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Beekeeping in Celtic and Indo-European[1]

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Abstract

This article reconstructs where, when and how Celtic speakers adopted beekeeping on the basis of the Celtic apicultural vocabulary. Following a short introduction giving the archaeological and historical background of beekeeping, it is argued that Celtic inherited a lexicon for bee produce from Proto-Indo-European (PIE), but not for bees or beehives. The various external sources and internal derivations for the remaining words in the apicultural lexicon are then employed to reconstruct in what periods and from what sources Celtic speakers adopted beekeeping. This reconstruction demonstrates that bee domestication by IE speakers post-dates PIE. A European lexicon can be reconstructed for bees, drones and hollow beehives, implying that sylvestrian beekeeping was adopted by IE speakers soon after their migration into Europe. A Proto-Celtic (PC) layer relating to swarming suggests that PC speakers achieved more intimate knowledge of beekeeping, while words for beehives are of even later date, suggesting continued innovation in hive-building techniques after the break-up of Celtic.

1. Introduction

Historical linguistics and linguistic palaeontology can play a role in reconstructing how apiculture developed in prehistoric Europe. For instance, as the etymology of the word for 'beehive' is derived from a word meaning 'wickerwork', it becomes obvious that wickerwork was used to build beehives by the time of this derivation. Tracing the spread of a word may also reveal when and where a technology such as beekeeping was developed and how it spread. If a word in a given language is analysable as a derivative of a pre-existing word in this language, the corresponding concept may well originate within this language community. If, on the other hand, a word appears borrowed in the language, the corresponding concept may also have been borrowed. Tracing the direction in which words spread may help uncover prehistoric networks of technological spread. The date at which such loanwords entered a language is often dateable relative to regular phonological developments. An analysis of the sound laws a word has undergone can serve to establish roughly when a word entered the language. Celtic provides a useful case study on the linguistic evidence for prehistoric

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developments in Indo-European beekeeping: a large number of words in the apicultural lexicon are known from the medieval Celtic languages because of the survival of law texts dealing with beekeeping in both Irish and Welsh.[2] The Irish laws are known as the *Bechbretha* 'bee-judgments'.

A word may have one of several sources, and when multiple words have the same source, they can be said to belong to the same etymological layer. The deepest identifiable layer concerns words inherited from PIE; these words can be identified as such when they have cognates agreeing in both form and meaning in other Indo-European languages sufficiently far removed in geography or phylogeny to exclude later borrowing. Another layer concerns words productively formed using IE roots and morphology; these words may post-date PIE itself, but the precise age of such formations is often unknown unless they can be dated with respect to known sound laws or morphological developments. A third category comprises semantic innovations, whose date is even more difficult to establish on linguistic grounds. When a morphological or semantic innovation is shared between Celtic languages, however, the innovation can reasonably be expected to date to their most recent common ancestor at the latest, for example PC, Proto-Insular-Celtic or Proto-Brittonic.

Loanwords into Celtic stand in opposition to words inherited from PIE.[3] Loanwords are, in principle, datable to the time when the donor language is known: borrowing must have occurred after the date of any visible sound changes in the source language and before any sound changes took place in the receiving language. However, not all languages from which Celtic has borrowed words have survived into the historical period. In these cases, the fact of borrowing and its date must be inferred from the Celtic words themselves. A loanword into Celtic may be recognized as such when it cannot be reconciled with a PIE root or morphology or, preferably, when a lexeme contains phonemes or phoneme clusters that cannot be generated by any PIE form respecting the constraints of PIE.[4] Examples of this category are words that have an illegal root structure when projected back into PIE, or Irish words with *p*-, in which case the word must be borrowed after it regained *p* as a phoneme.[5] When different languages in a language family contain a similar-looking word that nevertheless resists reconstruction to a single proto-form or root, this can constitute evidence that a word has been independently borrowed into IE dialects from a non-IE language, even if the donor form is unknown. This principle allows one to estimate when a word was borrowed. If, for example, a word can be reconstructed to a single PC form, but resists reconstruction into a single PIE form, it is likely to have been borrowed between PIE and PC. One criterion for distinguishing such independent borrowings from chance resemblances is to look for so-called recurrent irregularities.[6]

Language contact can also be inferred from calques. In such cases, however, no phonological material is exchanged between languages, so the date of calques cannot be established with reference to historical phonology.

[2] *BB*.

[3] This study excludes loanwords that entered Celtic after the early Middle Ages, e.g. from English or French.

[4] Lack of an IE root connection is not by itself a sufficient criterion to consider a lexeme borrowed, because a word may in theory have been lost everywhere else.

[5] David Stifter, 'With the Back to the Ocean. The Celtic Maritime Vocabulary', in Kristian Kristiansen, Guus Kroonen and Eske Willerslev (eds), *The Indo-European Puzzle Revisited: Integrating Archaeology, Genetics, and Linguistics* (Cambridge: CUP, forthcoming) discusses this principle in more detail in its methodology section.

[6] Examples of such 'recurrent irregularities' are alternations between an *a*-prefixed form and a form lacking such a prefix, or alternations between **a* and **ai*, see Peter Schrijver, 'Animal, Vegetable and Mineral: Some Western European Substratum Words', in Alexander Lubotsky (ed.), *Sound Law and Analogy* (Amsterdam: Rodopi, 1997), 293–314.

1.1. Evolutionary stages of beekeeping

The evolution of beekeeping can be divided into three stages: honey hunting, sylvestrian beekeeping and domestic apiculture. People are known to have hunted for honey far back into prehistory. The first evidence that humans interacted with bees is found in traces of beeswax found on Anatolian pottery of some 9,000 years old. Spanish rock paintings of 7,000 to 8,000 years old depict honey hunters harvesting suspended from rope ladders.[7] A second stage of bee domestication is sylvestrian beekeeping, when beekeepers would encourage the settlement of bees by hollowing out tree trunks. Bees' nests were boarded up and this board typically contained a mark of ownership of the relevant beekeeper. This stage continued well into the historical period in Eastern Europe, but less so in Western Europe.[8] The final stage of development, domestic apiculture, entails building beehives that can be looked after near one's house. This type of beekeeping entails tracking swarming bees and possibly also combining and splitting colonies. As such, it requires some knowledge about the reproductive cycle of bees and their division of labour.

Because honeybees have left few traces in the fossil record it is difficult to establish when prehistoric Europeans started exploiting them. Traces of beeswax have been found on Neolithic pottery in Europe and the Middle East, the oldest of which are found in Neolithic Anatolia, but this may be because that is the source of some of the earliest pottery. Within Europe, the northern limit of bee exploitation appears to be Denmark, because pottery in Ireland, Scotland and Fennoscandia lack beeswax residue. Beeswax residue is similarly absent on Neolithic pottery on the Pontic-Caspian steppe.[9] While analysis of beeswax residue on Neolithic pottery may help in charting the extent of consumption of honeybee produce, it cannot establish whether this honey and wax was gathered from wild beehives, managed tree hollows or domestic beehives.

The oldest evidence of domestic beekeeping dates to the third millennium BCE in Egypt. Here we find a relief showing beekeepers working hives, and processing and storing honey. Hittite laws document fines for stealing bee swarms and hives. The oldest known beehive dates to about 875 BCE, and is found in Israel.[10] Beekeeping was established in the Mediterranean region, and horizontal pottery hives were used in 400 BCE Greece. Greek accounts relate observations on bee behaviour and beekeeping. Sources from Roman antiquity also provide details on beekeeping. Varro described various types of hives made in his day, noting that earthenware, wicker, bark, fennel stalks and hollow trees were used, with the best hives made of bark, and he gave directions concerning the placement of apiaries relative to farm buildings, and so his writings provide evidence for domestic apiculture.[11] Partial remains of the oldest known woven wicker hive were found in a northern German peat bog.[12]

With the exception of pottery hives, beehives tend to be perishable, while wax residue on potsherds may reflect consumption rather than production. The earliest evidence for beekeeping relates to the Middle East, but this may well be because the earliest written

[7] Gene Kritsky, 'Beekeeping from Antiquity Through the Middle Ages', *Annual Review of Entomology*, 62 (2017), 249–64 (250).

[8] Eva Crane, *The World History of Beekeeping and Honey Hunting* (New York and London: Routledge, 1999), Chapter 9.

[9] Mélanie Roffet-Salque, Martine Regert, Richard P. Evershed, Alan K. Outram et al., 'Widespread Exploitation of the Honeybee by Early Neolithic Farmers', *Nature*, 527 (2015), 226–30.

[10] Kritsky, 'Beekeeping from Antiquity', 251.

[11] Varro, *On Agriculture* III 16: 12–15, see Cato and Varro, *On Agriculture*, Loeb Classical Library, trans. W. D. Hooper and Harrison Boyd Ash (Cambridge, MA: Harvard University Press, 1934), 504–9.

[12] Kritsky, 'Beekeeping from Antiquity', 251–3.

records have been found in this region, and may not reflect the real extent of ancient beekeeping. Historical linguistics may serve to counter some of this potential eastern bias in the historical evidence for ancient beekeeping.

1.2. Earlier research on Indo-European beekeeping

Earlier researchers on bee-related vocabulary in Indo-European languages include Le Sage and Crane,[13] but these works did not explore how and when IE speakers acquired beekeeping in prehistory. Conversely, palaeolinguistic works on the PIE homeland do not discuss apiculture in great detail. PIE speakers were familiar with bees, based on their use of the words **mel-i(t)-* 'honey' and **med^{h}-u-* 'mead'. Indeed, several handbooks on PIE culture or its homeland adduce these words to argue that PIE speakers must have lived near honeybees, so that potential homelands may be limited to regions where bees are found by the late Neolithic.[14] Conspicuously absent, however, are words for 'bee', 'drone' or 'beehive'.

This paradoxical presence of words for bee produce, coupled with the absence of words for bees themselves, can be resolved in several ways. *EIEC* accepts that only geographically restricted terms for 'bee' can be found, but that the reconstruction of words for 'honey' and 'wax' is sufficient evidence that PIE speakers were familiar with bees, and that PIE did have a word for 'bee' that has not survived.[15] Although this may be possible, it will be demonstrated that solid PIE reconstructions exist for the similar-looking wasps and hornets. It is difficult to envisage how the word for 'bee' could be lost without significant changes in the relationship between Indo-Europeans and bees, all while inherited words for 'wasp' and 'hornet' are ubiquitous even in present-day descendant languages. An explicit account of why a PIE word for 'bee' has not survived could explain why inherited words were displaced or how PIE speakers may not have known bees in the first place.

Vennemann presents a scenario of displacement.[16] He suggests that the three-stage evolution of beekeeping from honey hunting via sylvestrian beekeeping to domestic apiculture may be linked to the presence of PIE words for 'honey' and 'mead', but the absence of words for 'bee', because a word for 'bee' may easily be borrowed together with the technique of domestication itself. A consequence of this idea is that the bee is quite unlike other insects and small animals in that it is not part of the lexicon for local flora and fauna typical of substrate vocabulary, but rather that it should be considered a word that spread with a technology, that is, a *Kulturwort*.

An alternative scenario is that PIE speakers were not familiar with bees in the first place and the words for 'honey' and 'mead' may indicate long-distance honey-trading networks. Familiarity with honey and mead does not have to imply familiarity with bees if PIE speakers

[13] D. E. Le Sage, 'Bees in Indo-European Languages', *Bee World*, 55 (1974), 15–26, 46–52; Eva Crane, 'Terms in Indo-European Languages for some Concepts Related to Honey, Bees and Hives', *DIAS* (2009), *https://www.dias.ie/celt/celt-publications-2/terms-in-indo-european-languages-for-some-concepts-related-to-honey-bees-and-hives/*, accessed 1 October 2022.

[14] Otto Schrader, *Sprachvergleichung und Urgeschichte, linguistisch-historische Beiträge zur Erforschung des indogermanischen Altertums* (Jena: Costenoble, 1883), 127, 148, adduced words relating to honeybees to exclude any PIE homeland east of the Ural mountains. More recently, Thomas V. Gamkrelidze and Vjaceslav V. Ivanov, *Indo-European and the Indo-Europeans: A Reconstruction and Historical Analysis of a Proto-Language and Proto-Culture*, trans. Johanna Nichols (Berlin and New York: Mouton de Gruyter, 1995), 516–17, as well as David W. Anthony, *The Horse, the Wheel, and Language: How Bronze-Age Riders from the Eurasian Steppes Shaped the Modern World* (Princeton, NJ: Princeton University Press, 2007), 90–9, made similar arguments.

[15] *EIEC* 57–8.

[16] Theo Vennemann, 'Germania Semitica: *Biene* und *Imme*. Mit einem Anhang zu lat. *apis*', *Sprachwissenschaft*, 23 (1998), 471–87 (477).

bought honey from neighbouring populations. PIE speakers who moved away from their homeland and adopted beekeeping may then have adopted the relevant vocabulary and retained their familiar vocabulary for bee produce.

