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Term formation in Welsh: Problems and solutions

Delyth Prys, Tegau Andrews and Gruffudd Prys

This paper describes how international standards, particularly ISO 704, have been adopted for use in term formation and standardization in the Welsh language. It discusses some additional factors that have also influenced methods of term formation in Welsh, such as Welsh morphosyntactic peculiarities and the sociolinguistic environment in Wales. The hope, in explaining the Welsh situation, is that this will provide a useful case study for other language communities.

1. Introduction

Welsh is a modern Celtic language spoken by over half a million people (Office of National Statistics 2012). It has a long literary tradition, and a standard written form dating at least as far back as 1588, when a Welsh translation of the Bible was published. The spread of English in Wales, its rise in status, and the subsequent prohibition of Welsh in public office and other aspects of life, including education, meant that only comparatively recently has the situation improved. In the second half of the twentieth century the growth of Welsh-medium education and the gradual improvement in the official status of the language, culminating in the *Welsh Language (Wales) Measure* (Welsh Government 2011), led to an increased need for new technical terminology in the language.

Many small projects were initially undertaken in order to fulfil this need. By the early 1970s several vocabularies had been published by the Welsh Joint Education Committee¹ and the University of Wales Press.² The first modern terminological dictionary, *Geiriadur Termau*, appeared in 1973, and many more vocabularies were produced between the 1970s and 1990s, published by various institutions (Andrews and Prys 2016). Then, in 1993 the School Curriculum Authority³ commissioned Bangor University to

¹ The Welsh Joint Education Committee, now known as WJEC, operates as an examination board for schools and colleges.

² The University of Wales Press published vocabularies and dictionaries on behalf of the now disbanded Board of Celtic Studies and their Language and Literature Panel.

³ The School Curriculum Authority changed names and functions several times before being absorbed by the Welsh Government in 2006, where responsibility for standardizing Welsh terms for school education in Wales now resides.

undertake a broad terminology standardization exercise, to coincide with the introduction of a new National Curriculum. This led to the publication of the influential terminological dictionary, *Y Termiadur Ysgol: Standardized terminology for the schools of Wales* (Prys and Jones 1998). Some years later, a second edition was published, *Y Termiadur* (Prys et al 2006), and this was followed by a third, online only, edition, *Y Termiadur Addysg* (Prys and Prys 2011–), which continues to be revised and expanded. Many other commissions for the standardization of Welsh terminology followed, including, notably, one for standardizing terminology for Welsh-medium education at university level, which led to the online publication of *Geiriadur Termau'r Coleg Cymraeg Cenedlaethol* (Prys, Andrews et al 2009–), also regularly updated.

Standards and guidelines were needed for carrying out Welsh terminology work, first and foremost, for the education sector in Wales (Andrews and Prys 2016). This prompted the staff of *Y Termiadur Ysgol* to adopt ISO international standards for terminology in the mid-1990s. Many standards were found to be relevant, but the most important was ISO 704 *Principles and methods of terminology* (International Organization for Standardization 1987).⁴ Some years later, the Welsh Language Board commissioned the staff of *Y Termiadur* to develop guidelines for standardizing Welsh terminology to cater to the needs of the government's translation service, and these were also based on ISO 704 principles (the 2000 edition) (Prys and Jones 2007).⁵

The adoption of ISO standards proved of great use in Wales; however, several aspects of term formation — in any language — are dependent on the lexical, morphosyntactic and phonological peculiarities of the language in question. Some of the issues that arose in Welsh are discussed below, with the aim of providing a case study for other language communities.

2. Morphosyntactic features of Welsh

Welsh belongs to the P-Celtic branch of modern Celtic languages. Amongst its peculiarities, it has a verb-subject-object word order, a traditional vigesimal counting system,⁶ conjugated prepositions, two grammatical

⁴ ISO 704 has been revised and republished many times. In addition to the 1987 edition, this paper refers to the 2000 and 2009 versions.

⁵ In 2000 the name changed to *Terminology Work — Principles and Methods*.

⁶ In a deliberate attempt to modernize the language, an alternative decimal-based counting system was introduced in the early nineteenth century; however, it did not entirely replace the traditional system. Both systems are in current use, albeit in slightly different environments (Roberts 2016).

genders (masculine and feminine) and consonant mutations. Welsh mutation is a process whereby certain consonants are replaced by others, or removed, according to fixed rules. It is triggered by a number of different factors and affects nine consonants. Mutation happens at the beginning of words (initial consonant mutation) and elsewhere. It is the ‘elsewhere’ which is a consideration in term formation. Certain Welsh prefixes trigger mutation, such as *ad-*, *dad-* and *rhyng-* (which could be translated to English as *re-*, *un-*, *inter-*). Examples are shown in Table 1 below.

Table 1. Welsh mutation with prefixes

Prefix + word	Mutation	Resulting term	English equivalent
ad + galw	g is removed	adalw	retrieve
rhyng + trofannol	t is replaced by d	rhyngdrofannol	intertropical
dad + calcheiddio	c is replaced by g	dadgalcheiddio	decalcify

Mutation also occurs in compound terms, where the first element qualifies the second. Examples are seen in Table 2 below.

Table 2. Welsh mutation in compounds

Word elements	Mutation	Resulting term	English equivalent
llog + mynydd	m is replaced by f	llosgfynydd	volcano (literally: burning + mountain)
hir + cul	c is replaced by g	hirgul	elongated (literally: long + narrow)
mynegi + bys	b is replaced by f	mynegfys	index finger (literally: to point out + finger)

Including the 9 mutating consonants, the modern alphabet contains 28 letters. Of these, 7 are digraphs. There are, in addition, some accented characters, although these are not counted as part of the alphabet. Accented characters serve to indicate vowel length in some contexts, or to signal a pronunciation that does not conform to the usual rules of the language.

