I want to thank the Language Log community for their comments and encouragement, especially the archaeologists, who I think have given me a broader and more representative picture than I had previously. I'd like to make use of that information in hammering out the linguistic constraints on the date and disintegration of Proto-Indo-European, but I haven't got time to do that now. So this is a post to answer some questions and tie up some loose ends, in increasing order of complexity.

1.   "Sycopated" in an earlier post is simply a typo for "syncopated".

2.   I think jfruh is right about translation effects between Germanic languages in the spread of the monotheistic application of the Germanic 'god' word. It seems clear that at the time the western Roman Empire fell apart Gothic, Norse, and West Germanic were three different languages, and there were already substantial dialect differences within West Germanic; but the "family resemblance" of all the languages must have been even more obvious than it is today. (How different the other probable East Germanic languages—Vandal, Burgundian, etc.—were from Gothic can't be determined, as nothing survives but names.) You might think that the adaptation of the Gothic word (*guþ,* with neuter endings but masculine concord, apparently because of the shift in meaning) in the middle of the 4th century in what is now Romania would have had nothing to do with the adaptation of the West Germanic word (probably *god at that date), but there might actually be a connection, as follows. (See Richard Fletcher, *The Barbarian Conversion* (New York 1997: Holt) 100-7; the following is a summary of part of Fletcher's fuller account.)

The Goths became Arian rather than Catholic Christians. That might have been an accident at first, but in the long run it was probably politically inevitable, because the Roman emperors had opted for the Catholic version of the creed, and conversion to the Roman variant of Christianity tended to imply an alliance with the emperor on unequal terms. Not surprisingly, the other East Germanic peoples who took over political leadership of various parts of the western Empire also became Arians at first. By contrast, the usual story about the Franks, the first West Germanic group to be converted, is that their warlord Clovis was converted directly from polytheism to Catholic Christianity. But one of his sisters seems to have been an Arian Christian at the time of his conversion, and there is a contemporary letter which congratulates Clovis on his conversion from "heresy" to orthodox Catholicism. The heresy in question can only have been Arianism. So it's fairly likely that the Frankish ruling class learned to use their native word *god for

the monotheistic deity from speakers of another Germanic language who had ultimately learned to do so from the Goths.

There was also a Frankish connection in the conversion of the English about a century later. True, the first missionaries to southern England came direct from Rome; but what started the ball rolling was the fact that the king of Kent had married a Catholic Frankish princess. Apparently she discussed religion with her husband, and it's a fair bet that *god was the word she used to refer to the Christian god. And since the rest of the Germanic world was evangelized from England and the Frankish kingdom, either directly or indirectly, there could easily have been an unbroken series of loan-translations. It's probably saying too much to suggest that we speakers of English use the word *God* the way we do because of a decision made by Bishop Wulfila in the 4th century—maybe he wasn't the first to use the native word that way, maybe others did so later independently —but it looks like there's a historical connection.

3.   Merri is reporting the usual view when he suggests that Hittite never had a distinction between masculine and feminine, but Craig Melchert has demonstrated that the usual view is incorrect. (See H. Craig Melchert, "The feminine gender in Anatolian," in George Dunkel et al. (edd.), *Früh-, Mittel-, Spätindogermanisch* (Wiesbaden 1994: Reichert), pp. 231-44, with references.) A large part of the problem is that scholars have been drawing conclusions about Hittite without considering the evidence of the other Anatolian languages (some of which, to be fair, were mostly undeciphered until fairly recently). It turns out that Lycian has a substantial class of nouns in -*a* some of which have to reflect inherited feminines in *-eh$_2$ (e.g. *lada* 'wife', *xñna* 'grandmother', *arawa* 'freedom') while others have been attracted into that class within the separate history of the language (e.g. *kbatra* 'daughter', *xawa* 'sheep', *wawa* 'cow'). In addition, a derivational suffix -*i*- which is widespread in the Luvian subgroup and in Lydian is apparently most easily explained as the inherited feminine suffix *-ih$_2$. Melchert's argument is too complex to rehearse here, and it's nuanced: he suggests that feminine gender was grammaticalized in the Indo-European family in two stages, and that Anatolian participated only in the first stage. But if any of what he says is right, loss of the category "feminine" in the Anatolian languages—separately, after the Proto-Anatolian stage—and (in some languages) re-use of the feminine markers for other grammatical purposes does have to be posited.