2. No PIE word for 'bee'

Words for wasps and hornets, which resemble bees, are reconstructible for PIE, but none of these words appears to have meant 'bee' originally. What follows are some words for such animals, and they can all be shown to have an original meaning other than 'bee'. It is only natural, then, that Celtic did not inherit a word for 'bee' from PIE.

PIE **(h₁)uobʰ-s-eh₂/ih₂* is attested in most IE branches, cf. W *gwychi* 'drone', OCo. *guhien* gl. *vespa*, OB *guohi* gl. *fucos*, Lat. *vespa* 'wasp', OE *wæfs*, *wæps*, *wæsp* gl. *vespa*, *crabro*, Lith. *vapsvà*, *vapsà*, Russian *osá*, SCr. *òsa*, Avestan *vaβžaka-* 'scorpion', Pehlevi *wabz* 'bee, wasp', Baluchi *gvabz* 'bee, wasp'.[17] The word, found in both European and Asian branches of Indo-European, may plausibly be connected to the root **h₁uebʰ-* 'to weave', which may refer to how wasps weave their nests.[18] In a few languages this word has an apicultural meaning: in Welsh and Breton the word may mean 'drone' and the meaning 'bee' is found in several Iranian languages. These meanings are secondary to 'wasp', because no single apicultural meaning is found in more than one branch of IE. Within Celtic, the meaning 'drone' is found in W *gwychi* and OB *guohi*, but 'wasp' is found in OCo. *guhien*. OIr. *foich*, which means 'wasp', but not 'drone', must be borrowed from Brittonic after PC **xs* > *x* in Brittonic, but before **w* > *gʷ* and the Brittonic semantic shift to 'drone'. The word was probably polysemous in the Common Brittonic period because the innovative meaning is found at the edges of the Brittonic-speaking area, while the conservative meaning is found in the centre.

PIE **ḱrh₂-s-r/n-* 'hornet' was inflected as an archaic heteroclitic *r/n*-stem, and is continued by Lat. *crābrō*, OLith. *širšuõ*, Russian *šéršen'*, and PGm. **hurnuta-/ō-* > OS *hornut*, OHG *hornuz*, MDu. *hornete*.[19] Although hornets resemble bees, this word is unlikely to have meant 'bee' originally, not only because it means 'hornet' in all descendant languages, but also because the formation likely meant 'horned one' originally. This naming strategy fits the hornet better than the bee, because bees' antennae are noticeably smaller than those of hornets and wasps.[20]

PIIr. **makš-* 'fly; bee' (Skt. *mákṣ-*, YAv. *maxši-* 'fly', Sogdian *mwxšk-* 'mosquito') must be connected to Proto-Finno-Ugric **mekše* 'bee' (Finnish *mehi-läinen*, Erzya *mekš*, Moksha *meš*, Hungarian *méh*, among others). It is generally accepted to have been borrowed from Indo-Iranian into Uralic and not vice versa because Uralic has no inherited apicultural lexicon, and because **medʰ-u-* or its Indo-Iranian continuant is also thought to have been borrowed into Uralic.[21] PIIr. **makš-* can be etymologized as an old compound of PIE **medʰ-u-* (with loss of **u*) and **kʷei-* 'to pile, stow, gather'.[22] The resulting **medʰ-kʷi-* could

[17] Gamkrelidze and Ivanov, *Indo-European and the Indo-Europeans*, 516; *EDLI* 670.

[18] *IEW* 1179.

[19] It is disputed whether ToB *kro(ṅ)kśe** 'bee' belongs here, see Gamkrelidze and Ivanov, *Indo-European and the Indo-Europeans*, 516; Douglas Q. Adams, *Etymological Dictionary of Tocharian B* (2010), *https://dictionaries.brillonline.com/tocharian-b* s.v. *kro(ṅ)kśe**.

[20] *EDLI* 140; *EDPG* 259.

[21] Sampsa Holopainen, 'Indo-Iranian Borrowings in Uralic: Critical Overview of the Sound Substitutions and Distribution Criterion', unpublished PhD thesis, University of Helsinki, 2019, *http://urn.fi/URN:ISBN:978-951-51-5729-4*, 139–42.

[22] Christian Carpelan and Asko Parpola, 'Emergence, Contacts and Dispersal of Proto-Indo-European, Proto-

then yield **makš(i)-* if the resulting cluster **-dʰkʷ-* was analysed as a thorn cluster, but the loss of **u* would be irregular and it is uncertain whether such clusters of dental and velar stops could develop into **kš*.[23] Even if PIIr. **makši-* is formed of PIE **medʰ-u-* and **kʷei-*, then this compound cannot be much older than Pre-PIIr., because in order to make sense as a compound 'honey-gatherer', the compound must have been introduced after the dialectal IE semantic shift from 'mead' to 'mead; honey' and after the semantic shift of **kʷei-* to 'to collect, hoard, pile'. Thus, the word cannot be of PIE origin even if it contains these PIE elements.

3. European *bʰi- ~ *bʰe-

The element **bʰi- ~ *bʰe-* 'bee' is found in Slavic **bъčelà* (cf. OCS *bъčela*, Russian *pčelá*, SCr. *pčèla*) Germanic **bīōn-* (OE *bēo*, OHG *bīa*), PC **beko-* (OIr. *bech*, W *begegyr*), Lith. *bitė*, Latv. *bite*, and possibly Lat. *apis*, Gk. σφήξ.[24] *IEW* reconciles these forms by reconstructing a PIE root **bʰei-* with expansions in **n*, **k*, or **t* to account for the various consonants found at the end of this root.[25] However, it is difficult to understand these additions with reference to PIE morphology, and they appear semantically empty because the same meaning 'bee' is found in each language family irrespectively of the root-final consonant. The element has been described as onomatopoeic in origin, which may ultimately be the case, but the similarity of forms within Indo-European suggests that they are not independently onomatopoeic, so a shared lexeme, either inherited or borrowed, must be reconstructed.[26] Hamp observes that this word is restricted to Europe, particularly Northern Europe, and finds no clearly unitary simple stem.[27] He therefore suspects that the word is an early borrowing from a European source rather than a word inherited from PIE.

Gamkrelidze and Ivanov describe this word as PIE in spite of its restricted dialect distribution to Europe.[28] They nevertheless project it back into PIE because the existence of a word for 'honey' necessitates a word for 'bee' and because of shared myths between IE

Uralic and Proto-Aryan in Archaeological Perspective', in Christian Carpelan, Asko Parpola and Petteri Koskikallio (eds), *Early Contacts between Uralic and Indo-European: Linguistic and Archaeological Considerations* (Helsinki: Suomalais-Ugrilainen Seura, 2001), 55–150 (114–15).

[23] Holopainen, 'Indo-Iranian Borrowings in Uralic', 141.

[24] A putative Proto-Iranian **baina-* 'fly, bee' (cf. Ossetic *bynʒ*, *binʒæ* 'fly', *mydybynʒ*, *mudbinʒæ* 'bee', Baluchi *bēnag*, *bēnay* 'honey; beehive; bee', Pashto *waynə́*, *wenə́*, *wuynə́* 'termites, white ants') does not belong to this etymon, contra Vera Sergeevna Rastorgueva and D. I. Èdel'man, *Ètimologičeskij slovar' iranskix jazykov*, 4 vols (Moscow: Vostočnaja Literatura, 2000–20), I, 61–2. This word rather comes from Proto-Iranian **paina/i-*, with voicing back-formed from the intervocalic voicing in **hangu-paina/i-* 'bee honey', see Krzysztof Tomasz Witczak, 'Iranian **paina-* "Honey" and **hangu-* "(Queen) Bee"', *Studia Etymologica Cracoviensa*, 10 (2005), 205–9 (208). Similarly, Lat. *fūcus* 'drone' has two competing etymologies. It can be reconstructed to **bʰoiko-* to connect it to **bʰi- ~*bʰe-*, but this requires an otherwise unattested *o*-grade variant. An alternative reconstruction is **bʰouk(ʷ)o-* (*IEW* 163), with the cognates OE *bēaw* and Low German *bau* 'gadfly', cf. Michael Weiss, 'Life Everlasting: Latin *Iūgis* "Everflowing", Greek Ὑγιής "Healthy", Gothic *Ajukdūþs* "Eternity" and Avestan *Yauuaēȷ̄ī-* "Living Forever"', *Münchener Studien zur Sprachwissenschaft*, 55 (1994), 131–56 (140); *EDLI* 245. The latter etymology is to be preferred, because *fūcus* cannot have meant 'drone' only. Varro defines the *fūcus* as black, and Plautus describes it as consuming bees; these descriptions are consistent with the gadfly. Le Sage, 'Bees in Indo-European Languages', 19, argues that if **bʰ(e)i-* can be distorted to give **bʰe-* in Celtic, then surely it can be distorted to give **bʰeu-* as well, so that *fūcus*, *beaw* and *bau* can be related to the element **bʰi-* on a deeper level. Still, the connection remains problematic both formally and semantically.

[25] *IEW* 116.

[26] Le Sage, 'Bees in Indo-European Languages', 17–19; *EDLI* 245.

[27] Eric P. Hamp, 'Varia III', *Ériu*, 22 (1971), 181–7 (186–7).

[28] Gamkrelidze and Ivanov, *Indo-European and the Indo-Europeans*, 516–17.

cultures. They also suggest a lexical link between PIE and Egyptian *bj.t* 'bee', arguing for a Near Eastern PIE homeland on the grounds that contact with Egyptian was only possible in that area.[29] Vennemann also identifies Egyptian *bj.t* 'bee' or a cognate thereof as the source for Indo-European words containing the element **bʰi-*, but he better accounts for its European distribution by positing that this lexical exchange took place in Europe after the Indo-Europeanization of Europe.[30] He proposes that the word spread with a seafaring Hamito-Semitic superstrate population along the Atlantic and North Sea coast. This account makes it possible to understand root expansions in **t* as an Egyptian feminine suffix. It does not, however, explain the vocalic alternations that will be discussed hereafter. Another issue is the existence of this word in Balto-Slavic, which was poorly connected to the North Sea region. The explanation also depends on his theory of a Hamito-Semitic superstrate in Europe; without it one would expect more reflexes in IE languages closer to Egypt; however Greek, the closest IE language to Egypt, uses μέλισσα for 'bee'.[31]

3.1. Germanic *bīōn-

PGm. **bīōn-* is reconstructible to an ablauting *n*-stem to explain the variation in forms between **bīōn-* (Nw. *bie*, OHG *bīa*, OE *bīa*, *bīo*, Du. *bij* 'bee'), **bīnon-* (MHG *bīne*, *beine* 'bee'), and **binon-* (OHG *bina*, MLG *bene* 'bee').[32] Forms with long **ī* continue the full-grade **bʰei-* and those with short **i* continue zero-grade **bʰi-*. The form that entered Germanic likely had one of these shapes, and the variation **bʰei-* ~ **bʰi-* may have been part of the donor language's morphology in order to account for the Germanic flexion as an *n*-stem. Vennemann proposes that OE *imbe*, OHG *imbi*, German *Imme* 'bee (swarm)' < PGm. **embja-* contains this word as its second element, with the first element or the whole compound borrowed from a Hamito-Semitic **Vm-* 'people'.[33]

3.2. Celtic *beko-

The Insular Celtic material comprises OIr. *bech* 'bee' and W *begegyr*, *bygegyr* 'drone'. Some disagreement exists as to the original stem vocalism.[34] *VKG* and *LEIA* reconstruct **e*, while *IEW* and *EDPC* reconstruct **i*.[35]

For OIr. *bech*, either PC **biko-* or PC **beko-* may be reconstructed, as this contrast in stem vowel is lost with Primitive Irish lowering.[36] It is theoretically possible to uncover the original vocalism from oblique case-forms that cause raising (e.g. genitive singular) when the stem ends in a voiceless consonant, because intervening voiceless consonants appear to block this

[29] Gamkrelidze and Ivanov, *Indo-European and the Indo-Europeans*, 773.

[30] Vennemann, 'Germania Semitica'.

[31] The appurtenance of σφήξ 'wasp' to this element is doubtful, see §3.6.

[32] Guus Kroonen, *The Proto-Germanic* n-*Stems: A Study in Diachronic Morphophonology* (Amsterdam: Rodopi, 2011), 228–31.

[33] Vennemann, 'Germania Semitica', 479–83.

[34] Marieke Peters, 'De etymologie van Oudiers *bech* "bij" en de herkomst van Ierse honingbijen', *Kelten*, 81 (2019).

[35] *VKG* I, 367, 537; *LEIA*, B24–5; *IEW* 116; *EDPC* 65.