Welsh orthography can make translingual borrowing challenging, as will be discussed shortly.

3.1. Filling lexical gaps in non-technical language

As is the case with other minoritized languages in close contact with a neighbouring major language, Welsh has been influenced by vocabulary borrowings from its neighbour, English. Contact between these two languages began after the Anglo-Saxon invasions of England in the post-Roman period, and borrowings date back several centuries. English words continue to enter Welsh in several different ways. In informal spoken Welsh, in a process known as code switching, English words are often inserted to fill gaps in a speaker's vocabulary and are used even in cases where equivalent Welsh words exist and are known to the speaker (Thomas and Webb-Davies 2017). In written Welsh, there is a more deliberate attempt to fill lexical gaps for new concepts.

When there are no words in a language for a new or unfamiliar concept, borrowing from the language where that concept was first encountered is a common method of naming the concept in the recipient language. This process relies on a certain amount of agreement amongst users of a language in order for the new lexical items to gain a wide currency. The amount of language planning or centralized direction involved in the introduction of such new lexical items varies from one linguistic community to another, as do attitudes towards borrowing. Ideologies concerning linguistic purism often come into play and influence the choice of lexical items, with language communities who are more averse to accepting borrowings from a neighbouring dominant language putting greater effort into coining new words that they perceive to be more 'pure' from their own linguistic building blocks (Thomas 1991).

In the case of Welsh, there is no language academy that monitors borrowings or coins new words for non-technical language. Historically, lexicographers have coined words for lexical gaps, using either existing Welsh resources or Latin or Greek bases (Hawke 2018). Some coinages survive whereas numerous others were replaced with borrowings from English (Hawke 2018).⁷ Coined words are still added to modern

⁷ Hawke mentions *amlen* (*am* [about] + *llen* [sheet]) for 'envelope' as an instance of a surviving and currently used coinage, and *pellebyr* (*pell* [distant] + *eb* [says] + *-yr* [noun suffix]) for 'telegraph' as an instance of a coinage which yielded to English borrowings – *telegraff* and *teligraff*.

dictionaries, as can be seen for example in *The Welsh Academy English-Welsh Dictionary*, where such words are indicated by an asterisk (Griffiths and Jones 1995).

English borrowings become part of the language when they undergo morphological developments and become naturalized, such as nouns mutating, acquiring a Welsh spelling and a Welsh plural ending (Hawke 2016). New words, whether borrowed or coined, find their way into the historical dictionary of the Welsh language, *Geiriadur Prifysgol Cymru*, once they have been attested in the work of three separate writers or speakers (Hawke 2018). Popular general-language dictionaries, however, tend not to include obvious direct English loan words unless they are entrenched in the language. For example, the form *compiwter* ‘computer’, well-attested in *Geiriadur Prifysgol Cymru* (GPC Online 2014, s.v. *compiwter*), does not appear in the entry for *computer* in *The Welsh Academy English-Welsh Dictionary*, where *cyfrifiadur* (*cyfrif* [to count] + *-iadur* [noun suffix]) is given (Griffiths and Jones 1995, s.v. *computer*). Obvious English borrowings also tend to be avoided in higher registers of Welsh (Rottet and Morris 2018: 341, 355, 421).

3.2. Filling lexical gaps in technical language

As with non-technical language, historically, lexical gaps in technical Welsh were filled by lexicographers. Given their lack of scientific understanding, this led to the creation of a large number of unsuitable Welsh technical terms in the nineteenth century, much to the dismay of Welsh-speaking scientists at the time (Hughes 1990: 7). This period was characterized by a reluctance to borrow or adapt international and English terms, first, due to the foreign look of such terms, and second, because borrowing would have reflected unfavourably on the purity and self-sufficiency of Welsh in a period of lexical nationalism (Hughes 1990:11–13). Terms were made up of native word elements and were meaningless, unrecognizable and inconsistent (Hughes 1990:7, 13). Multiple terms existed for individual concepts, and terms were also characterized by errors in their scientific content (Hughes 1990: 7, 15). For example, the similarity between the coined terms for *oxygen* and *sulphur* (*ufelai* and *ufelair*, respectively) suggested these to be closely related concepts (Hughes 1990: 16).⁸ Scientists emphasized the need for consistent and meaningful terms and the need for one term to represent one concept

⁸ These have been standardized since as *ocsigen* and *sylffwr* (Prys and Prys 2011–, s.v. *oxygen*, *sulphur*).

only (Hughes 1990: 16). There was very little growth in suitable technical vocabulary, however, and up until 1963 and the beginning of the Welsh-language scientific journal, *Y Gwyddonydd*, authors of scientific literature were reluctant to borrow international or English terms (Hughes 1990: 17). Then, the growth in Welsh-medium education spurred the development of numerous educational terminology projects, followed by the adoption of ISO standards for terminology standardization.

Today, when new technical terms appear, they often do so in the translation of English documents into Welsh, and a sizeable amount of Welsh texts are produced in this manner every year. The problem of finding an appropriate Welsh term for an English term that has no recognised equivalent is often first encountered by translators. Whilst Welsh speakers can simply employ the English term in informal speech, translators are expected to provide a functional Welsh equivalent, or at the very least attempt to paraphrase the English. This often results in several different candidate Welsh terms for one English term. Rather than finding lexical gaps, a Welsh terminologist with access to bilingual corpora, translated resources and translation memories often finds a plurality of competing forms, employing a variety of different term formation strategies, each candidate term varying in its conceptual accuracy or its suitability for the intended audience. Selecting the most appropriate term from amongst the various candidate terms is the main function of the terminologist, a task facilitated by the existence of international standards and principles.

4. Principles of terminology standardization

From the 1990s, as mentioned above, the main international standard used in Welsh terminology standardization work has been ISO 704. ISO 15188 *Project management guidelines for terminology standardization*, published later (2001), has also been of key importance. ISO 704 deals with methods of terminology standardization, while ISO 15188 emphasizes the importance of terminologists working with subject specialists to standardize terms that will be acceptable to the community of experts who will use them. ISO 704 is the basis of most of the discussion below.