Moreover, there's another feminine marker, not mentioned by Melchert in the article referenced above, that has to be taken into account. For 'three' and 'four' we can reconstruct very peculiar feminine forms for the non-Anatolian, non-Tocharian languages, namely *tisrés 'three' (Sanskrit *tisrás,* Avestan *tišrō,* Gaulish *tiđres,* Old Irish *téoir*) and *kʷétesres 'four' (Skt. *cátasras,* Av. *čataŋrō,* OIr. *cethéoir;* on the Irish forms see Warren Cowgill, "Old Irish *teoir* and *cetheoir," Language* 33 (1957) 341-5). 'Three (fem.)' is plausibly *tri-sr- with dissimilatory loss of the first *r, but the feminine of 'four' is not so transparently derived from masc. *kʷetwóres, neut. *kʷetwṓr, and that suggests that these feminine forms are extreme archaisms. (That they don't appear in Tocharian is not surprising, since the fem. pl. and neut. pl. merged in that subgroup, and the surviving forms are neuter; that they don't appear in Anatolian is also not surprising, given that all attested Anatolian languages have lost the feminine gender. Also, either Anatolian or the non-Anatolian half of the family has replaced the numeral 'four' (!), since non-Anatolian *kʷet-wer- and Proto-Anatolian *mæ:-u- are obviously unrelated words; the archaic feminine of the former word reconstructed above suggests, but does not prove, that it was Anatolian that replaced this numeral.)

The *-ser- suffix does show up in Anatolian as well, but in a different set of fossils (see Harry Hoffner and H. Craig Melchert, *A grammar of the Hittite language* (Winona Lake 2008: Eisenbrauns), Part 1, p. 59). In Hittite it forms feminines of nouns denoting male persons (*ḫassu-s* 'king' : *ḫassu-ssara-s* 'queen', etc.); it also shows up in Luvian *nan-asr-i-s* 'sister' (: *nan-i-s* 'brother').

This widespread but rare suffix might reflect an old word for 'woman' (as several colleagues have suggested), but in both halves of the family it has become grammaticalized as a suffix, and in both halves the suffix survives only in relics. (Possible lexical relics include (non-Anatolian) *swésōr 'sister' and Latin *uxor* 'wife' (though the latter unfortunately has no attested non-Italic cognates).) We need to at least consider the possibility that *-ser- was the oldest feminine suffix of (pre-)PIE that can now be recovered; if it was, that pushes the three-gender system considerably farther back in time.

4.   The PIE form of 'bear' probably was *h₂r̥tḱos, as Seadog Driftwood notes; it's guaranteed, more or less, by Hittite *ḫartaggas,* which probably means 'bear' (though I understand that that's not as watertight as we'd like). The form *h₂r̥ḱtsos that I cited was an intermediate form on the way to Latin *ursus,* and of course I should have said so. The

word is interesting because it's part of the infamous "thorn cluster" problem in Indo-European phonology, which is the last thing I'm going to talk about in this post. There is an extensive secondary literature on the problem; see, for example:

Schindler, Jochem, 1967, "Das idg. Wort für „Erde" und die dentalen Spiranten," *Die Sprache* 13.191-205;

Schindler, Jochem, 1975, "A thorny problem," *Harvard Indo-European Studies* 2.28-47;

Mayrhofer, Manfred, 1983, "Ergebnisse einer Überprüfung des indogermanischen Ansatzes „Thorn"," *Anzeiger der phil.-hist. Klasse der Österreichischen Akademie der Wissenschaften* 119.240-55;

Mayrhofer, Manfred, 1986, "Lautlehre" (Cowgill, Warren, and Manfred Mayrhofer, *Indogermanische Grammatik,* Band I, 73-216), pp. 150-8

(all with further references).

The easiest way to grasp the thorn cluster problem is to consider the sound correspondences between Indo-Iranian clusters of dorsal and coronal obstruents with consonant clusters in other branches of the family, especially in Greek. Normally an IIr. sibilant corresponds to a sibilant in the other branches, e.g.:

	'axle'	'right(-hand)'	'joint (with the trunk)'
PIE	*aḱs- (*h₂eǵ-s-?)	*deḱsi-	*koḱso-
Sanskrit	ákṣas	dákṣinas	kákṣāt (abl.) 'armpit'
Avestan	—	dašinō	kašəm (acc.) 'armpit'
Greek	ἄξων /áksɔ:n/	δεξιός /deksiós/	—
Latin	axis	dexter	coxa 'hip'
Gothic	—	taíhswa	—
Old English	eax	—	—

	'razor'	'transport' (aorist)	'point at' (aorist)
PIE	*ḱsuróm	*wēǵʰ-s-	*dēyḱ-s-
Sanskrit	kṣurám	vāk-ṣ-	—
Avestan	—	—	dāiš (2sg.)
Greek	ξυρόν /ksurón/	—	δειξα- /deik-sa-/ 'show'
Latin	—	vēx- (perfect)	dīx- (perfect) 'say'