[36] The variant forms Ir. *meach* 'bee' and ScG *speach* 'wasp' are secondary. Ir. *meach* has a central distribution among Irish dialects, as opposed to the peripheral *beach* (Hamp, 'Varia III', 184), and the shift to *m-* can be explained from the gen. pl. form *na mbeach*. The *s* in *speach* is unlikely to be old (contra *VKG* I, 88, who compares it with Greek σφήξ). For it to be old would require that the onset **sbʰ-* survived as PC **sb-* > Ir. *sp-*. If this **bʰ* following the **s* merged with **sp-* in PC or any time before that, however, the expected reflex would be PC **sɸ-* > Ir. *s-*. It is more likely to be a shortening of *coinnspeach* 'hornet' < *conas beach* lit. 'bad-tempered bee'.

raising.[37] Thus, a gen. sg. **bikī* would be expected to yield **bich* and a gen. sg. **bekī* would be expected to yield *beich*. As only the latter form is attested in *eDIL*,[38] the reconstruction **beko-* is most straightforward. However, analogy with *o*-stems not ending in voiceless consonants may not be excluded here; such analogy is found in the gen. sg. *meisc* for expected **misc*, from *mesc* 'drunk' < PC **misko-*.[39] If a similar analogy occurred in gen. sg. *beich*, the original vocalism cannot be recovered; if such an analogy did not occur, the original vocalism was **e*.

Both stem vowels are attested in W *begegyr*, *bygegyr*; the former reconstructs to **e* and the latter to **i*. This vacillation in vocalism could be the result of an irregular vowel reduction to *y* in pretonic syllables also seen in *eleni, yleni* 'this year'. Alternatively the *y* is dissimilatory before the following *e*, or the *e* is dissimilatory before the *y* in the final syllable; equally irregular processes of assimilation may be imagined with equal ease.[40] As long as these vowel reductions and possible dissimilations remain poorly understood, it cannot be determined which form is original. The earliest attestation of this word is in the poem *I Ddymuno Lladd y Gŵr Eiddig* by Dafydd ap Gwilym.[41] Here, of the eight manuscript attestations, seven have *e* and one has *y*.[42] In other sources given by *GPC*, *e* similarly predominates. Because *e* is more common in early texts, the Welsh suggests PC **beko-* over **biko-*.

Limousin Occitan *bec*, Creuse *beco*, and Italian dialectal *bega* 'wasp' lead back to a Gaulish **bekos*.[43] Gaulish therefore suggests an original **e*, but the material suggesting this source only comprises borrowings, and small phonetic differences like the one between [e] and [i] may well be lost in the process of borrowing.

When the cases of Irish, Welsh and Gaulish are each considered independently, not one language provides compelling evidence for reconstructing **e* over **i*. But taken together, a reconstruction **beko-* is clearly to be preferred over a reconstruction **biko-*. The upshot of a PC form without **i* is that no shared vocalism can be reconstructed between Celtic on one side, and Germanic, Italic and Balto-Slavic on the other side. To complicate matters further, PC **bitamon-* discussed in §9.4 does have original *i*-vocalism.

W *begegyr* means 'drone', and its onset *beg-* may be equated with OIr. *bech* and Gaulish **beco-*, but the second element *-egyr* does not have a satisfying etymology. Cognacy with Lat. *piger* 'inactive' may be rejected, as it implies a mismatch between a Celtic original root-final voiceless stop **peik-* and a Latin voiced stop **peig-*.[44] Perhaps, then, the word contains two suffixes: the originally adjectivizing *-eg* < PC **-ikā* and a suffix *-yr*. Adjectives in *-eg* often gained a substantive meaning signifying appurtenance, for example *bronneg* 'breastplate', from *bron* 'breast'.[45] Thus an old formation **begeg* 'belonging to the bee' may be proposed. The suffix *-yr* appears to be a Brittonic innovation also found in the animal names *crëyr* 'heron' from *crëu* 'to croak' and W *eryr*, MB *erer* 'eagle' contrasting with a suffixless OCo., MB *er* 'id'.[46]

[37] David Stifter, *Sengoídelc: Old Irish for Beginners* (Syracuse: Syracuse University Press, 2006), 44.

[38] *eDIL* s.v. *bech*.

[39] *eDIL* s.v. *mesc(c)*.

[40] *IEW* suggests that the form with *e*-vocalism is a taboo deformation, but this can equally easily be said for the form with *y*-vocalism.

[41] *GPC* s.v. *bygegyr, begegyr*.

[42] Huw Meirion Edwards, Dylan Foster Evans, Dafydd Johnston and A. Cynfael Lake, *Gwaith Dafydd ap Gwilym* (2007), *http://www.dafyddapgwilym.net/*, poem 116, accessed 1 October 2022.

[43] Xavier Delamarre, *Dictionnaire de la langue gauloise: Une approche linguistique du vieux-celtique continental* (Paris: Editions Errance, 2003), 70.

[44] Contra Whitley Stokes, 'Irish etymologies', *Revue Celtique*, 27 (1906), 85–92 (85).

[45] Stefan Zimmer, *Studies in Welsh Word-Formation* (Dublin: DIAS, 2000), 497ff.

[46] OCo., B *er* can be a direct reflex of PC **orū*, the *n*-stem nom. sg. of PIE **h₃ér-on-* (Hitt. *ḫāran-*, Go. *ara*, Lith. *erẽlis* 'eagle', Gk. ὄρνις 'bird'). MIr. *irar, ilar* 'eagle' appears to be a borrowing from Brittonic following Brittonic *i*-affection and suffixation with *-yr, -er*. The

3.3. Slavic *bьčelà

PSl. **bьčelà* is attested in OCS *bьčela*, *bъčela*, Russian *pčelá*, *bčelá*, Czech *včela*, and Serbo-Croatian *pčèla*, *čèla* among others, and is reconstructed **bʰikelehz*.[47] It is formed with a diminutive suffix **-el-* found productively in Baltic.[48] PSl. **bьčelà* may go back to an older **bečelà*, because the variation in vocalism between **vьčerъ* 'evening' and **vьčera* 'yesterday' suggests a development of **e* > **ь* before **č*.[49] This allows for a reconstruction **bʰek-* rather than **bʰik-*, providing a potential match for the *e*-vocalism found in Celtic.

3.4. Lith. bìtė

The Baltic material comprises Lith. *bìtė*, *bìtis*, *bitìs*, Latv. *bite*, OPr. *bitte* 'bee'. Together they allow for reconstruction of an element **bʰit-*.

3.5. Lat. apis

Lat. *apis* 'bee' has no single commonly accepted etymology.[50] Le Sage suggests intra-Latin derivations from *opus* 'work', *apsiscor* 'to obtain', *apio* 'to connect', or *bibo* 'to drink',[51] but the derivation would be irregular in all these cases. He also tentatively suggests a connection with Basque *abia* 'gnat', but this is semantically unsatisfying; even if it is borrowed, the direction of borrowing could be the reverse. Gamkrelidze and Ivanov suggest that it is related to **bʰ(e)i-* with taboo replacement of the initial consonant.[52] Vennemann identifies an Egyptian *ʿfj* as the source of Lat. *apis*.[53] The adoption of *f* as Lat. *p* requires borrowing before Italic developed its **f*, projecting the borrowing event back into pre-Proto-Italic, which Vennemann places in north-western Europe. However, it is not certain whether a foreign *f* in any pre-stage of Italic could yield Lat. *p*, and whether such a pre-stage of Italic could be in contact with Egyptian. Also, the meaning 'honeybee' is found in the phrase *ʿfj n bjt* 'honey-*ʿfj*'. If this *ʿfj* required such a specification with 'honey', then perhaps it did not by itself mean 'bee' only, as opposed to Lat. *apis*, which meant 'bee' even on its own.

Lat. *apis* may ultimately be related to the **bʰei*-element. The case of **dʰron-* ~ **tron-* discussed in §5 provides a parallel for an alternation between a voiced aspirate and a voiceless stop consonant. Because of their semantic similarity, it stands to reason that **bʰei-* and **Dron-* are from a similar source. Under such an assumption, reflexes of a voiceless **pei-* may be predicted analogous to **dʰron-* ~ **tron-*. The onset *a* in Lat. *apis* may then be an *a*-prefix found in substrate words across Europe; an *a*-prefixed form has a vocalic reduction in the second syllable, cf. Lat. *raudus* ~ OHG *aruz* 'ore' < **raud-* ~ **a-rud-*.[54] Similarly, PGm. **bīōn-* and *apis*

assumption of such a suffix *-yr* and that MIr. *irar, ilar* is borrowed from Brittonic incidentally solves multiple problems with the Celtic word for 'eagle', which is more traditionally reconstructed PC **eriro-* and supposedly directly continued by MIr. *irar*, W *eryr*, MB *erer*. This traditional reconstruction has two problems. The first is that the initial **e-* rather than **o-* required for the Irish cannot be reconciled with the PIE onset **hₓe-* (*EDPC* 117; *EDPG* 32). The other problem is that there is no Celtic evidence for an archaic suffix **-iro-*; its apparent removal in Breton and Cornish speaks against its old age.

[47] *EDSIL* 72.

[48] Le Sage, 'Bees in Indo-European Languages', 18.

[49] *VKG* I, 88.

[50] *EDLI* 47.

[51] Le Sage, 'Bees in Indo-European Languages', 20.

[52] Gamkrelidze and Ivanov, *Indo-European and the Indo-Europeans*, 516.

[53] Vennemann, 'Germania Semitica'.

[54] Schrijver, 'Animal, Vegetable and Mineral'; Guus Kroonen and Rune Iversen, 'Talking Neolithic: Linguistic and Archaeological Perspectives on how Indo-European was Implemented in Southern Scandinavia', *American Journal of Archaeology*, 15 (2017), 511–25 (518).

allow for reconstruction to **Bei-* ~ **a-Bi-*, where *B* stands for a sound or group of sounds that could be adopted as both **bʰ* and **p* by IE speakers. This scenario allows for a substratal **bʰei-* to be ultimately related to Egyptian *bj.t*. One may recall the ultimately known Akkadian origin of Gk. ἄγλις and γέγλις 'garlic', but its *a*-prefix suggests that its proximate source lies in a European substrate.[55] Similarly, *apis* and all the other reflexes of **bʰei-* in other European languages could have entered Indo-European through the language of the *a*-prefix, but this unknown language may itself have borrowed this word from Egyptian. Contra Vennemann, then, this word does not necessarily imply an Afroasiatic superstrate in Atlantic Europe, because an intermediary language may be proposed.

3.6. Greek σφήξ

Greek σφήξ 'wasp' does not have a satisfying etymology. It has been compared with σφήν 'wedge', referring to the wasp's stinger, and to σφάκελος 'convulsion', referring to the wasp's constricted body, but neither comparison is semantically satisfying.[56] *EDG* considers it Pre-Greek and compares ψήν 'gall-insect' with the assumption of a Pre-Greek alternation ψ- ~ σφ-. Even if such metathesis is a feature of Pre-Greek, it leaves the ψήν ~ σφήξ without a further etymology.

Perhaps σφήξ can be brought into the fold of the **bʰe-* ~ **bʰi-* element if the meaning 'wasp' is a secondary development.[57] It agrees in vowel quality, though not quantity, with PC **beko-* and it shares its consonantal skeleton. It only differs in that Greek has *s-* and that it is inflected as an athematic noun as opposed to the Celtic thematic flexion. The long vowel in Greek as opposed to the short vowel elsewhere is paralleled by **Dron-*, whose reflexes in Greek have long vowels while short vowels are the norm elsewhere. If Doric σφᾱ́ξ (Theocritus) represents a regular continuation of Proto-Greek and is not a hyper-Doricism, then σφήξ is unrelated to the 'bee'-word discussed here.[58] It is for this reason that the appurtenance of σφήξ to **bʰe-* ~ **bʰi-* is doubtful.

3.7. Synthesis

The word is restricted to Europe, but within Europe it is quite widespread: Celtic, Germanic, Italic, Balto-Slavic, and possibly Greek, contain this element. A PIE origin of this element is unlikely: it is restricted to Europe, the alternation in vocalism **bʰe-*,**bʰei-* looks un-IE, and expansions in **k* and **t* do not change the meaning 'bee' when compared to non-expanded forms, making it difficult to identify them as PIE derivatives such as **-ḱo-* or **-ti-*.[59] An onomatopoeic origin cannot be excluded, because the only element occurring in all branches is the onset **bʰ-*, but even words with an ultimately onomatopoeic origin may be related. An independent onomatopoeic origin poorly accounts for the ubiquity of this element within Europe as opposed to its absence outside Europe. Moreover, many other elements appear across branches that are not closely related in either space or genetic affinity, cf. **k* in Celtic,

[55] Guus Kroonen, 'On the Etymology of Greek *ἄγλις* and *γέγλις* "Garlic": An Akkadian Loanword in Pre-Greek', *Journal of Indo-European Studies*, 40 (2012), 289–99.

[56] Pierre Chantraine, *Dictionnaire étymologique de la langue grecque: histoire des mots*, 4 vols (Paris: Klincksieck, 1968–80), 1077; *EDG* 1430.

[57] *VKG* I, 88.

[58] *VKG* I, 537.