The basic criteria for selecting appropriate terms in Welsh can be summarized as follows:

- i. A term should reflect, as far as is possible, the features of the concept given in the definition.
- ii. A term should be linguistically correct.

- iii. A term should be concise.
- iv. A term should be capable of generating other forms.
- v. A term should correspond to one concept only.

At times, some of these principles can come into conflict with one another. In Welsh, for example, principles (ii) and (v) can conflict due to mutation. Words that begin with the letter *b* often mutate to *m*, for example the *b* in *baban* ‘baby’ mutates after the first person singular personal pronoun and this becomes *fy maban* ‘my baby’. Failure to mutate is considered incorrect. With a term such as *biliwn* ‘billion’, however, mutation can create confusion as the soft-mutated form of *biliwn*, *miliwn*, is the same as the unmutated term *miliwn* ‘million’. To avoid this potential ambiguity, the agreed-upon convention is that *biliwn* does not undergo mutation. In this case, the principle of conceptual clarity takes precedence over that of linguistic correctness.

Despite occasional complications such as these, in most cases the criteria outlined above serve as a strong basis for term standardization in Welsh. This is because it is possible to ascertain whether a term is concise, or linguistically correct, according to parameters that are well established within the language. We will explore some of those considerations below.

4.1. Linguistic correctness

Welsh terminologists adhere to the norms of what constitutes linguistic correctness, referring to such authorities as orthographic standards, major dictionaries, and canonical grammar books. The historical dictionary *Geiriadur Prifysgol Cymru* (GPC Online 2014–) is the authoritative dictionary of the language, and, together with the revised version of the published report on the orthography of the Welsh language, *Orgraff yr Iaith Gymraeg* (Lewis 1987), it is the main resource consulted by terminologists for matters of orthography. There is a choice of grammar books on the language, written both in Welsh and in English, with those written in English often geared towards either learners of Welsh or international linguistics audiences. For these and other reasons, the standard reference grammar book for Welsh terminologists is *Gramadeg y Gymraeg* (Thomas 1996).

Welsh orthography, in the case of native words and morphemes, is mostly problem-free: the modern principles established in 1928 were generally accepted and later revised in 1987. There are, however, some issues, mainly

concerning hyphenation, some accented characters, and borrowings with spellings that are difficult to naturalize, which terminologists would like to see resolved. The panel convened for the 1987 revision of the orthography was subsequently disbanded, with no provision for continued revision and oversight, and can no longer be consulted. By contrast, *Geiriadur Prifysgol Cymru*, of which the first full print edition was completed in 2002, is continually being updated online, and serves as a *de facto* authority for the orthography of new words in the absence of an official panel for the standardization for Welsh.

The hyphenation problem relates to readability, especially in very long words. Allowing hyphenation between some prefixes and the following word element would help the reader understand unfamiliar words composed of many elements. For example, *hunananghymaredd*, meaning ‘self-incompatibility’ is easier to parse as *hunan-anghymaredd* but this is not yet standard practice in the orthography. Terminologists, however, have introduced hyphenation to some terms (including *hunan-anghymaredd*) for the sake of clarity (Prys and Prys 2011–, s.v. *hunan-anghymaredd cemegol*). Accented characters help the reader to pronounce some words, but there is some confusion about the use both of diaeresis on some vowels to indicate that they are sounded separately, and of circumflex accents on certain vowels to denote their length. This is more of an issue with borrowings from English, such as *ril* versus *riil* (‘reel’), where current orthodoxy specifies the unaccented spelling, but where a circumflex accent would help the reader correctly identify and pronounce an unfamiliar word. Spellings that are hard to naturalize include sounds which do not have a corresponding letter combination in Welsh. For example, the /tʃ/ sound written as ‘ch’ in English found in terms such as *chilli* is rendered as ‘ts’ in Welsh – *tsili*.

Most problems of linguistic correctness can be addressed by reference to the authoritative works mentioned above, and discussions with the staff of *Geiriadur Prifysgol Cymru*. Linguistic correctness is also influenced, however, by the meaning of the underlying concept. One such problem is that of number in a multiword unit. In English, it is unclear in a term such as *sector model* whether the model relates to a single sector or several separate sectors. This ambiguity in specifying number is a common feature of English terms that poses problems when attempting to form a Welsh equivalent. In Welsh, the plural form must be used if the concept involves more than one sector, and the correct term would therefore be *model sectorau* (‘model of sectors’). Often, translators without a full

understanding of the concepts being discussed will default to using the singular as in English, for example *model sector* ('model of a sector'). In dealing with such ambiguities, the terminologist may require the help of a subject specialist to select the appropriate form (a fact that underlines the importance of collaboration between terminologists and subject specialists), or at the very least he or she will look at the term in other languages that also require number agreement between nouns and their modifiers.

4.2. Conciseness and linguistic economy

The preference for a concise term rather than a longer equivalent seems to exist in several languages. Complex terms and phrases containing more than one word or lexical unit become cumbersome and difficult to use, especially when they are needed to generate other forms. In Welsh, choosing a concise term over a more complex one is usually straightforward. There are often two choices in the formation of a compound term, however: either a loose compound of noun + adjective as two separate words (e.g. *tymor hir*, meaning 'long term'), or a closed compound of adjective + noun as one word (e.g. *hirdymor*, again meaning 'long term'). Note that, in Welsh, the adjective usually follows the noun, but in closed compounds the order is reversed. Additionally, in closed compounds the second element mutates (as seen earlier in Table 2). Closed compounds in Welsh are usually features of higher registers, and loose compounds, rather than the closed equivalents, can seem more familiar to those accustomed to the individual words that make up the term. In more technical contexts, closed compounds are generally favoured as they are more concise and easier to use as the basis for further multi-word terms or compounds. The use of closed compounds also helps in the terminologization of some words, which would otherwise be seen as a sequence of general-language words.

