Cornish speakers. He rarely states which is which. For example, he records the word for 'lord' nine times (Table 17).

Table 17	Lhuyd's spelling of the word for 'lord'	
Reference	**Lhuyd's spelling**	**Probable source**
LV011	*arleth*	copy of vernacular LateC spelling
LV011	*arlodh*	Cornish speaker in 1701
LV011	*arluit*	copy from *Old Cornish Vocabulary*
LV011	*arlydh*	Cornish speaker in 1701
AB055b	*arleth*	copy of vernacular LateC spelling
AB055b	*†arlụydh*	re-spelled from entry in OCV
AB065b	*†arlụidh*	re-spelled from entry in OCV
AB108c	*arlydh*	Cornish speaker in 1701
AB128a	*arlụdh*	re-spelled from MidC *arluth*

Here Williams is obliged to claim that Lhuyd's spellings with <-dh> represent influence from Welsh *arglwydd*. Against this we consider evidence from BM.

4.2 <u>The spelling of the word for 'lord' in *Bewnans Meryasek*</u>

The saint's play *Bewnans Meryasek* was written (or possibly copied) by Rad Ton in 1504, but the first ten pages were damaged by water, and were copied by a later scribe ("Scribe B"). He did not make a scrupulous copy, but altered many words, presumably better to conform to his ideas of orthography and perhaps his idiolect. The word for 'lord' is found 103 times in Ton's text, spelled *arluth* every time. Scribe B writes *arluth* only once, and this is taken to be a direct copy of Ton's original. Otherwise he re-spells Ton's text as *arlud* four times. The <-d> here can hardly mean [d] and is taken to mean [ð]. **This is a rare piece of evidence that unstressed /-ð/ was pronounced [ð].**

4.2 A stanza from *Resurrexio Domini*

In the following S6 stanza from RD, the rhyming scheme, the phonemics, phonetics and an English translation[17] have been added to the textual spelling.

RD.0715	*a fystynyn ny yn fen*	A	//-ɛn//	['ẹːn]	O let us hurry speedily;
RD.0716	*rag dreheuys yv an men*	A	//-ɛn//	['ẹːn]	for the stone is lifted
RD.0717	*thyworth an beth*	B	//-ɛð//	['ẹːð]	from the tomb!
RD.0718	*arluth fattel byth haneth*	C	//-ɛθ//	[ɛθ]	Lord, how will it be this night,
RD.0719	*mar ny wothefaf ple theth*	C	//-ɛθ//	['ẹːθ]	If I know not whither went
RD.0720	*penvyghterneth*	B	//-ɛð//	[ɛð]	the Chief of Kings?

The important feature of this stanza is that it contrasts //-ɛð// and //-ɛθ// in rhyme. This means that the final consonants in the B-rhymes and the C-rhymes are different. In particular, the unstressed final segments in *haneth* and *penvyghterneth* are contrasted, as [-ɛθ] and [-ɛð] respectively.

4.3 Other final consonants

Williams' contention that unstressed //-ð// was realized as [-θ] is based partly on analogy with unstressed //-g// being realized as [-k]. But the analogy is weakened by the fact that in native words, there is no *//-k// to contrast with //-g//; it does not matter whether //-g// is written <g> or <k>: //θ// and //ð//, on the other hand, are separate phonemes. Williams uses the same analogy for unstressed //-v//, which he thinks was pronounced [f]. The analysis in this paper shows that the principle of analogy is invalid in the case of //-ð//, and it may well be so for other phonemes.

5) CONCLUSIONS

- //ð// was realized as [ð] and //θ// was realized as [θ] in all positions, including unstressed finally.
- A simulation of choosing rhyming words shows that Williams' idea that unstressed //-ð// was pronounced [-θ] is at least 99.5% likely to be wrong.
- Analyses of rhyming pairs show that poets tended to choose congruent and perfect rhymes with either //-θ// or //-ð// rather than imperfect rhymes between //-θ// and //-ð/./
- They also gave priority to congruent rhymes over perfect rhymes.

[17] Translation by Graham Sandercock.

6) REFERENCES

Bruch, B. (2009) "Medieval Cornish versification: an overview". *Keltische Forschungen* **4,** 55–126.

Davies-Deacon, M. (2020) "The orthography of revived Cornish as an attempt at pluricentricity. *Language Problems and Language Planning* **44**(1), 66–86. Available at https://doi.org/10.1075/lplp.00056.dav

George, K.J. (1986) *The pronunciation and spelling of Revived Cornish.* Cornish Language Board, Saltash.

George, K.J. (2017) "***Menydh*** and other Cornish words for 'mountain'". Available at www.cornishlanguage.info/plns/menydh/pdf.

George, K.J. (2020) *An Gerlyver Meur*, 3rd edn. Cornish Language Board, Callington.

Stokes, W. (1868) "A Cornish glossary". *Transactions of the Philological Society*, 137-250.

Williams, N.J.A. (1995) *Cornish today*. Sutton Coldfield, 289 pp.

Williams, N.J.A. (2000) *English-Cornish dictionary.* Dublin, 485 pp.

Williams, N.J.A. (2006) *Towards authentic Cornish.* Westport, 294 pp.

Williams, N.J.A. (2016) *The Cornish consonantal system.* Dublin, 117 pp.

Williams, R. (1865) *Lexicon Cornu-Britannicum*, Llandovery.