[59] These extensions in velars and dentals are rather reminiscent of the 'nut'-word, presumably borrowed from a non-IE language and found with a root-final velar in Lat. *nux*, a dental in Germanic (cf. OE *hnutu*), and without any consonant in OIr. *cnú*, W *cnau* (*EDPC* 212).

Slavic, and possibly Greek, as well as **i* in Celtic, Germanic, Baltic, and possibly Italic and Slavic. The reality of an alternation between **e* and **i* is backed up by Celtic, because both **$b^{h}e$-* and **$b^{h}i$-* must be reconstructed for Celtic to account for all the forms.

Egyptian *bj.t* and *ʿfj* alone cannot account for all the alternations found in Europe. A Hamito-Semitic superstrate would moreover account for words found in languages along the Atlantic and North Sea coast, but Balto-Slavic and arguably Italic fit this geographic description poorly. If anything, this word rather appears to have entered Indo-European from a pre-Indo-European substrate. The *a*-prefix and alternation **b^{h} ~ *p* in *apis* are even paralleled by other words thought to have a substrate origin. It is conceivable that the word that entered Indo-European was itself related to Egyptian, but the pan-European distribution and formal dissimilarity argue against direct borrowing from Egyptian into Indo-European.

4. Welsh, Cornish gwenyn*, Breton* gwenan

W *gwenyn*, sg. *gwenynen*, OCo. *guenenen* gl. *apis*, MCo. *gwenyn*, sg. *gwenenen*, B *gwenan*, sg. *gwenanenn* all share the meaning 'bee'. In early Welsh, a variant ending in *-en* is found in *gwenen*.[60] It is derived from the PC verb **g^{w}an-o-* 'to strike, kill, pierce' (OIr. *gonaid*, W *gwanu*, *gwân*. B *gwanañ*, Co. *gwana*); thus, the bee was known as the 'stinger' among Brittonic-speaking people.[61] The ending *-yn ~ -en* in W and Co. appears to be nominalized adjective in **-ino-* or **-inā* also found, for example, in W *melyn* (masc.), *melen* (fem.) 'yellow', from **meli-* 'honey' discussed in §7.1. The **i* implies that the base of W *gwenyn*, etc., was an *i*-stem derivative of **g^{w}an-o-* still found in Old Irish *gein* and *guin* 'wound'. Masculine **g^{w}enino-* regularly yields W and Co. *gwenyn*, while feminine **g^{w}eninā* regularly yields W and Co. *gwenen*.[62] The ending *-an* in Breton *gwenan* is not the regular outcome of either form, but alternation between expected *-en* and attested *-an* is paralleled by OB *blithen*, *blithan* MB *lizenn*, *lyen*, *lyan* 'year'.

5. European *Dron- ~ *Dren-

English *drone* and its cognates within Germanic appear related to various words for drones or similar-looking insects in Balto-Slavic, Greek and Celtic.[63] For Germanic, an ablauting element **d^{h}ren- ~ *d^{h}ron- ~ *d^{h}rn-* may be reconstructed, for Balto-Slavic an element **tron-* and the derivatives **tronto-* and **trontnio-* may be reconstructed, for Greek a vocalic alternation between **d^{h}rēn-* and **d^{h}rōn-* may be reconstructed, and in Celtic an element **tron-* may be

[60] The phonetic reality of this *e*-vocalism is confirmed by the Black Book of Carmarthen (Aberystwyth, NLW Peniarth 1, ff. 18^{r}, ll–12–18^{v}, 1–2), where *guenen* is found in rhyming position with *dien* 'grass', *Moesen* 'Moses' and *femen* 'woman', and by a poem by Ieuan Gethin (15th c.), *Cwyn am ddifa bydafau*, which has *gwenen* rhyming with *pren* 'wood' twice, Ann Parry Owen (ed.), *Gwaith Ieuan Gethin* (Aberystwyth: Canolfan Uwchefrydiau Cymreig a Cheltaidd, 2013), 38, ll. 19–20, 23–4. The same *e*-vocalism is also found in the derivative *gwenenydd* 'beekeeper'.

[61] Le Sage, 'Bees in Indo-European Languages', 19–20.

[62] A zero-grade **g^{wh}n̥-* underlies the PC verbal base **g^{w}an-o-*, and few traces of an *e*-grade remain in Celtic (*EDPC* 144). While masculine PC **g^{w}anino-* and **g^{w}enino-* could yield W *gwenyn* equally well, for the feminine forms only an *e*-grade **g^{w}eninā* yields *gwenen*; a zero-grade **g^{w}aninā* would yield ***gwanen* (cf. the river-name *Hafren* < **sabrinā* 'Severn'). Thus the proposed formation **g^{w}enino-/ā* is somewhat archaic in that it pre-dates the Common Celtic generalization of the zero grade, although a zero-grade reconstruction can be salvaged by assuming that the first *-e-* in feminine *gwenen* is analogical after *gwenyn*.

[63] *IEW* 255–6.

reconstructed. These forms are not reconstructible to a single PIE root, as the initial dental vacillates between **dʰ-* and **t-*. An ablaut-like vocalic alternation between **e* and **o* is also found in the reconstructions.

These words appear related within each branch to various verbs meaning 'to drone, buzz, wail', and to nouns describing a buzzing insect. However, it is unlikely that all words for 'drone' are independently formed by the same verbal base: many other animals and other natural phenomena can make a buzzing sound, yet this lexeme is used specifically for the drone across Europe, and only in Europe. It is unlikely that such an onomatopoeic verbal base **Dron-* was independently formed with the meaning 'to buzz': many onomatopoeic formations for 'to buzz' contain a labial stop instead, cf. Eng. *purr*, *buzz*.[64] It is nevertheless difficult to say whether it was the noun for 'drone' that was initially adopted in Indo-European, or the verb, but at least the Brittonic and Greek verbal formations discussed here appear denominal.

The Celtic words for 'to buzz' adduced under **dʰren-* in *IEW* are OIr. *dresacht* 'creaking noise (of a wheel)' and Gallo-Lat. *drēnsō*, *-āre* 'cry (of a swan)', both with initial *d* going back to PIE **d(ʰ)*.[65] Celtic words for 'drone' go back to a (later lenited) *t*, suggesting PIE **t*. This variation in onsets suggests that words for 'drone' and 'to buzz' are not etymologically related at least within Celtic. Similar words for squeaking and the like are found in IE languages without a related word for 'drone' outside Europe, viz. Skt. *dhráṇati* 'to sound' and Arm. *dṙnčim* 'to blow a horn'.[66] Unlike the drone-word, these words never show alternation **t*~**dʰ*. A folk-etymological relationship whereby drone-words with **dʰ-* are influenced by the onomatopoeic root is possible, leaving **t-* as an archaism. However, this contamination would have to occur independently in both Greek and Germanic to account for all the forms.

5.1. Proto-Balto-Slavic *tron(t)o-

A Proto-Balto-Slavic element **tron-* is found in various formations.[67] Lith. *trãnas* 'drone' and Latv. *trans* 'drone' are reconstructible to **trono-*. Slovak *trút*, Serbian Church Slavonic *trutъ* 'wasp', SCr. *trût* 'drone' and several other Slavic forms allow a reconstruction **tronto-*. Polish *truteń* and Russian *trúten'* 'drone' are reconstructible to **trontnio-*; such a formation may be analogous to other words in *-enь*, such as Polish *szerszeń*, Russian *šéršen'* 'hornet' or Russian *slepen'* 'horsefly'. All of the attested forms show original *o*-vocalism and anlaut in **t*. In Latvian, a form with initial *d-* is also found in *dranis*, but its onset may be the result of contact with Finnic.[68]

5.2. Proto-Germanic *dren- ~ *drun- ~ *dran-

The Germanic material varies considerably in vocalism. PGm. **drena(n)-*, *-ōn-* is found in OHG *treno* gl. *apis*, *fucus*, MHG *tren*, OS *dreno* 'drone', among others; these forms have *e*-vocalism. PGm. **drana(n)*, *-ōn-* is found in OE *dran*, *drane*, *dræn* gl. *fucus*, ME *drane*, E dial. *drane*, OS *drano* and NHG *Tran*; these forms may go back to original *o*-vocalism. PGm. **druna(n)-*, *-ōn-* may be reconstructed for MDu. *darne*, *dorne*, 'some kind of bee' and MoE *drone*, and **duran-* for OE *dora* 'bumble-bee'; this *u*-vocalism may be a reworking of a zero-grade form. This variation in vocalism is reconcilable to an ablauting *n*-stem.[69] A root

[64] *IEW* 142–3.
[65] *IEW* 255–6.
[66] *IEW* 255–6.
[67] *EDSIL* 498; *EDPG* 101.
[68] Valentin Kiparsky, 'Slavische und baltische b/p-Fälle', *Scando-Slavica*, 14 (1968), 73–97 (83).
[69] Kroonen, *Proto-Germanic* n-*Stems*, 152–3.

**dʰren-* would allow reconstruction of a paradigm with all three types of vocalism through ablaut, cf. nom. sg. **dʰrén-ōn*, gen. sg. *dʰr̥-n-ós*, acc. pl. **dʰron-n-n̥s*. The precise vocalism of the donor form of a Germanic *n*-stem is difficult to establish, but the *e*-vocalism found in the nominative was likely present. Perhaps the word also had this ablaut-like vowel variation in the source language. Even if only one variant in vocalism was borrowed into Germanic, the Germanic primarily offers evidence for *e*-vocalism, as this is found in the nominative. This contrasts with the *o*-vocalism found in Balto-Slavic and Celtic, but agrees with the (albeit long) *e*-vocalism in Gk. θρήνη.

5.3. Greek

Greek θρῶναξ 'drone' is reconstructible to **dʰrōn-*, and shares its initial **dʰ-* with Germanic, but not Balto-Slavic and probably also not Celtic. Its *o*-vocalism is shared with Balto-Slavic and Celtic. This *o* is short elsewhere, but Proto-Germanic likely had a paradigm containing long **ē*, so even a long vowel is paralleled outside Greek. All in all, Gk. θρῶναξ appears about as different from its extra-Greek cognates as these cognates are to each other, so if a substrate word **Dron-* is to be accepted, then θρῶναξ must be descended from it.

Within Greek, θρῶναξ has been connected to various forms sharing its consonantal skeleton: θρήνη, ἀθρήνη, ἀνθρήνη, ἀνθηδών, ἀνθρηδών, τενθρήνη, τενθρηδών and πεμφρηδών. These words variously refer to bees, hornets and (burrowing) wasps. Beekes has connected all these forms through various Pre-Greek phenomena.[70] The variants θρήνη ~ ἀθρήνη ~ ἀνθρήνη are connected through the Pre-Greek phenomena of *a*-prefixation and nasal infixation, while τενθρήνη, τενθρηδών are argued to be root-reduplicated variants of ἀνθρήνη, ἀνθρηδών, respectively. The variation δ ~ ν between forms in -ηδών and -ήνη is paralleled by other words that show alternation between a stop and a homorganic nasal. Beekes adduces parallels for each of these alternations,[71] but it is difficult to envisage that all of these words are borrowed from Pre-Greek, because even if these alternations are a feature of borrowing from Pre-Greek, it follows that each of these words was independently borrowed into Greek, implying that a single Pre-Greek lexeme was borrowed many times over into Greek. An analysis of how the variation could arise within Greek itself requires fewer borrowing events, and its postulates are easier to disprove.

Gk. θρῶναξ contains a somewhat productive velar suffix often found in words for animals, cf. κόραξ 'raven', ὕραξ 'shrew-mouse'.[72] Within Greek, θρῶναξ appears most closely related to θρήνη 'bee, hornet, wasp' as it differs only in vocalism and in that the latter contains a thematic ending instead of a velar suffix. The difference in vocalism is formally reconcilable to an Indo-European qualitative ablaut **ō* ~ **ē*, either as full grades with **hₗ* or as lengthened grades. However, it is difficult to imagine how this could have occurred here, as such formations tend to be of considerable age and restricted to the PIE lexicon.[73] A PIE origin of the **Dron-* element would be problematic, so perhaps this ablaut-like vowel change is also a feature of the substrate language. This is shown by reflexes of **Dren-* with *e*-vocalism in Germanic. Further cognates are θρῆνος 'dirge, lament' and the denominative θρηνέω 'to wail'.

[70] *EDG* 104, 105, 554, 1467; Robert S. P. Beekes, *Pre-Greek: Phonology, Morphology, Lexicon* (Leiden and Boston: Brill, 2014), 87.

[71] Beekes, *Pre-Greek*, 13, 14, 27.

[72] Pierre Chantraine, *La formation des noms en grec ancien* (Paris: Honoré Champion, 1933), 379.

[73] The velar suffix does not necessarily take the *o*-grade with inherited roots, cf. δέλφαξ 'mother swine' < PIE **gʷelbʰu-* 'womb' (*EDG* 313).