Terminologization means taking a general-language word and using it to designate a technical concept. In Welsh, the terminologization of less common words is preferred to that of familiar words which might not be understood to have any special-language significance. An early study of Welsh technical terms noted how schoolchildren answering a mathematical question on *similar triangles* (triangles of the same shape but possibly of different sizes) scored higher in Welsh than children answering the same question in English (Jones 1993). In Welsh the term is *trioglau cyflun*. *Cyflun* (*cyf* + *llun* meaning 'equiform') is not used in modern Welsh outside technical contexts, whereas the English word *similar* has a common everyday meaning of 'somewhat the same, but not identical'

(the equivalent adjective in Welsh would be *tebyg*). Not only is the Welsh term more transparent than its English equivalent here, but it is also more apparent that the term in question is a technical term and not the general word *similar* used to modify *triangle*.

4.3. Generating other forms

Another useful criterion when standardizing Welsh terms has been assessing how easy it is to generate other word forms from them. In ISO 704: 2009, the English example *medicinal plant/ herb* is given. Of the two, *herb* is the preferred term because forms such as *herbaceous*, *herbal*, and *herbalist* can be derived from it, whereas no other terms can be derived from *medicinal plant*. In Welsh, if the candidate term is a noun, the terminologist will attempt to generate a plural form, a verb, an adjective, an antonym, and any other derivatives belonging to the same conceptual cluster. If it is not possible to generate these forms, the terminologist will consider whether another candidate term can generate more forms. An example is shown in Table 3 below.

Table 3. Welsh noun and derived terms

English	Welsh
ion	ïon
ions	ïonau
ionic	ïonig
to ionize	ïoneiddio
ionized	ïoneiddedig
ionizable	ïoneiddadwy
an ionization	ïoneiddiad
ionizations	ïoneiddiadau
to un-ionize	anïoneiddio
un-ionized	anïoneiddedig
ionosphere	ïonosffer
ionospheres	ïonosfferau

5. Principles of term formation

The principles of terminology standardization discussed above help Welsh terminologists to select the most appropriate term as a preferred term for a domain, from among existing or possible candidate terms. But how are Welsh candidate terms formed in the first place and are there situations in which a terminologist must form new candidate terms? The answer to the second question is yes. The answer to the first question is found in ISO 704:2009, which states that methods of term formation can include:

- transdisciplinary borrowing
- translingual borrowing (both as direct loans and loan translation)
- transliteration
- transcription
- derivation
- conversion
- abbreviation and blending.

Below, the different methods are discussed in the context of the Welsh language.

5.1. Transdisciplinary borrowing

Transdisciplinary borrowing means taking a term from one domain and using it in another. English often uses transdisciplinary borrowing. Since many new concepts are first described in English, the dominant language of science and technology today,⁹ its transdisciplinary borrowings may subsequently be copied in other languages. ISO 704: 2009 gives the example of the biology term *virus* being borrowed into the domain of computer science to describe computer malware. Welsh has copied this strategy, and what was originally a transdisciplinary borrowing in English has become both a transdisciplinary and translingual borrowing from English into Welsh. In the case of *virus*, it was originally borrowed and adapted to Welsh orthography as *firws* in the domain of biology, and later applied by extension to the computer science domain. The initial borrowing of *firws*

⁹ For an account of how different languages in different periods have gained primacy in scientific discourse, see Gordin's *Scientific Babel* (2015).

from the English *virus* was no doubt facilitated by its origin as a Latin form, Welsh having a long tradition of borrowing from Latin, with words such as *corpws* ‘corpus’ and *pysgod* ‘fish’, from Latin *piscātus*, having early attestations in *Geiriadur Prifysgol Cymru* (GPC Online 2014–, s.v. *corpws*, *pysgod*). Such borrowings will be explored in greater detail below.

5.2. Translingual borrowing

In its simplest form, translingual borrowing entails a direct loan from another language, albeit with different pronunciation, spelling and/or inflection. For example, *entrepreneur* is a direct loan from French into English. In Welsh, many direct loans exist in the domain of music, such as *ensemble* and *symffoni*.

Well-established orthographical, pronunciation and inflectional rules exist for the assimilation of borrowed scientific terms into Welsh, many of which derive ultimately from Latin and Greek. The orthographical rules are based on the letter changes that occurred naturally between Latin and Welsh in earlier periods (Lewis 1943). For example, *photoautotrophic* becomes *ffotoawtotroffig* in Welsh, and *virus*, as seen earlier, becomes *firws* (Prys and Prys 2011–, s.v. *photoautotrophic*, *virus*). Some twentieth century borrowings from Latin have emulated historical sound changes; for example, *strwythur* ‘structure’ is a learned twentieth century borrowing emulating the historical development of *-uct-* to *-wyth-* seen when Latin *fructus* developed into Welsh *ffrwyth* (first attested in the thirteenth century) (GPC Online 2014–, s.v. *ffrwyth*). One problem with such scholarly borrowing from Latin and Greek is the occasional conflict between borrowings directly from these Classical languages and colloquial borrowings from English of words that were originally Latin or Greek. This issue often arises where English pronunciation has diverged from that of the Classical languages.