	'bull, ox'	'demonstrate'
PIE	*uksḗn	*dekʷs-
Sanskrit	ukṣā́	dákṣatā (iptv. 2pl.) 'persuade'
Avestan	uxšā	daxšaṯ '(s)he instructed'
Gothic	aúhsne (gen. pl.)	—
Old English	oxa	—
Tocharian B	okso	—
Hittite	—	tekkussa- 'give a sign'

And normally an Indo-Iranian coronal stop corresponds to a coronal stop in the other branches, e.g.:

	'eight'	'night'
PIE	*oḱtṓw	*nokʷt-
Sanskrit	aṣṭā́, aṣṭáu	náktam (adv.) 'at night'
Avestan	ašta	—
Greek	ὀκτώ /oktɔ́:/	νυκτ- /nukt-/
Latin	octō	noct-
Gothic	ahtau	nahts
Old English	eahta	niht
Tocharian B	okt	nekcīye (adv.) 'at night'

(For the labiovelar in 'night' cf. Hittite *nekuz mēhur* 'evening', lit. 'evening's time'. In Greek the *o became *u* next to the labiovelar, which was then delabialized because it was next to *u;* otherwise the Greek reflex of this cluster is *pt.*) Other examples of dorsal + *t are easy to find, but most are productive formations that could have arisen repeatedly, so that we can't be sure they really go back to PIE. For instance, the Latin supine *coctum* and the Vedic Sanskrit dative infinitive *páktavē,* both meaning 'in order to cook', could be caseforms of an inherited noun *pékʷtus 'cooking', acc. *pékʷtum, dat. *pekʷtéwey (with the accent levelled in Sanskrit); but they could just as well have been formed within the individual histories of the languages. The same is true of Skt. *diṣṭás* 'shown' and Lat. *dictus* 'said', possibly reflecting *diḱtós 'demonstrable, pointed at'; Skt. *riktás* and Lat. *re-lictus* 'left behind', possibly reflecting *likʷtós; and so on. Somewhat better is the

pair Skt. *tyaktás* 'forsaken, abandoned' and Gk. σεπτός /septós/ 'august, reverend', made to a root *tyegʷ- which must have meant something like 'yield to, get out of (someone's) way', because verbal adjectives in -*tó*- are not productive in Greek; but note that in this case the root should be zero-grade *tigʷ-, so even if the adjective is old it has undergone morphological change in both languages.

   But there is a third set of forms in which Sanskrit sibilants correspond to coronal stops in some other branches. Even if we follow Mayrhofer (cited above) in rejecting all examples that are not certain, we are left with three fairly straightforward equations and three that require further discussion. The easy cases are:

	'bear'	'(s)he, they settle'	'(s)he destroys'
Sanskrit	ŕ̥kṣas	kṣéti, kṣiyánti	kṣiṇā́ti
Avestan	aršō	šaēiti, šiieinti	—
Greek	ἄρκτος /árktos/	Myc. —, ki-ti-je-si	φθίνει /pʰtʰínei/, Hom. φθίνει /pʰtʰíːnei/ 'it wanes'
Latin	ursus	—	—
Middle Irish	art	—	—
Hittite	ḫartaggas	—	—

In the last item the short vowel in Attic vs. the long vowel in Homeric Greek shows that the Proto-Greek present stem was *pʰtʰi-nw-e/o-. This has a different nasal suffix from the Sanskrit present: corresponding to the Greek present we expect a class V present in Sanskrit, and instead we find a class IX. But Sanskrit has certainly innovated here, because old class IX presents are formed only to roots that ended in laryngeals, and this root didn't; the PIE present suffix for this root was almost certainly *-néw- ~ *-nu-, and it was almost certainly causative in function (so the intransitive meaning of the Greek present is an innovation too). The root must have meant 'perish', and that's why the compound derived adjective Skt. *ákṣitas* = Gk. ἄφθιτος /ápʰtʰitos/ means 'imperishable'. Whether Lat. *sitis* 'thirst' was derived from the same root, and is thus etymologically identical with Skt. *kṣítis* and Gk. φθίσις /pʰtʰísis/, both 'perishing, disappearance, decay', is unclear; if it does belong here it shows the same outcome as *ursus*. Finally, note that the inherited verb 'settle' preserved in Mycenaean Greek was later replaced with a

derivative, κτίζειν /ktísde:n/, which of course exhibits the same outcome of the initial cluster.