Another reasonably certain etymon of some of the words mentioned is ἄνθος 'flower', which may be the derivational base of ἀνθηδών 'bee; hawthorn' after addition of the animal suffix -ηδών.[74] The suffix -(η)δών is somewhat productive in agent nouns and animals specifically, cf. τείρω 'to oppress, destroy' > τερηδών 'wood-worm', ἀείδω 'to sing' > ἀηδών 'nightingale'.[75] Accepting that ἄνθος 'flower' served as the derivational base for some bee-words strengthens the idea that ἀν- in ἀνθρήνη is haplological for *ἀνθο-θρήνη,[76] rather than a Pre-Greek *a*-prefix.[77] The resulting form ἀνθρήνη is quite similar in both form and meaning to ἀνθηδών. The rhotic in ἀνθρηδών may consequently be explained as the result of a folk-etymological association of ἀνθηδών with θρήνη or ἀνθρήνη.

Semantically τενθρήνη, τενθρηδών differ from ἀνθρήνη and ἀνθρηδών in that the former refer to ground-burrowing wasps specifically while the latter terms are more general in meaning. This onset is also found in τερηδών 'wood-worm; grub which infests beehives'. It thus seems that the element τεν- meant 'burrowing'. Perhaps τενθρηδών is a lexical blend of τερηδών (or its simplex verb τείρω) and ἀνθρηδών, where the former provided the meaning 'burrowing' and the latter 'wasp'. Such a blend also gives a second possible origin of the intrusive rho in ἀνθηδών: perhaps it was ἀνθηδών which merged with τερηδών and it is the latter's medial rhotic that ended up in the lexical blend ἀνθρηδών. Similarly to τενθρηδών, τενθρήνη can be a blend of τερηδών (or τείρω) and θρήνη.

EDG suggests that τενθρηδών (and consequently related forms) could originally have contained a labiovelar on the basis of πεμφρηδών because in non-Aeolic dialects, a labiovelar regularly turns into a dental before front vowels and turns into a labial before other vowels; in Aeolic, labiovelars always turn into labials. Such a reconstruction would invalidate a connection between θρῶναξ and any other forms discussed here, as θρῶναξ is not followed by a front vowel. Similarly, neither ἄνθος nor τείρω could be related to any other words discussed here, as both forms contain an etymological dental. However, πεμφρηδών is best reconstructed with a labial to allow for comparison with SCr. *bumbar* 'bumble-bee', Skt. *bambhara* 'bee';[78] these may be independent onomatopoeic formations, but even then they show a parallel for forming such onomatopoeias with labial sounds.

Forms lacking a nasal are sometimes found, cf. ἀθρήνη, τεθρηνιώδης 'honeycombed'. These forms are all reduced from words that are themselves lexical blends or compounds with haplological loss, so the loss of a nasal can be explained as extensions of these types of reduction in word size, rather than from Pre-Greek.

All in all, the various steps taken to explain the huge variety of forms within Greek itself yield two relevant etymons originally meaning 'drone' or 'wasp': **dʰrēn-* and **dʰrōn-*. The evidence for Pre-Greek morphology such as *a*-prefixation, prenasalization and reduplication is poor. Perhaps this is unexpected: the appearance of this drone-root across Europe implies that this word is from the general European substrate layer and not from the singular Pre-Greek language hypothesized to have been spoken in Greece before the Greeks arrived. This consequently implies that **dʰrēn-* and **dʰrōn-* may well have been borrowed into Greek before Indo-Europeans ancestral to the Greeks arrived in their historical location.

[74] Chantraine, *Dictionnaire étymologique*, 89–90; *EDG* 104.

[75] Chantraine, *La formation*, 360–2; *EDG* 27 rejects the connection between ἀείδω and ἀηδών because *ē*-grade in the noun is unexpected. However, the example of τείρω > τερηδών suggests that the η is part of the suffix, not the root, and therefore that ἀηδών is haplological for *ἀεδ-ηδών.

[76] *IEW* 255–6.

[77] *EDG* 105.

[78] Chantraine, *Dictionnaire étymologique*, 880.

5.4. Proto-Brittonic *tron-

Old Breton *satron*, Modern Breton *sardon*, sg. *sardonenn*[79] 'bumblebees' and OCo. *sudron* 'drones', sg. *sudronen* have verbal derivations meaning 'to buzz' in B *sardonad*, *sardonenniñ* and Co. *sudronenny*. The word does not appear to be attested outside Breton and Cornish. The latter part *-dron* can be equated with the drone-words in the other IE languages;[80] it likely represents an earlier lenited **tron*, in which case the onset accords more closely to Balto-Slavic **t-* than Germanic and Greek **dʰ-*. If somehow a sandhi phenomenon blocks the lenition in a compound, an initial *d-* can still be equated with the Germanic and Greek. There is no evidence of either original *e*-vocalism or a long vowel. The first element Co. *su-* and B *sa-* remains unexplained. The correspondence between Co. *u* and B *a* is not regular. Perhaps it reflects two irregular reductions of LPBr. **-aβ-*, in which case the element could be from **stab-*, cf. W *sefyll*, Co. *sevel*, B *sevel* 'to stand'. This verb can also carry the meaning 'be lazy, be idle' so that the compound can be analysed as 'idle *dron*', a common *Benennungsmotiv* paralleled, for example, by Irish *ladrann saithe* 'drone', lit. 'thief of the swarm'.

5.5. Synthesis

An independent onomatopoeic origin of the European word for 'drone' appears excluded on the grounds that the formal similarity is too great. A PIE origin can be excluded on account of its irregularity, with reconstructions requiring different initial dental stops and different vowel quantities and qualities. These irregularities find a parallel in Lat. *apis* vs. all other words containing **bʰe-* ~ **bʰi-*.

This leaves borrowing from an unknown source, possibly the same language as the source of **bʰe-* ~ **bʰi-*, as the most likely scenario.[81] The geographical distribution is awkward: Greek, Balto-Slavic, Germanic and (British) Celtic. Particularly the presence of this word in Greek makes for an awkward fit, as it is the only one lacking the **bʰi-* root. It is also geographically far removed from the others, implying that the word entered Greek before Greeks arrived in Greece.

6. Words for 'queen'

No PIE word for 'queen-bee' may be reconstructed. Naming strategies found in Celtic include 'mother' in W *modrydaf*, W *mamwenynen*, B *mamm-wenan*, 'sow' in Irish *cráin-bheach* and 'queen' in W *brenhines*. The first formation has the appearance of an archaism.

Welsh *modrydaf* 'queen-bee; old colony' may be analysed as a compound containing **modr-* < PC **māter-* 'mother' and *-ydaf* < *-fydaf*, the lenited form of *bydaf* cognate with OIr. *bethamain*.[82] A reflex of PC **māter-* is lost in all Brittonic languages except in the mythological name *Modron* < PC **mātronā* and as an element in PC **mātrikʷī-* 'aunt' (W *modryb*, OB *motrep*, B *moereb*, LCo. *modrab*). The formation of the *modrydaf* compound must antedate this loss of **māter-* in Brittonic, and because **māter-* is lost in all Brittonic languages, the formation of

[79] The modern Breton forms show metathesis *-dr-* > *-rd-*.

[80] Albert Deshayes, *Dictionnaire étymologique du breton* (Douarnenez: Chass-Marée, 2003), 645.

[81] An anonymous reviewer entertains the possibility that such a substrate language may have influenced the phonological shape of a putative inherited PIE word for 'drone'. This scenario is difficult to exclude, but it is not parsimonious in that it multiplies the amount of parameters required for the etymology to work, i.e. both a PIE etymology and the presence of a substrate language.

[82] *BB* 202; §9.4 discusses the second element.

the compound *modrydaf* must antedate the Common Brittonic period. Even if no cognates of this compound are attested in the other Brittonic languages, a word for 'queen-bee' in the Proto-Brittonic apicultural lexicon may be reconstructed.

7. Words for 'honey, mead'

Shared words for 'honey' and 'mead' are amply attested in both European and Asian branches and they even look fairly old in terms of inflection (**mel-i(t)-* with traces of a heteroclitic; **medʰ-u-* as a not particularly productive *u*-stem). Yet what they do not have is an intra-PIE root from which they are derived by known morphological processes. Consequently, we may say that these words are of PIE date. Ultimately, however, the words may well have a foreign source even if it cannot be established with certainty what this source was.[83]

7.1. PIE *mel-i(t)-

PIE **mel-i(t)-* 'honey' is one of the better-attested words of PIE. It is found in Anatolian, Armenian and in most European branches of Indo-European, cf. Hittite *militt-*, Gk. μέλι, Armenian *meɫr*, Latin *mel*, OIr. *mil*, Go. *miliþ* among others.[84] The word appears archaic in Indo-European because it has traces of heteroclitic inflection, for example in Lat. gen. sg. *mellis* < **mel-n-es* and Arm. gen. sg. *meɫ-u*, and on account of the existence of derivatives such as OIr. *milis*, W *melys* 'sweet' < PIE **melit-ti-* with archaic dental assibilation.[85] The ubiquity of this word across Indo-European shows not only that PIE speakers were familiar with honey, but also that this familiarity endured as speakers migrated away from their homeland. Derivatives meaning 'bee' are found in Albanian *bletë*, Armenian *meɫu* and Greek μέλισσα. However the formations are unidentical, implying that the derivations and the accompanying semantic shift post-date the PIE period. Restriction of this derivation to Albanian, Armenian and Greek moreover implies that the shift occurred in south-east Europe in post-PIE times.

7.2. PIE *medʰ-u-

PIE **medʰ-u-* is widely attested in both European and Asian branches of Indo-European and it can mean both 'honey' and 'mead', cf. Skt. *mádhu* 'honey; sweet intoxicating beverage', Avestan *maδu-* 'wine, mead', Ossetic *myd* 'honey', Gk. μέθυ 'sweet beverage; wine', Lith. *medùs* 'honey', Latv. *medus* 'honey; beverage', OIr. *mid* 'mead', among others. Whenever both **mel-i(t)-* and **medʰ-u-* are found in a single language, the former means 'honey' and the latter refers to a beverage. This suggests that **medʰ-u-* primarily or only meant 'mead' in PIE.[86]

[83] Uralic makes for a possible source. No native apicultural vocabulary is typically reconstructed for Proto-Uralic, and what is reconstructed is thought to be borrowed from PIE or later IE languages. But if the apicultural vocabulary of PIE itself cannot be demonstrated to be native, then the direction of borrowing cannot be demonstrated, and we must consider the possibility of the reverse direction.

[84] *IEW* 723–4.

[85] Gamkrelidze and Ivanov, *Indo-European and the Indo-Europeans*, 517.

[86] Gamkrelidze and Ivanov, *Indo-European and the Indo-Europeans*, 517–18. It was borrowed into Proto-Finno-Ugric **meti* 'honey' either from PIE or from an IE dialect, most likely Proto-Indo-Iranian, see Gamkrelidze and Ivanov, *Indo-European and the Indo-Europeans*, 829;

7.3. PIE *knH-(n)k-

An adjective **knh₂-(n)ḱo-* 'yellow (like honey, gold, amber)' may underlie PGm. **hunanga-* 'honey' (ON *hunang*, OHG *honang*, OE *honig*) and Gk. κνῆκος 'safflower'.[87] An original apicultural meaning 'honey' is possible here, but by no means certain. ToB *kro(ṅ)kśe** 'bee' has been proposed as a further cognate, but the comparison is formally problematic.[88] The word has been suggested to be derived from **keh₂r-* 'wax', but this requires laryngeal metathesis as well as an original heteroclitic inflection not attested in any descendant languages.[89]

8. Words for 'wax, honeycomb'

No PIE word for 'wax' or 'honeycomb' may be reconstructed, and known Celtic vocabulary appears to have entered Celtic rather recently, to the extent it is datable. Generally in Indo-European, words for 'wax' or 'honeycomb' are derived from words for 'to weave' or 'to arrange', in reference to the honeycomb's neat division into cells or the side-by-side arrangement of honeycombs in the beehive.

An instance where 'arrangement' shifted to 'honeycomb' is PGm. **hrētō-* (ODu. *rāta* 'honeycomb', MHG *rāze* 'honeycomb, stake'), for which an older meaning 'arrangement, stake' may be inferred from the OCS cognate *krada* 'bonfire, stake'.[90] The naming strategy OIr. *críathar melo* 'honeycomb', lit. 'honey-sieve' may be understood from the cells of a honeycomb being arranged like a mesh of a sieve. Because of the ubiquity of this naming strategy, little can be inferred about the age of this formation.

Two similar formations are found in Germanic and Balto-Slavic, viz. ON *vax*, OE *weax*, OHG *wahs* < PGm. **wahsa-* and Lith. *vãškas*, Latv. *vasks*, OCS *voskъ* < PBSl. **uosko-*.[91] The apparent metathesis between the velar and the **s* may perhaps be explained from a shared pre-form **(h₂)uog-sko-*.[92] There are two feasible PIE root connections: **h₂ueg-* 'to grow' (whence the Eng. homophone *to wax*) or **ueg-* 'to weave', with a semantic shift from either 'that which is grown' or from 'that which is woven' to 'wax'. A parallel for the latter semantic shift is OHG *wabo* 'honeycomb', from *weban* 'to weave'. Although the formation is plausibly based on a PIE root, the derivation and the apicultural meaning appears to be a post-PIE in view of the restriction of this word to Balto-Slavic and Germanic.