The most prominent example is whether to keep the hard /k/ sound of Latin and Greek or use the /s/ sound these words have acquired in English. Non-technical terms that have entered Welsh directly from English usually follow the English pronunciation, so *cinema* became *sinema* without the /k/ from the original Greek etymon κίνημα (*kinema*) (attested in 1917, GPC Online 2014–, s.v. *sinema*). Yet the English term *ceramics*, originally from the Greek κεραμικός (*keramikos*), was adapted as a technical Welsh term as *cerameg* (preserving the /k/ sound and keeping a similar *c*-initial written form). This is attested in terminology lists as far back at least as 1970 (GPC Online 2014–, s.v. *cerameg*, *serameg*). The alternative form

serameg, an oral borrowing from English with an/s/ pronunciation, also exists in the general language (GPC Online 2014–, s.v. *cerameg*, *serameg*, Griffiths and Jones 1995, s.v. *ceramics*). The same pattern can be seen in other words and in word elements. For example, in general-language dictionaries the word element *cyto-* is written variously as *cyto-*, *seito-* and *syto-* in Welsh, the last two as oral borrowings from English/'sɪtəʊ/, whereas in terminological dictionaries, it has been standardized as *cyto-*, pronounced /kəto:/ (GPC Online 2014–, s.v. *cyto-*, *seito-*, Griffiths and Jones 1995, s.v. *cytoblast*, *cytochemical*, Prys and Prys 2011–, s.v. *cytosol*, *cytosgerbwd*).

Welsh terminologists and educators have adhered to the /k/ pronunciation, arguing that the international look of the terms is more important than their English pronunciation, especially where there are related international abbreviations and symbols.¹⁰ They recognize, however, that some inconsistency remains because certain word elements which entered as oral borrowings have become entrenched in the language.¹¹ In technical terms, problems can occur when deviating from the pattern of retaining the /k/ sound. One of the historic instances of the /k/ sound being dropped in favour of the /s/ sound in chemistry resulted in the concepts of acid and azide being potentially indistinguishable in Welsh. *Asid*, attested from 1771 (GPC Online 2014–, s.v. *asid*) and firmly entrenched in the language could not, so many centuries later, be replaced with *acid*, and the solution was to borrow azide as *asaid* (Prys and Prys 2011–, s.v. *sodiwm asaid*).

Whilst it may seem that Classical borrowings into Welsh are more acceptable than borrowings from English, some English forms, such as *blog*, have been borrowed into Welsh with little in the way of resistance or competing forms created from within Welsh. It would seem that this is primarily due to the makeup of the term: it is neither overtly English in

¹⁰ See the introductory note of the revised and reprinted term list *Termau Bioleg, Cemeg a Gwyddor Gwlad* (Welsh Joint Education Committee 1993). It explains that the panel convened for the 1987 revision of the orthography advocated, by and large, converting English pronunciation to Welsh spelling; however, those involved in the development of the 1993 term list concluded that this was not acceptable in specific technical instances, and agreed with teachers who opposed this method on the grounds that disassociating from the international forms of technical terms would disadvantage Welsh children in international science discourse.

¹¹ For example, the English word element *-type* became entrenched as *-teip* following English pronunciation, rather than *-typ*, and so genotype was standardized as *genoteip* (Welsh Joint Education Committee 1993).

its combination of sounds, nor is its orthographical form problematic. As a result, *blog* has been successfully appropriated into Welsh as a noun and extrapolated into the various derived forms required: the verbnoun *blogio* ‘blogging’ and the plural *blogiau*, as well as the conjugated verbal forms such as *blogiais* ‘I blogged’ and all the associated mutated forms: *dyflogio* ‘your blogging’, *fy mlogiau* ‘my blogs’, and so on. Whilst some English forms have been borrowed successfully, it is also true that some terms etymologically derived from Classical forms are not always comfortably and consistently assimilated into Welsh, for instance, Latin forms with the prefix *ex-* such as *esiampI* ‘example’, *eithrio* ‘except’ and *estraddodi* ‘extradite’, as well as the competing forms *echdynnu* and *alldynnu* for *extract*.

In contrast to direct loans, loan translation, also known as calquing, entails the translation of the morphological elements of a foreign term to create a new term. This is often more acceptable in Welsh than direct loans, especially when the resulting term does not look like an English word that has been assimilated into Welsh. For example, it is clear to Welsh speakers that the term *dopio* is a direct borrowing of *doping* in English. It was coined in collaboration with subject experts who agreed that there was no better way of labelling this concept in Welsh. The media, when discussing doping cases, have used descriptions such as *camddefnyddio cyffuriau* ‘misuse of drugs’, *defnyddio cyffuriau* ‘use drugs’, *sgandal cyffuriau* ‘drugs scandal’, *profion cyffuriau* ‘drugs tests’ and *asiantaeth gwrth gyffuriau* [sic] (‘anti-drugs organization’, for ‘anti-doping organization’) (Golwg 360 2013, Golwg 360 2012, BBC 2013, BBC 2012). Doping, however, also includes illegal methods not related to prohibited drugs, and related terms include *neurodoping*. Therefore, the phrases used by the media were not appropriate in technical discourse, and no other solution presented itself than to use a direct loan from English, *dopio*. One subject expert, however, about to be interviewed on national radio about the doping scandal laughingly worried about his father’s reaction if he were to use such ‘bad Welsh’ on air. *Dopio* would, understandably, be seen as an instance of lower register code switching by any listeners who were unaware that *misuse of drugs* was not conceptually accurate. A great many Welsh terms are loan translations, but they do not appear to be ‘bad Welsh’ as they do not sound or look like English borrowings. Examples of loan translations are given in Table 4 below.