In these words we seem to have a consonant cluster that yielded a dorsal plus a sibilant in Indo-Iranian, a stop (labial if originally labiovelar, otherwise velar) plus a coronal stop in Greek, a coronal stop in Celtic, an *s* in Latin, and *tk* in Hittite. Since the Hittite reflex is the only one that's distinctive, it makes sense to base our reconstruction on that; thus we can reconstruct:

$\qquad$ *h₂r̥tḱos 'bear' $\qquad\qquad\qquad$ *dʰgʷʰey- 'perish'

$\qquad$ *tḱéy-ti '(s)he settles' $\qquad\qquad$ *n̥-dʰgʷʰi-tos 'imperishable'

$\qquad$ *tḱi-énti 'they settle' $\qquad\qquad$ *dʰgʷʰi-néw-ti '(s)he destroys'

So far, so good; but we still need to explain how to get from the reconstructed forms to the forms in each of the attested languages. Before we tackle that, though, we should look at the word for 'earth'.

The attested cognates for 'earth' are at first bewilderingly various:

Hittite nom.-acc. *tēkan,* gen. *tagnās,* loc. *dagān;* Cuneiform Luvian *tiyammis;* Hiero-

$\qquad$ glyphic Luvian *ta-ka-mi-a* (dat.);

Tocharian A *tkaṃ, tkan-;* Tocharian B *keṃ, ken-;*

Vedic Sanskrit *kṣā́s,* acc. *kṣā́m,* gen. *jmás ~ gmás,* loc. *kṣámi;*

Avestan *zå,* acc. *ząm,* gen. *zəmō;*

Greek χθών /kʰtʰɔ́:n/, χθον- /kʰtʰon-/; adv. χαμαί /kʰamái/ 'to the ground (Hom.), on

$\qquad$ the ground';

Latin *humus;*

Old Irish *dú, don-* 'earth (poetic), place';

Lithuanian *žẽmė;* Old Church Slavonic *zemlja;*

Albanian *dhe.*

One thing is immediately clear: the forms of the Luvian group, Indo-Iranian, Latin, and Balto-Slavic, as well as the Greek adverb, show that the PIE stem ended in *-m-. The languages in which it ends in *-n-,* namely Hittite, the Tocharian languages, Greek, and Irish, are all languages in which word-final *-m became *-n* (or could have done so, in the case of Tocharian; other clear Tocharian evidence is hard to find). To explain the stems of those languages we have to suppose that at least one commonly used caseform of 'earth' had no overt ending, that its (or their) *-m became *-n* by regular sound change,

and that -n- was then levelled through the paradigm. That tells us a little about the PIE paradigm; it also warns us to expect extensive morphological change in the attested forms of this word.

Hittite long vowels usually reflect PIE accented vowels, and the pattern of long vowels in the Hittite paradigm of 'earth' is exactly that of a PIE "amphikinetic" accent paradigm: accent on the first syllable of the stem in the direct cases (in theory the "root" syllable, though this one never occurs without its suffix, i.e. without the second syllable of the stem), accent on the endings in most oblique cases (of which the gen. sg. is typical), and accent on the second syllable of the stem (the "suffix") in the locative singular. The PIE paradigm should have been the following:

> nominative *dʰéǵʰōm < pre-PIE **dʰéǵʰom-s (by Szemerényi's Law)
>
> accusative *dʰéǵʰōm < pre-PIE **dʰéǵʰom-m̥ (by Stang's Law)
>
> genitive *dʰǵʰm-és (or possibly *dʰǵʰm̥-és, with a syllabic sonorant after the
>   heavy initial cluster)
>
> locative *dʰǵʰém (or, with a deictic particle, *dʰǵʰém-i).

Thus the troublesome cluster should have occurred only in the oblique cases; evidently Greek and Sanskrit have levelled it into the direct cases, but the Anatolian languages have not. (As Sara Kimball pointed out to me twenty-odd years ago, the fact that the nom. sg. and acc. sg. have become identical by sound change must be the reason why 'earth' has become neuter in Hittite, whereas it is feminine in all the other languages and must have been feminine in PIE. Hittite kept the forms and switched the gender; the other languages kept the gender and remodelled the forms.)