8.1. *kēr- ~ *kār-

An element **kēr- ~ *kār-* is found in several languages in Eastern Europe. Within Indo-European, it is originally restricted to Baltic and Greek, cf. Lith. *korỹs*, Latv. *kâre* 'honeycomb', Greek Attic-Ionic κηρός 'wax', κηρίον 'honeycomb' and Doric κᾱρός 'wax'.

Carpelan and Parpola, 'Emergence, Contacts and Dispersal', 114; Holopainen, 'Indo-Iranian Borrowings in Uralic', 146.

[87] *EDPG* 255; *EDG* 722.

[88] Adams, *Dictionary of Tocharian B*, s.v. *kro(ṅ)kśe**.

[89] *EIEC* 271; the proposed non-IE origin of this etymon discussed in §8.1 cannot be reconciled with these archaic morphological transformations.

[90] *EDPG* 245.

[91] The word was borrowed from Baltic into Finnic, possibly along with several other words relating to apiculture, cf. Finnish and Estonian *vaha*, Santeri Junttila 'The Prehistoric Context of the Oldest Contacts between Baltic and Finnic Languages', in Riho Grünthal and Petri Kallio (eds), *A Linguistic Map of Prehistoric Northern Europe* (Helsinki: Suomalais-Ugrilainen Seura, 2012), 261–96 (271).

[92] *EDPG* 566.

They are formally reconcilable to **kār(i)o-*, i.e. PIE **keh₂r(i)o-*, but the word is restricted to Eastern Europe.[93] More comparanda are found in Uralic and Turkic. Within Uralic, it is attested in Estonian *kärg* 'honeycomb' but not elsewhere in Finnic, within Mordvinic, Erzya *keŕas* and Moksha *käŕas* 'honeycomb' are found, within Mari there is West Mari *käraš* and East Mari *karaš* 'honeycomb', and Udmurt has *karas* 'honeycomb'. All of these forms are reconcilable to an original front vowel. Within Turkic, Chuvash *karas* 'wax, honeycomb', Tatar *käräz* and Bashkir *käräδ* 'honeycomb' also allow for an original front vowel.

The Indo-European words do not have a credible language-internal derivation. For the Baltic, a derivation from Lith. *kárti* 'to hang' has been suggested,[94] but this is semantically arbitrary, and no cognate verb is attested in Greek,[95] nor does it account for the vacillation between the Indo-European back vowel and Uralic and Turkic front vowel. A PIE heteroclitic **kóh₂-r*, obl. **kh₂-n-*, **kh₂-en-* 'wax' has been proposed to unify the words discussed here with a metathesized PIE **knh₂-kó-* (Eng. *honey*, Gk. κνηκός 'golden'), among others,[96] however no reflex of this element exists with a heteroclitic flexion and it requires metathesis. Such a paradigm is also unable to yield the front vowels required for Uralic and Turkic. In fact, the front and back vowels cannot be unified in PIE terms, so any reconciliation of the Indo-European with Turkic and Uralic implies a non-Indo-European etymology. Within Greek, there is another argument for a non-IE origin in the form of the derivative κήρινθος 'bee-bread', with the suffix -ινθος. This suffix is otherwise only found in non-inherited vocabulary, so κήρινθος, and therefore κηρός appear non-Indo-European in origin even without data from other languages.[97]

In non-Doric dialects, Proto-Greek **ā* becomes *ē*, so only a reconstruction with **ā* unifies Attic-Ionic κηρός with Doric κᾱρός. It is therefore conceivable that an Attic-Ionic form with *ē* was the source of the Uralic and Turkic comparanda, but this would require rather long-distance contact between Greece and Northern Eurasia after this change of **ā* to *ē*. It is also conceivable that the original vowel was **ē* and that the Baltic forms are from Uralic and Turkic. This, however, would require that Doric κᾱρός is a hyper-Doricism, and implies a far-fetched scenario whereby Lith. *korỹs*, Latv. *kâre* is not directly related to Gk. κηρίον, despite a shared pre-form **keh₂rio-*. Both scenarios are difficult to envisage, so they suggest a third possibility whereby an unknown language in Eastern Europe gave the donor form, and it is this donor language that is responsible for the difference in vocalism.

Greek κηρός is borrowed into Latin as *cēra* 'beeswax'.[98] The Latin vocalism reveals the donor form to be from Attic-Ionic rather than Doric. The Greek and Latin moreover differ in that the Greek is masculine and the Latin is feminine. A Greek masculine noun being borrowed into Latin as feminine is problematic, as the gender of thematic Greek nouns is usually preserved in Latin.[99] Both of these issues suggest a less-than-straightforward pathway of borrowing. This non-matching gender may imply that the Latin and the Greek share a non-IE donor language, or that the Latin was borrowed through a non-IE intermediary such as Etruscan.[100]

[93] Vittore Pisani, 'Rom und die Balten', *Baltistica*, 4 (1968), 7–21 (19).

[94] Ernst Fraenkel, *Litauisches etymologisches Wörterbuch*, 2 vols (Heidelberg: Universitätsverlag Winter, 1962–5), 283.

[95] *Altlitauisches etymologisches Wörterbuch (ALEW 2.0)*, *https://alew.hu-berlin.de/* s.v. *kárti*.

[96] *EIEC* 637.

[97] Chantraine, *Dictionnaire étymologique*, 527; *EDG* 689.

[98] A. Walde and J. B. Hofmann, *Lateinisches etymologisches Wörterbuch*, 3rd edn, 2 vols (Heidelberg: Carl Winter, 1938–54), I, 202.

[99] J. André, 'Les Changements de Genre dans les Emprunts du Latin au Grec', *Word*, 24 (1968), 1–7 (1); *EDLI* 108.

[100] A parallel case in support of the latter scenario whereby a Greek noun in -ος is borrowed as Lat. *-a* through Etruscan intermediation is Gk. βροντήσιος to

Lat. *cēra* then spread to Insular Celtic, cf. OIr. *céir*, W *cwyr*, B *koar*, Co. *kor* 'wax'. According to Falileyev, the Irish was borrowed from British Latin, rather than from Classical Latin.[101] Borrowing into Irish must precede the Brittonic and presumably British Latin diphthongization of *ē* that started in the sixth century.[102] Evidence for a specifically British Latin source can only come from circumstantial evidence, as this word was formally identical in both Latin varieties until this diphthongization. Falileyev notes that the Irish apicultural lexicon contains borrowings from Brittonic, but Latin loanwords are otherwise absent.[103] One argument against a specifically British Latin source is that the word is masculine in Brittonic unlike in either Latin or Irish, where it is feminine. Falileyev sidesteps this issue by proposing that the donor language of OIr. *céir* was British Latin rather than Brittonic, but if Brittonic evidence is disregarded for reconstruction of British Latin, little information remains on this Latin dialect. Perhaps it is true that the masculine gender of *cwyr*, *koar* and *kor* is a Brittonic-internal innovation. Breton collectives are always masculine in the collective and feminine in the singulative (cf. feminine *koarenn* 'honeycomb'), but masculine singulatives existed side by side with feminine singulatives in Old Breton.[104] This shift to masculine gender is not complete in Welsh, cf. feminine collectives *cledr* 'stave, rod; lath, lattice', *cors* 'swamp; reeds', and words ending in *-wys* (< Lat. *-ensēs*) such as *erchwys* 'pack of hounds' and *Lloegrwys* 'Englishmen'. In Welsh, the masculine collective *cwyr* 'wax' confirms an original masculine gender, while in the singulative both feminine *cwyren* 'wax cake or tablet' and masculine *cwyryn* are found. Because there is no evidence for a general shift toward masculine gender in collectives in Common Brittonic times, and because Welsh provides evidence for an original masculine gender, this masculine gender is better explained as an earlier shift in gender before borrowing into Brittonic. Perhaps British Latin speakers reanalysed the ending in *-a* as a neuter plural ending rather than a feminine singular. This neuter noun then shifted to masculine as the neuter gender was lost in Brittonic.

The grammatical gender of OIr. *céir* is uncertain. It is inflected as an *i*-stem, whose feminine inflection is identical to the masculine; only through concord with articles, adjectives or anaphoric pronouns can its grammatical gender be determined. *eDIL* presents no instances where its grammatical gender can be established in this way, and thus provides no gender.[105] MoIr. *céir* is feminine, but its gender is attested much later than the borrowing. Given the identical flexion of masculine and feminine *i*-stems, it is easy to imagine that the feminine gender in MoIr. is not original. The *i*-stem flexion of OIr. *céir* is in itself problematic: the more common *ā*-stem would be the expected outcome of a feminine borrowed noun, cf. the feminine *ā*-stem *caindel* 'candle', presumably borrowed from (British) Latin *candēla* at the same time as *céir*. It is therefore likely that the *i*-stem flexion is analogical after a similar word. The semantically related feminine *i*-stem *mil* 'honey' may have provided the analogical base for the *i*-stem flexion of *céir*. Under this analogy, the feminine gender of *céir* may also be

Lat. *frontēsia*. Here an Etruscan intermediary must be posited to account for the adoption of βρ- as *fr-*, as this development reflects a regional phenomenon within Etruscan (A. J. Pfiffig, *Die etruskische Sprache: Versuch einer Gesamtdarstellung* (Graz: Akademische Druck- u. Verlagsanstalt, 1969), 42).

[101] Alexander Falileyev, 'Early Irish *Céir* "Bee's wax"', *Éigse*, 33 (2002), 71–4.

[102] Kenneth H. Jackson, *Language and History in Early Britain* (Edinburgh: Edinburgh University Press, 1953), §28.

[103] Falileyev notes that OIr. *lestar* 'beehive', discussed in §9.5, is Brittonic in origin, and borrowing of this word post-dates Roman-era development of Irish **-st-* > *-ss-*. However, there is evidence that the stop is retained in the cluster **-str-*, so this piece of circumstantial evidence can be rejected.

[104] Roparz Hemon, *A Historical Morphology and Syntax of Breton* (Dublin: DIAS, 1975), 40.

[105] *eDIL* s.v. *céir*.

analogous to *mil* rather than being inherited from Latin, and a masculine or neuter British Latin or Brittonic source cannot be excluded.

8.2. Eng. honeycomb*, Welsh* crib*, Breton* krib*, OIr.* cír

Eng. *honeycomb* is composed of elements meaning 'honey' and 'comb'. This naming strategy for words meaning 'honeycomb' is isolated within Germanic, but it is shared with Celtic, cf. Ir. *cíor mheala*, Manx *kere volley*, ScG *cìr-mheala*, W *crib*, B *krib* and Co. *kriben vel* 'honeycomb', all consisting of their respective words for 'honey' and 'comb'. The logic behind this naming strategy is not immediately obvious. A comb is an instrument with straight pins arranged in a row used to arrange and line up hair or other fibres. A honeycomb, however, does not have any pins. However, honeycombs in a wild beehive tend to hang parallel to each other from the top of the hive, so each honeycomb may be understood as a tooth of the hive. It is thus easy to imagine that a whole hive may be called a *comb*, but to imagine a single cake in the hive denoting a *comb* is less easy. It is therefore likely that this expression was calqued between English and Celtic.

OE *camb* could mean 'crest (on a helmet)' as well as 'comb'; this meaning still survives in specialized meanings, such as *coxcomb*, the fleshy crest found on heads of gamefowl. The meanings 'ridge (on a mountain range)' and 'ridge (on an animal's back)' are attested in dialectal Northern English, as well as in other Germanic languages, cf. ON *kambr* 'comb, mountain crest, ridge on animal's back'. *Comb* in this meaning 'ridge, elongated strip' is easier to understand as the source of the compound. These secondary meanings have largely disappeared by the Modern English period, so the formation *honeycomb* must be of some age. The English usage of *comb* for 'honey' dates back to the Middle English period only; the OE word for 'honeycomb' was *bēo-brēad* (lit. 'bee-bread'). Because the naming strategy can be traced back further for Brittonic than for English, and because the English naming strategy is isolated within Germanic, it appears that English *honeycomb* is calqued from Celtic rather than vice versa.

Different etymons for 'comb' are used in Goidelic and Brittonic, implying that the usage of 'comb' to describe a honeycomb does not go back to PC times, but was rather calqued between Brittonic and Goidelic. The usage of *crib/krib* for 'honeycomb' is pan-Brittonic, which implies that the whole range of meanings including 'honeycomb' was already present by the time of Breton migrations to Continental Europe.

9. Words for 'swarm, colony, hive'

Naming strategies for beehives may aid in understanding both the spread of bee domestication and in reconstructing what material was used to construct beehives. Many materials used for beehives may have been quite perishable, distorting both the date when bees were domesticated where there is no writing, and giving an incomplete picture of the techniques used.