Table 4. Loan translations in Welsh

English term	Welsh term	Composition of Welsh term
jawless fish	pysgodyn di-ên	<i>pysgodyn</i> ‘fish’ + <i>di-</i> prefix (‘without’) + <i>gên</i> ‘jaw’ with first consonant removed due to mutation
farmers’ market	marchnad ffermwyr	<i>marchnad</i> ‘market’ + <i>ffermwyr</i> ‘farmers’
longboarding	hirfyrddio	<i>hir</i> ‘long’ + <i>bwrdd</i> ‘board’ with mutated first consonant <i>b</i> → <i>f</i> and internal vowel change of <i>w</i> → <i>y</i> + verbnoun ending <i>-io</i>
cell wall	cellfur	<i>cell</i> ‘cell’ + <i>mur</i> ‘wall’ with mutated first consonant <i>m</i> → <i>f</i>
pre-synthesized	rhagsyntheseiddiedig	<i>rhag-</i> suffix (‘pre’) + <i>syntheseiddio</i> ‘synthesize’ with verb ending <i>-o</i> removed + <i>-edig</i> verbal adjective suffix

Of the terms in Table 4 above, one is worthy of further mention, namely, *rhagsyntheseiddiedig*. There is sometimes a tendency in Welsh to prefer paraphrasing to using long terms, in order to make the text more readable to people who may not have encountered the term before. This is especially true of institutions responsible for producing materials for school children. Therefore, a form such as *wedi’i syntheseiddio o flaen llaw* (having been synthesized beforehand) is often preferred to *rhagsyntheseiddiedig*. This is essentially a question of register, and users need to be reminded that the technical terms given in terminological dictionaries are not always appropriate in less technical environments. Thus, the concise technical term is added to the dictionary, but paraphrasing is encouraged in materials where non-technical registers are more appropriate.

Interestingly, loan translations are sometimes preferred to more creative Welsh inventions. In the case of *text message*, the Welsh *nodyn bodyn* ‘thumb note’, which contained no borrowing and was used by the Welsh radio station, BBC Radio Cymru, in the early 2000s, did not catch on (BBC 2017). This was despite its obvious Welsh origins and the fact that it rhymed pleasingly. Instead, the loan translation *neges destun*, from

neges ‘message’ and *testun* ‘text’, with initial consonant mutation, gained traction and is now the accepted term.

When considering loan translation as a term formation method, Welsh terminologists often check whether obsolete Welsh words could be re-used for the modern meaning required. Many historically attested words in *Geiriadur Prifysgol Cymru* have fallen out of use and could be repurposed. This is not new as a term formation method in Welsh. The word *atynnu*, for example, originally meant ‘to go or take away’ in the fourteenth century but was reused in the nineteenth century to mean ‘attract’ and is the term in current use in the domain of physics (Zimmer 2000: 564). Recently, in the case of the term *condyloid joint*, there were two candidate terms; *cymal condylaidd*, a loan translation, and *cymal cambylaidd*, based on the Welsh word *cambwl* meaning the end of a bone which connects into the socket of another bone, first attested in D. Silvan Evans’ dictionary published in 1887–1906 (GPC Online 2014–, s.v. *cambwl*). In this case, *cymal condylaidd* was preferred for several reasons. First, it was already in limited use, having appeared in two terminology dictionaries dating from 1986 and 1994 (Lewis 1986, Hughes 1994), and having featured occasionally in educational resources. Secondly, *condylaidd* is closer to the international norm in medical terminology and is therefore more transparent to medical practitioners. The historical form *cambwl*, on the other hand, is neither familiar nor transparent to the average Welsh speaker.

Candidate terms based on a borrowed word or phrase tend to be preferred to revived old Welsh words that the average Welsh speaker would not be able to parse for their meaning. Borrowings also tend to be preferred to colloquial Welsh forms because the latter often lack the accuracy required in the field of modern healthcare, as in the case of *clefyd siwgr* ‘sugar disease’ for *diabetes*. More traditional Welsh forms also suffer from the fact that they often correspond to a more general concept than the one defined in a technical context, as in the case of the use of *nychdod* ‘a weakening’ for *dystrophy*, which was dropped in favour of using *dystroffi*.

5.3. Transliteration

ISO standards exist for the transliteration of Arabic, Cyrillic, Greek, Hebrew, Thai, and other scripts into Latin script, and for the Romanization of Chinese and Japanese.¹² International transliteration is very rarely used

¹² These are too numerous to be referenced here, but a full list may be found on the ISO website at <https://www.iso.org/ics/01.140.10/x/> (accessed 31 January 2020).

in Welsh term formation as it can be problematic when applied to the orthographical system found in Welsh. In addition, transliterated terms can appear to be poorly assimilated adaptations of English terms as the Welsh alphabet does not feature the letters *k, q, v, x, z*, which are common both to the Latin script and to the English alphabet – the letters *c, c, f, cs*, and *s* respectively are normally used as substitutes when borrowing and assimilating English technical terms, but are not employed in international transliterations. The latter do, however, occur in Welsh in certain contexts. For example, when transliterating the five *Ks* of the Sikh religion from the original Gurmukhi script into Latin script, experts in the Sikh religion advised that it would not be acceptable to represent the five religiously significant *Ks* of Sikhism with the Welsh letter *C*, despite the fact that many Welsh speakers perceive *K* to be an English letter, and the *K* is preserved in this context as a result (e.g. *Kirpan*). This usage is generally accepted when the difference between the Latin script and the English alphabet is explained to a general readership.

5.4. Derivation

Derivation is a frequently used method of term formation in Welsh, and entails adding affixes to existing words or lexical units to form new terms. In Welsh, both prefixes and suffixes are used, and most of these are listed in *Geiriadur Prifysgol Cymru*. Due to the increasing tendency to adopt transliterated forms of international medical nomenclature in preference to less well-defined traditional medical terms,¹³ the use of Classical prefixes such as *poly-*, *hyper-* and *hypo-* is increasing in scientific and technological domains, although Welsh prefixes such as *rhyng-* and *uwch-* are still preferred to many of their Latin counterparts such as *inter-* and *super-*. Some prefixes used in Welsh terms are shown in Table 5 below.

Table 5. Prefixes used in Welsh terms

English	Welsh	Prefix used
hypertext	hyperdestun	hyper
hypermedia	hypergyfryngau	hyper
hyperextension	gorestyn	gor ‘over’

¹³ For example, *polyffagia* is the preferred term for *polyphagia*, rather than *gornewyn* (‘over-hunger’).

hypoglycemic attack	pwl hypoglycemig	hypo
interspecific competition	cystadleuaeth ryngrywogaethol	rhyng
intertidal zone	parth rhynglanw	rhyng
supersonic	uwchsonig	uwch
superosculate	uwchfialu	uwch
supercontinent	archgyfandir	arch

In Welsh, the suffix often dictates the grammatical gender if the word is a noun, and this helps terminologists in deciding the gender of the new term. For example, the suffix *-fa* as found in *swyddfa* ‘office’ usually indicates a feminine noun and gives the additional information that the term refers to a place (Thomas 1996). Some suffixes had ceased to be used spontaneously by Welsh speakers to create new lexical items but have been revived by terminologists to enable the formation of new terms. For example, the suffix *-iant* appears to have been unproductive for centuries by 1961, but in 1973, a number of new terms ending in this suffix appeared in the *Geiriadur Termau* (Thomas 1996), and by 2020 *Y Termiadur Addysg* has over 350 terms ending in *-iant* (Prys and Prys 2011–). Adding affixes in Welsh creates concise one-word terms, rather than less user-friendly multiword units.

5.5. Conversion

In term formation, conversion means changing the syntactic category or grammatical function of existing forms. In Welsh, this also entails derivation. Whereas in English a verb and a noun might appear superficially similar (e.g. *an output/ to output*), morphological changes, including internal vowel change and/or the addition of suffixes, are needed to create verbs in Welsh. Therefore, *allbwn* ‘an output’, becomes *allbynnu* ‘to output’. Whilst forming nouns out of adjectives is a straightforward process in English, this is problematic in Welsh. Either the noun object must be specified where it is merely implied in English, or a noun suffix must be added to the adjective. For example, *a lateral* in the sense of ‘a lateral consonant’ would have to be specifically denoted as a consonant, *cysain ochrol*, meaning ‘lateral consonant’, rather than just *ochrol*, the adjective meaning ‘lateral’. Alternatively, the noun suffix *-yn* would have

to be added to the adjective, to convert it to a noun, *ochrolyn*. This strategy was rarely used formerly due to lack of productive noun endings in Welsh but has recently become more common. It is also seen with the noun suffix attaching to the base morpheme, as is the case with *integryn* ‘an integral’ formed on the stem of *integu* ‘integrate’.

5.6. Abbreviation and blending

Abbreviations and blends (formed by clipping and combining two or more words) have historically been little used for term formation in Welsh. In the case of abbreviations, a large number of Welsh words begin with the letter *c* due to the frequency of common prefixes such as *cyd-*, *cym-* and *cyf-* (cognates with *co-* and *com-*). The result is that most abbreviations tend to be too similar to each other to fulfil their function in Welsh. Not all abbreviations suffer from this problem, however, and some useful examples have been adopted by subject specialists. For example, the abbreviation *iff* in mathematics for *if and only if* became *oss* in Welsh, from *os a dim ond os* (Prys and Andrews 2009–, s.v. *os a dim ond os*). Blends, when they do occur, tend to be Welsh blends based on a loan translation of the English blend. For example, *qubit* from *quantum bit* became *cwandid*, based on *did* ‘bit’ + *cwantwm* ‘quantum’ with the noun order being reversed as it is a closed compound (idem, s.v. *cwandid*).

6. Acceptability

It is possible to judge how appropriate a term candidate is by using the criteria in ISO 704, discussed in section 4 above. However, judging how acceptable a term is to a community of users is more difficult. In the case of highly technical Welsh terms, the community of users is also the community of subject experts. The group is therefore small, and its members often participate in the standardization process. Terms that are used by the general public, however, can be hotly debated or they can simply fail to gain currency. One creative example that fell by the wayside is *safwe* a blend of *safle* ‘site’ and *gwe* ‘web’, now long forgotten and replaced by *gwefan* (the standardized term for website, literally *web* + *place*). At the time of writing there is much debate on the term for *self-isolation*, which is in everyday use in the Covid-19 pandemic. *Hunanynysu* is the preferred term of the government translation service (Welsh Government Translation Service 2004–). A doctor began discussing the term in mid-March 2020 on a popular Facebook language group, *Iaith*. A selection of comments regarding various candidate terms are shown below.

Table 6. Discussion of the candidate terms for ‘self-isolate’