9.1. PC *satio-

The PC word for 'swarm' is **satio-* (OIr. *saithe*, W *haid*, B *hed*, Co. *hês*), itself from **seh₁-* 'to sow', or, more likely, **seh₂-* 'to stuff, have one's fill' through an intermediate meaning 'satiety (of

bees)'.[106] Multiple compounds with **satio-* as their second member may be reconstructed for the various swarms produced by a beehive throughout the year, i.e. PC **kintu-satio-* 'first swarm' (OIr. *céitsaithe*, W *cyntaid*) and PC **taruo-satio-* 'second swarm' (OIr. *tarbsaithe*, W *tarwhaid*, B *tarvhed*). Names for later swarms cannot be reconstructed to PC, and the *Benennungsmotiv* of OIr. *meraige* 'third swarm', lit. 'fool' attests to their reduced economic value.[107]

The literal meaning of **taruo-satio-* 'second swarm' is 'bull-swarm', and may be compared to a ninth-century gloss *tarb* found in §25 of the *Bechbretha*. *BB* tentatively translates the gloss *tarb* with 'drone' on account of the similarity between the deep-throated lowing of a bull and the buzz of a drone;[108] the first element of the compound **taruo-satio-* could thus have referred to either the drones it contained, or to the bellowing sound the swarm could make. However, this drone-bull polysemy is unparalleled elsewhere in Celtic, and the context of the gloss *tarb* does not require a translation as specific as 'drone'. An alternative interpretation of *tarb* could come from the widespread notion in the classical and medieval European world that bees were spontaneously generated in the fresh carcass of an ox, a process referred to as *bugonia*.[109] With this in mind, it is possible that *tarb* 'bull' was perceived as the genitor of a new swarm, and that gloss *tarb* referred to newly born swarms rather than drones, and that **taruo-satio-* originally meant 'swarm born to a bull'. If so, belief in *bugonia* may be reconstructed to the Common Celtic period.

9.2. MIr. teillenn

MIr. *teillenn* 'swarm of bees' yielded MoIr. *seileán*, Mx. *shellan*, ScG *seillean* 'bee', which *eDIL* speculatively connects to *ell* 'flock, troop'.[110] Zero to *t* can be understood as rebracketing following the masculine nom. sg. article *in* (before C), *int* (before V), i.e. **int eillenn* > *in teillenn*. Forms with initial *t-* are still found in some ScG dialects.[111] The shift *t-* > *s-* can be understood as a reanalysis of the lenited forms (e.g. after the nominative plural article) after the MIr. period when both *t* and *s* lenite to /h/.

9.3. Welsh henllau

Welsh *henllau* may describe an old beehive, or an old colony of bees that stays within the hive as opposed to the bees that swarm out. It is a compound word whose first element is *hen* 'old' whose function is transparent: the oldness of the colony stands in contrast with the younger swarms it generates, and indeed in the Welsh laws it is used in opposition to the various swarms.

The second element, *llau*, is less transparent. *BB* etymologizes *llau* as from PC **leg-* < PIE **leg^{h}-* 'to lie down',[112] and proposes an original meaning 'old settlement', but no formation corresponding to such W **llau* 'settlement' is found in any Celtic language. *GPC* considers the second element to be *llau* 'lice'.[113] The usage of *llau* 'lice' for bees is not obvious; *llau* may be used for other insects than lice, but only for parasitic insects, and the Breton and

[106] Contrary to *EDPC* 323, the Brittonic forms do not point towards PC **sati-*, because short **i* in final syllables did not cause *i*-affection to **a*, see Peter Schrijver, *Studies in British Celtic Historical Phonology* (Amsterdam and Atlanta: Rodopi, 1995), 265.

[107] Calvert Watkins, 'Old Irish *saithe*, Welsh *haid*: Etymology and Metaphor', *Études celtiques*, 16 (1979), 191–4; *BB* 47.

[108] *BB* 115–17.

[109] Crane, *World History*, 579–81.

[110] *eDIL* s.v. *1 teillenn*.

[111] Charles M. Robertson, 'Variations of Gaelic Loan-words', *The Celtic Review*, 2/5 (1905), 34–45.

[112] *BB* 202; cf. *IEW* 658–9 for the proposed root connection.

[113] *GPC* s.v. *henllau*.

Cornish cognates *laou* and *low* only mean 'lice'. However, a wider range of meaning is found outside Celtic. Germanic and Tocharian offer potential cognates in PGm. **lūs-* > OE *lūs*, ON *lús*, OHG, MDu. *lūs* 'louse', and ToA *lu*, B *luwo* 'animal'. The range of meanings is best reconciled by considering the meaning 'animal' found in Tocharian the most archaic. A semantic narrowing to 'small animal' or 'insect' may then be proposed to account for the meaning 'bees; beehive' in W *henllau*.[114] A further semantic narrowing to 'louse' then seems to have occurred in both Celtic and Germanic.[115] The alternative scenario in which the original meaning was 'louse' and the meanings 'beehive' in Welsh and 'animal' in Tocharian are independent innovations is less likely. This would require that the louse served as the prototypical animal whose word-form was extended to all other animals among the Tocharians.

Thus the compound *henllau* appears exceedingly archaic within Celtic, as it has to antedate the prehistoric Celto-Germanic semantic shift from '(small) animal' to 'louse'. It is therefore reasonable to assume that *henllau* is an archaic formation whose apicultural semantics date back to prehistory, although its precise age is difficult to establish.

9.4. OIr. bethamain*, W* bydaf

MIr. *bethamain* 'colony or swarm of bees' is only attested in the nominative plural. If interpreted as an *n*-stem, it implies a singular *betham**.[116] It has a cognate in W *bydaf* 'swarm or nest of bees, beehive'. Several proposals exist as to its segmentation and etymology.

Stokes emends the various manuscript readings to *bethṡamaini* in order to propose a compound in which the first element *beth-* or *byd-* is to be equated with Lith. *bitìs* 'bee' followed by a second element *samain* 'assembly'. For *bydaf*, he reconstructs **amā*, an element otherwise unattested in Celtic cognate to Gk. ἄμη 'shovel; water bucket, pail', Arm. *aman* 'vessel' and Skr. *ámatram* 'large drinking vessel'.[117] These etymologies can be rejected because they fail to unify the Irish and the Welsh material under a single etymology. The Irish etymology moreover hinges on an emendation of the manuscript readings while the Welsh requires an Indo-European element not otherwise present in Celtic.

BB follows *IEW* in reconstructing PC **betamon-* consisting of **bʰi-* with *-t*-enlargement, implicitly also adducing the Baltic forms, and an agent suffix **-amon-*, stating that an agent suffix implies that the formation meant 'maker of (swarms of) bees' originally.[118] There is indeed evidence that the agent noun suffix was productive for animal names, cf. OIr. *glaídem* 'wolf', lit. 'howler', *legam* '(clothes) moth', lit. 'dissolver, destroyer', and possibly OIr. *toinnem* 'salmon', lit. 'wave-er', *sirem* 'tick', lit. 'transverser'.[119] These *n*-stem animal names are derived from a word for an activity or feature associated with this animal; it would be unexpected for a word that already describes the animal to be expanded with an agent noun suffix.[120] A parsing as **bit-amon-* therefore implies that **bit-* originally denoted some sort

[114] *GPC* s.v. *llau*[1] provides further evidence of such an intermediate meaning 'small animal' in the form of the isolated *lleuen ddâr* 'wren', lit. 'oak louse'.

[115] Such a semantic narrowing to the meaning 'louse' possibly came about through a shift in markedness. A parallel case in Celtic whereby a word meaning 'animal' developed into 'louse' through this process is OIr. *míl* 'animal', which is also attested meaning 'louse' or 'hare', specifically (*eDIL* s.v. *1 míl*). An intermediate stage of this semantic narrowing is found in the collocations *míl étgud* 'louse', lit. 'cloth animal' and *míl maige* 'hare', lit. 'field animal'; when the context was obvious the specifier was dropped and the meaning 'louse' or 'hare' became the unmarked meaning.

[116] *eDIL* s.v. *2 bethamain*; *BB* 41.

[117] Stokes, 'Irish etymologies', 245.

[118] *BB* 41; *IEW* 116.

[119] Ulla Remmer, 'Agent Noun Polysemy in Celtic: the Suffix **-mon-* in Old and Middle Irish and its Proto-Indo-European origins', *STUF*, 64 (2011), 65–74.

[120] The exceptions are OIr. *trichem*, *trechem* 'young pig, boar', whose derivational base is obscure, and OIr. *léom* 'lion', a loan from Lat. *leō*.

of activity associated with bees, and not 'bees' itself. The comparanda given by *IEW* are all nouns meaning 'bee' or an associated animal, not a verb for an activity associated with bees. If these words are all derived from a root meaning 'to buzz', an agent noun suffix is still possible, but there is no other evidence that such a meaning was preserved after PC. Contra *BB*, W *bydaf* requires PC **bitamon-*, with *i*-vocalism, and not **betamon-*. It therefore appears that this form is more similar in vocalism to Germanic and Baltic than it is to PC **beko-* and derivatives.

Perhaps the word is better parsed *be-thamain* or *by-daf*, whereby the first element is **bʰi-* and the second element is OIr. *taman* 'tree trunk' < PC **taman(o)-* < PIE **(s)th₂-mn-* or **temh₁-no-*; this compound must originally have meant 'bee-trunk', and may be adduced as evidence that PC speakers were sylvestrian rather than domestic beekeepers, or that they fashioned their beehives out of tree trunks. This formation can then be compared to Lat. *alvus* 'belly, beehive', Gk. αὐλός 'hollow tube, flute', Lith. *aulỹs*, Latv. *aũlis* '(bee)hive' < PIE **h₂eul(i)o-*, which underwent a semantic shift from 'hollow tube' to 'beehive' in both Balto-Slavic and Latin. It is unlikely in both cases that this meaning 'beehive' goes back to PIE, and even if it does it may not imply bee domestication. Bee-swarms naturally settle in tree cavities, but as early beekeeping probably involved hollowing out trees to allow for more swarms, it may be that PIE speakers did the same for any trees they found.[121]

*9.5. PC *(ɸ)*lestro-

OIr. *lestar*, W *llestr*, OCo. *lester*, B *lestr* may reflect PC **(ɸ)lestro-* 'vessel' and may mean 'boat, crockery, beehive, receptacle'. The Irish has been argued to be Brittonic borrowings around the fifth or sixth century CE on account of the preservation of the cluster **-st-*, which regularly becomes *-ss-* in Irish.[122] However, the **t* is retained in the cluster **-str-*, as is shown by PC **alistro-* > OIr. *ailestar* 'flag iris' and PC **adastro-* > Ir. *adastar* 'halter'.[123] Thus, there is no need to assume a borrowing from Brittonic into Irish. PC **(ɸ)lestro-* may reflect PIE **plék-s-tro-*, to **plék-* 'to plait', in which case the meaning 'basket, wickerwork' appears original, and an argument can be made that early Celtic speakers had wickerwork hives.[124] However, the semantic extension to 'vessel, boat, crockery' is pan-Celtic, and in Old Irish *lestar* was primarily applied to wooden containers.[125] If this semantic extension predated the extension to 'beehive', an argument can equally well be made that early Celtic beehives were made out of a waterproof material, such as clay or wood.

Parallel cases where a single etymon means both 'wickerwork, vessel, container, boat' and 'beehive' are rather common in Indo-European. Compare Welsh *cwch*, which means both 'boat' and 'beehive', Greek κύβεθρον 'beehive' ~ κόβαθος 'vessel' ~ κυψέλη 'chest, box, beehive',[126] or Breton *kest* 'beehive; basket', a borrowing from Latin *cista* 'wooden box, basket' whose apicultural meaning arose within Breton. OIr. *cess* 'basket, wickerwork;

[121] Proto-Slavic **bъrtь*, **bьrtь* 'wild beehive, log for bees' shows a similar semantic shift, as it is derived from PIE **bʰerH-* 'to pierce, bore'.

[122] *BB* 42; Falileyev, 'Early Irish *Céir*', 71.

[123] David Stifter, 'Zur Bedeutung und Etymologie von altirisch *sirem*', *Die Sprache: Zeitschrift für Sprachwissenschaft*, 45 (2005), 160–89 (170); particularly Irish *adastar* 'halter' < PC **adastro-* is unlikely to be a Brittonic loanword, because it appears derivationally and semantically more primitive. Welsh *eddestr* 'horse' reflects PC **adastrio-*, and looks like a nominalized adjective in **-io-* 'haltery' with a subsequent semantic shift to 'horse'. If the Irish were to be borrowed from Brittonic, it would have to be borrowed from a Brittonic form without the derivation and subsequent semantic shift. However, such a form is not found in Brittonic making this scenario rather unparsimonious.

[124] Stifter, 'With the Back to the Ocean'.

[125] Fergus Kelly, *Early Irish Farming: A Study Based Mainly on the Law-texts of the 7th and 8th centuries AD* (Dublin: DIAS, 1997), 110.