Comment	Translation
<p>Mae ‘hunan-ynysu’ yn ddigon derbyniol gen i. Gellir ei ddefnyddio fel berf ynndo’i hun (Rhaid i Tom hunan-ynysu) neu gellir ei rannu (Rhaid i Tom ei ynysu ei hunan) ... (Jones, A. 2020)</p>	<p>I think ‘hunan-ynysu’ is acceptable. You can use it as a verb as it is (Tom must self-isolate) or you can split it up (Tom must isolate himself) ...</p>
<p>...cytuno. O leiaf yn ddealladwy ac o wreiddiau Cymraeg. (Jones, G. 2020)</p>	<p>...I agree. Understandable, at least, and from Welsh roots.</p>
<p>Hunan-ynysu yn lond ceg ond yn ddealladwy. Fyddai ymgilio yn haws? (Ifans 2020)</p>	<p>Hunan-ynysu is a mouthful, but it’s understandable. Would ymgilio be easier?</p>
<p>Diolch i bawb am yr ymateb, mae ymgilio, aros adre, meudwyo ac ymneilltuo i gyd yn amlwg yn boblogaidd. Mae angen i’r term ddisgrifio a gwahaniaethu beth sy angen os bo rhywun yn ynysu ei hun nid yn unig o’r byd tu allan ond hefyd wrth eraill yn yr un cartref. (Rhys-Dillon 2020)</p>	<p>[Doctor:] Thanks to everyone for replying, ymgilio [<i>retreat</i>], aros adre [<i>stay home</i>] and ymneilltuo [<i>withdraw, separate oneself</i>] are clearly all popular. The term needs to describe and differentiate what is needed if someone needs to isolate themselves not just from the outside world but also from others in the same home.</p>
<p>Erthyl o air newydd i’r Gymraeg yw ‘hunan-ynysu’, sy’n rhyw dair wythnos oed, ac yn gyfieithiad uniongyrchol o’r Saesneg. Beth fydddech yn ei awgrymu yn ei le? Beth am rywbeth fel ‘Encilio’, neu ddilyn y dull arferol yn y Gymraeg o wneud rhywbeth i chi’ch hun, sef defnyddio’r rhagddodiad ‘Ym’, (fel yn ‘ymolchi’, ‘ymweld’, ‘ymlwybro, ac ati) o flaen rhyw air addas? Os yw’r Gymraeg yn iaith fyw, dylai fedru cymhathu, nid cyfieithu’n uniongyrchol. Syniadau? (Williams 2020)</p>	<p>‘Hunan-ynysu’, which is about three weeks old and a direct translation from English, is a new abomination of a word in Welsh. What would you suggest instead? What about something like ‘encilio’ [<i>withdraw</i>] or following the usual method in Welsh when you do something yourself, which is to add the prefix ‘ym’ (like in ‘ymolchi’, ‘ymweld’, ‘ymlwybro’, etc.) before some appropriate word? If Welsh is a living language, it should be able to assimilate, not translate directly. Ideas?</p>
<p>Beth yn y byd sy’n bod ar “hunan-ynysu”? Mae pethau gwell i boeni amdanyn nhw, e.e. “parcio a reidio”...!! (Pearce 2020)</p>	<p>What on earth is wrong with “hunan-ynysu”? There are better things to worry about, e.g. “parcio a reidio” [<i>park and ride</i>] ...!!</p>

Various other candidate terms were put forward in this group, the main complaint being that *hunanyysu* was a new word and a loan translation, and that existing Welsh words were preferable. Some methods of term formation seem to be more acceptable to users than others, but further research is required into this sociolinguistic aspect of terminology work.

Acceptability is especially important in the Welsh context. As Welsh speakers are almost invariably also English speakers, texts that feature many terms that they do not deem acceptable may cause them to turn to an English version of the text, if available — a tendency that could ultimately undermine the viability of the language as a modern medium of communication.

Since the readability and accessibility of texts is of vital importance, translators can be tempted to translate an English technical term with a less technically accurate but more familiar general-language Welsh word. One example is the term *inseminate*. The more familiar *ffrwythloni* ‘fertilize’ is often used rather than the technically accurate *semenu*. Whilst these terms can be interchangeable in certain contexts, fertilization and insemination are not strictly equivalent terms: not all inseminations result in fertilization. Another issue seen in translation is the tendency to use a single familiar Welsh term as an equivalent for a number of similar yet discrete concepts, for example the use of *syrthni* for both *lethargy* and *drowsiness*, terms which have slightly different meanings in a medical context. Again, this is mainly driven by the desire to produce Welsh texts for the general public that are not full of unfamiliar words, and the lack of technical precision is often accepted in less technical contexts — at least, until both concepts, such as *lethargy* and *drowsiness*, appear in the same sentence.

At times, therefore, conceptual precision and perceived acceptability can be competing considerations when selecting the term to be used. Consequently, recognising which of the available term formation strategies results in the most acceptable term forms is important for the Welsh terminologist, and is an area requiring investigation. Although strictly speaking the terminologist’s role is to standardize technical and scientific vocabulary, the need to fill more general lexical gaps in the vocabulary of minoritized languages such as Welsh means that the standardization of terms is often understood to include providing solutions to more general lexical problems. A language community that is also engaged in the process of filling any lexical gaps can have strong views on the acceptability or otherwise of proposed new lexical items. In the context of technical terminology, there is a need to balance the acceptability of terms with

the requirement for conceptual clarity, but for more general lexical items, acceptability for its target audience is paramount. This lies outside the scope of the technical terminologist, but principles of term formation are still useful guidelines.

7. Conclusions

Welsh has at its disposal many different term formation strategies, and it is fortunately able to draw on a long tradition of borrowing from Latin and Greek, facilitating the incorporation of terms from domains such as health and biology where the influence of the Classical languages is strong in international nomenclature. There are some difficulties, however, in transliterating certain letter combinations found in the Classical languages into Welsh, although these pale in comparison with the problems caused by English borrowings, where the difference between orthography and pronunciation norms is more obvious. It is true that a preference for not depending too heavily on English as a source of borrowing also steers Welsh term formation away from adopting overtly English forms. Arguably, however, a greater factor in dissuading terminologists from standardizing borrowings from English is the desire to preserve the systematicity, internal consistency and phonetic nature of Welsh orthography rather than to adopt the phonetic free-for-all found in the orthography of English. The incompatibility of the Welsh and English orthographical systems plays a large part in this.

The other main consideration is ensuring that newly formed terms are as acceptable as possible to their intended audience, especially in a bilingual environment with English as a dominant language, where the speakers can form their own opinions as to the suitability of the terms. The prioritization of acceptability over utility is a contentious issue, and is perhaps best solved by considering the intended audience and the type of resource in which the terms appear; specialist and educational publications require emphasis on conceptual clarity whereas authors of texts intended for popular consumption may prefer to err on the side of acceptability.

Those are subjective issues, however. In the case of the protocols where more objective judgements are possible, the practice of Welsh terminology standardization follows well-established and stable principles which correspond mainly to the well-defined principles of term formation found in international standards. The issues highlighted here, especially those still awaiting resolution, are largely peripheral and confined to audience acceptability and the orthographic realization of terms. It is hoped

that some of the issues raised here are also relevant to other language communities, and that this Welsh case study may help these communities in the advancement of their terminological research.

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