[126] Beekes, *Pre-Greek*, 110–11.

beehive' appears derived from a verb meaning 'to braid' still found in the verbal adjective *cisse* 'braided', dat. pl. *cissib* gl. *tortis (crinibus)*, *cichsile* 'who braided (pl.)', *cichis* 'he will braid' with further cognates in Gallo-Lat. *cissium*, *cisium* 'light two-wheeled vehicle'.[127]

9.6. PC *rūsko-

Descendants of PC **rūsko-* 'bark' are found with the meaning 'beehive'. The Celtic material consists of Gaulish **rūskā* borrowed into Gallo-Latin as *rusca* 'bark, beehive' still found in French *ruche* and Catalan *rusc* 'beehive', as well as the Insular Celtic OIr. *rúsc*, W *rhisg*, *rhisgl*, B *rusk* 'bark', OCo. *rusc* gl. cortex. While the Gaulish, Irish and the Welsh straightforwardly reconstruct to **rūsko-*, the Breton and Cornish imply PC **rousko-*. This alternation can be resolved formally into the ablaut variants **ruh$_{1/3}$-sko-* and **reh$_{1/3}$u-sko-*, respectively.[128] However, thematic formations should not have ablaut variants.[129] It is therefore preferable to posit that the south-west Brittonic forms are borrowings in order to account for the difference in vocalism.[130]

Several avenues of borrowing have been proposed. Pedersen suggests that the Irish is borrowed from Brittonic,[131] but the correspondence between OIr. *ú* and W *i* regularly reconstructs to PC **ū*, and this proposal does not solve the Brittonic-internal discrepancy between Welsh on the one hand and Breton and Cornish on the other. Zair proposes that the Breton and Cornish are borrowed from Medieval Latin *rusca*, while Bauer proposes borrowing from Primitive Irish.[132] Both a Primitive Irish **rūskah* and a Gaulish or Gallo-Latin **rūskā* are compatible donor forms for the Cornish and Breton, but a Gaulish or Gallo-Latin rather than a Primitive Irish is to be preferred. The meaning 'beehive' is attested in Breton, Cornish, Medieval Latin, French and Catalan, but not in Welsh or Irish. A Gaulish or Gallo-Latin borrowing into south-west Brittonic therefore only requires a single semantic shift of 'bark' to 'beehive' in Gaulish or Gallo-Latin. Under a scenario where the Breton and Cornish is borrowed from Primitive Irish, the development to the meaning 'beehive' would have to occur after borrowing from Primitive Irish, and would have to be independent from the same semantic development in Gallo-Latin.

Irish *rúsc*, Welsh *rhisg(l)* 'bark' are both masculine; for Welsh the masculine gender is apparent in the singulative *rhisg(l)yn* 'piece of bark'. The Gallo-Latin and French words are feminine, however, implying that the Gaulish was feminine as well.[133] Here, the feminine morphology coincides with the meaning 'beehive'. This is probably no coincidence in view of the feminine Welsh *rhisg(l)en* '(bark) dish or pan, (piece of) bark'. There is thus evidence for a lexical split where the masculine denoted only the material and the feminine also denoted a container of this material. The masculine form is continued by Irish *rúsc* and Welsh *rhisg(l)yn* '(piece of) bark', while the feminine form is continued by Welsh *rhisg(l)*

[127] *LEIA* C-78–9. It is formally possible that *cess* represents a borrowing from Lat. *cista*, but the semantic shift to 'beehive' must then be independent from B *kest* on account of the more primitive semantics of W *cest*, which does not mean 'beehive'. *eDIL* s.v. *2 ces* also mentions Carl J. S. Marstrander, *Bidrag til det norske sprogs historie i Irland* (Kristiania: I kommission hos J. Dybwad, 1915), 62, 94, taking it as a borrowing from ON *kesja*, but this borrowing pertains to a different *ces*, namely the one meaning 'spear' at *eDIL* s.v. *3 ces*.

[128] Nicholas Zair, *The Reflexes of the Proto-Indo-European Laryngeals in Celtic* (Leiden and Boston: Brill, 2012), 156.

[129] Bernhard Bauer, 'Irish Loanwords in the Southwest British Celtic Languages', in Michael Hornsby and Karolina Rosiak (eds), *Eastern European Perspectives on Celtic Studies* (Newcastle upon Tyne: Cambridge Scholars Publishing, 2018), 23–33 (28).

[130] *EDPC* 317.

[131] *VKG* I, 332.

[132] Zair, *Reflexes*, 156; Bauer, 'Irish Loanwords', 28.

[133] Catalan *rusc* is masculine, but this is necessarily a later development in view of Medieval Latin *rusca*.

en 'bark, container' and Gaulish **rūskā* 'bark, beehive' and descendants. Based on Welsh *rhisg(l)en*, an intermediate meaning 'bark container' may be reconstructed for the semantic shift from 'bark' to 'beehive'. The original gender of the Breton cannot be retrieved: the collective *rusk* is masculine, because all collective nouns are, and the singulative *ruskenn* is feminine because all singulatives are.[134]

10. Stratification

Several linguistic strata may be reconstructed for the Indo-European and Celtic apicultural lexicon. A PIE stratum is found in reflexes of PIE **mel-i(t)-* 'honey' and **medʰ-u-* 'honey, mead'. These words are found in both Asian and European branches, so a Europeanism is excluded for these words. Notably, this layer seems to contain words for bee produce, but not for bees themselves, drones or hives.

The next stratum comprises words only found in Europe for which a substratum origin may be proposed. This layer comprises **bʰi- ~ *bʰe-* 'bee' and **Dron-* 'drone'. The word for 'wax', **kēr- ~ *kār-* also appears to belong to this substrate layer, but it only entered Celtic in the Roman era.

A number of derivations and compounds of Indo-European elements or the aforementioned substrate elements are found in PC, i.e. **kintu-satio-* 'first swarm', **taruo-satio-* 'second/third swarm', **bitamon-* 'beehive, colony'. This layer contains an elaborate lexicon for processes of swarming and for beehives or colonies. Other words are shared among the Celtic languages, but do not have a Pan-Celtic distribution, or show developments after the PC period. A semantic shift of PC **rūsko-* from 'bark' to 'beehive' in Gaulish (and its subsequent spread to Brittonic and Romance) implies that Gaulish speakers crafted beehives out of tree bark, and that their design spread to neighbouring language communities. PC **(ϕ)lestro-* 'vessel, beehive' can also be of PC date, but when and along what route it acquired its apicultural meaning is more difficult to establish. A shared Brittonic stratum is found in W *gwenyn*, B *gwenan*. W *henllau* and W *modrydaf* appear archaic in Welsh, but the precise age of their formation is difficult to establish.

Latin influence on Insular Celtic beekeeping is found in that the word for 'wax' is a borrowing from Lat. *cēra*. Somewhat more speculatively, Irish *ces* and B *kest* may share the semantic innovation of 'basket' to 'beehive'. Only the meaning 'basket' is found in the donor form, Lat. *cista*, so even if the Irish and Breton share this etymology, the meaning 'beehive' appears to be a later and local innovation. An early form of Welsh *gwychi* 'drone' was borrowed as Irish *foich* 'wasp' when the word still had its archaic meaning 'wasp'. Contra Falileyev, this borrowing in the meaning 'wasp', along with the possibly inherited status of OIr. *lestar*, leaves no lexical evidence that Brittonic rather than Latin influenced Irish apiculture.

The usage of a word meaning 'comb' for 'honeycomb' likely originated in a Celtic language and spread among Irish, Brittonic and early English. Because this spread constitutes a calque and not a borrowing, it is difficult to establish the ultimate source or the timing, but it is likely that this spread post-dates PC in light of the different words used for 'comb' in Brittonic and Goidelic, and the spread continued at least until the arrival of English on the British Isles. A Celtic source rather than an English source is likely because

[134] Hemon, *Historical Morphology*, 40.

English is unique among the Germanic languages in having this polysemy between 'comb' and 'honeycomb'.

Another way in which beekeeping vocabulary entered the Celtic languages is by semantic extension of words outside the apicultural domain. Many of these instances are rather transparent, and therefore presumably post-date the unity of Celtic. An example of this is MIr. *teillenn* 'swarm of bees', apparently from *ell* 'flock' whose Modern Goidelic descendants mean 'bee'.

11. Reconstruction of prehistory

PIE speakers cannot be ascertained to have had a word for 'bee', but they did have words for 'honey' and 'mead'. If PIE speakers indeed did not have a word for 'bee', the presence of words for their produce may mean that PIE speakers knew honey and mead as a trade good, but that they did not keep or hunt bees themselves. Borrowing of apicultural vocabulary between early IE and Uralic could point to such a scenario. The lack of words for 'bee' may mean that PIE speakers were honey hunters who raided beehives in tree hollows. Honey hunters would have a rather hostile view of bees, as bees would mainly be known as stinging insects as they defended their hives. One may adduce PIE words for 'wasp' and 'hornet' to see that PIE speakers knew about striped yellow and black stinging insects. Perhaps one of these words could originally designate the bee as well, and new designations for the bee were found as Indo-Europeans came to appreciate the animals more upon domesticating them.

A European substrate layer contains words for 'wax', 'bee' and 'drone'. What is still lacking by this stratum is a word for 'beehive', 'swarm', 'queen' or 'colony'. This stratum suggests that IE speakers colonizing Europe gained more intimate knowledge of bees and their social organization from pre-IE peoples, but they stopped short of domestic apiculture or beehive building. Further evidence for this scenario comes from the fact that terms for 'beehive' in both Italic and Balto-Slavic are derived from the meaning 'hollow', but words for 'beehive' derived from the material they were made of are not shared between IE branches. This suggests that IE speakers adopted sylvestrian beekeeping from the substrate population, meaning that they claimed and repeatedly harvested tree hives, even going as far as hollowing out more logs to encourage more beehives. Lack of shared words for swarms or queens among IE branches, however, implies that they stopped short of managing and catching swarms to keep in hives near their homes.

The fact that words for 'beehive; colony' and various types of swarms may be reconstructed for PC implies that PC speakers kept a rather close eye on their colonies. If speakers of PC were in the habit of observing and naming the various bee-swarms emanating from a colony, then it follows that the hive was close enough to their settlements to allow for this. Such precise terminology for swarms suggests domestic beekeeping as opposed to sylvestrian beekeeping. These words were formed on roots that were native in Celtic by the PC period, rather than being unanalysable forms, implying that Celtic speakers developed these techniques themselves and did not borrow them.

Subsequent lexical layers reveal advances in hive building techniques and new uses for bee produce. A word meaning both 'bark' and 'beehive' spread from Gaulish into south-west Brittonic and western romance. This implies that a technique to build beehives from bark spread from a Gaulish-speaking area. Borrowing from Latin is found in the Insular Celtic words

for 'wax' and 'candle'. Here borrowing most likely coincided with the arrival of Christianity to Britain, which is when wax candles came into demand. This arrival of Christianity may also have triggered the spread of the usage of words for 'comb' for 'honeycomb' among Goidelic, Brittonic and English. Subsequent developments in beekeeping are firmly in the historical period and are best charted by historians, not linguists.

Abbreviations

BB	Thomas Charles-Edwards and Fergus Kelly (eds), *Bechbretha: an Old Irish Law-tract on Bee-keeping* (Dublin: DIAS, 1983, reprinted in 2008)
EDG	Robert S. P. Beekes and Lucien van Beek, *Etymological Dictionary of Greek*, 2 vols (Leiden and Boston: Brill, 2009)
eDIL	*Electronic Dictionary of the Irish Language*, *http://dil.ie/*
EDLI	Michiel de Vaan, *Etymological Dictionary of Latin and the Other Italic Languages* (Leiden and Boston: Brill, 2008)
EDPC	Ranko Matasović, *Etymological Dictionary of Proto-Celtic* (Leiden and Boston: Brill, 2009)
EDPG	Guus Kroonen, *Etymological Dictionary of Proto-Germanic* (Leiden: Brill, 2013)
EDSIL	Rick Derksen, *Etymological Dictionary of the Slavic Inherited Lexicon* (Leiden and Boston: Brill, 2008)
EIEC	James P. Mallory and Douglas Q. Adams (eds), *Encyclopedia of Indo-European Culture* (London and Chicago: Fitzroy Dearborn Publishers, 1997)
GPC	*Geiriadur Prifysgol Cymru*, *https://geiriadur.ac.uk/gpc/gpc.html*
IEW	Julius Pokorny, *Indogermanisches etymologisches Wörterbuch*, 2 vols (Bern, München: A. Francke, 1959–69)
LEIA	Joseph Vendryes, Édouard Bachallery and Pierre-Yves Lambert, *Lexique étymologique de l'irlandais ancien*, 7 vols (Dublin: DIAS, 1959–96)
VKG	Holger Pedersen, *Vergleichende Grammatik der keltischen Sprachen*, 2 vols (Göttingen: Vandenhoeck und Ruprecht, 1909–13)