But there's a further wrinkle. As Schindler pointed out in his 1967 article (p. 200), we know what happened to a sequence coronal + dorsal + *m in PIE, or at least in the non-Anatolian branches, from the derivational relationship of two numerals. 'Ten' was *déḱm̥d, underlyingly */déḱm̥t/. 'Hundred' was clearly derived from it, but the surface form of hundred was not "*dḱm̥t-óm"; it is clearly reconstructable as *ḱm̥tóm, with no *d- (cf. Skt. śatám, Av. satəm, Gk. ἑ-κατόν /he-katón/, Lat. centum, Lith. šim̃tas, Tocharian B kante, A känt, Old Irish cét, etc., etc.). Evidently coronal stops were lost by rule in that environment. But that means that the gen. sg. of 'earth' should actually have been *ǵʰmés, and the other oblique cases must also have begun with *ǵʰm- (dative *ǵʰméy, instrumental *ǵʰméh₁, allative probably *ǵʰméh₂, possibly *ǵʰmá; the

ablative was identical with the genitive in the singular). That must be the reason why Iranian, Italic, Balto-Slavic, and Albanian have reflexes of *ǵʰ- in all forms, with no trace of the thorn cluster: they levelled the (non-locative) oblique stem through the paradigm at an early date. Note that the fossilized Greek adverb χαμαί /kʰamái/ also preserves the oblique stem, with a syllabic nasal (the "heavy" Lindeman's Law alternant); it probably reflects the PIE allative with the deictic particle *-i appended (Warren Cowgill, p.c. ca. 1980). The Vedic gen. sg. forms must also reflect this stem alternant, though with further changes. It looks like Hittite—the only Anatolian language that preserves much of the original paradigm—never underwent this sound change, but we can't be sure, because it's possible that a new zero-grade /dagn-/ was constructed on the basis of /de:gan/ within the separate prehistory of the language. 'Hundred', which stands a better chance of preserving the sound-change outcome because it is more isolated morphologically, should provide better evidence—but 'hundred' is not attested for any Anatolian language! So we just don't know whether Hittite *tagnās* is an archaism or has levelled the coronal stop back in from the rest of the paradigm.

Now we have enough material to discuss the sound changes that affected coronal + dorsal stop clusters. It would be possible to work out a different set of regular sound changes (often more than one set) for each of the languages separately, but it seems worth considering whether all the non-Anatolian languages (or all but Tocharian—see further below) might have shared a single sound change involving metathesis of these clusters (so that the dorsal preceded rather than followed). The most attractive suggestion, in my opinion, was made informally by Jochem Schindler at a conference in 1991; unfortunately he didn't publish it (he died in 1995).

Schindler started from the fact that there was a PIE phonological rule that inserted *s between two coronal stops, i.e. *T+T > *TsT. That may seem strange, but it's not doubtful, because the same rule still operates in our attested Hittite; for instance, from (zero-grade) /ad-/ 'eat' and present 2pl. subject ending /-te:ni/ you get *aztēni* [atste:ni] 'you guys eat'. (The rule isn't even as strange as it seems. A similar rule operates in Pawnee, a Caddoan language spoken on the other side of the world, though the details are different; see Douglas R. Parks, *A grammar of Pawnee* (New York 1976: Garland), pp. 14, 42-3.) Schindler hypothesized that this PIE rule inserting *s between coronal stops was generalized to insert *s between a coronal stop and any other stop (in that order);

thus *tḱ, for instance, would have been pronounced *[tsḱ] at first. Then, he suggested, the sequence *[ts] and the following dorsal stop underwent metathesis, so that underlying */tḱ/ was now pronounced *[ḱts]. It seems clear that such an outcome could easily have developed into the Indo-Iranian, Greek, and Latin reflexes of the cluster.

What about the reflexes in the other languages? At first it seems difficult to posit a development of dorsal + coronal stop + *s into a simple coronal stop in Irish. But to judge from the Cisalpine Gaulish compound **TeuoχTonion** /deːwo-gdonion/ 'of gods and men', the latter a derivative of 'earth' (cognate with Old Irish *duine* 'person' < *donios, cf. *don-* 'earth' above), these consonant clusters passed through a stage in Celtic very much like that attested in Greek, with the cluster-final *s lost very early. (For the Gaulish inscription see Michel Lejeune, *Recueil des inscriptions gauloises,* Vol. II, Fascicle 1 (Paris 1988: CNRS), pp. 26-37; it's written in an alphabet derived from Etruscan that does not distinguish between voiced and voiceless stops. I'm grateful to Joe Eska for helpful discussion.) Of course the resulting dorsal-plus-coronal clusters would have survived in Irish if they had occurred between vowels, but none of the surviving exam-ples do; all are word-initial or, in 'bear', after *r.* It's plausible to suggest that the dorsal was lost word-initially, since there are no Old Irish words that begin with clusters of two stops, and we actually know that dorsals were lost between *r* and a coronal: cf. OIr. present *orgaid,* conjunct *·oirg,* '(s)he slays' (root /org-/) with perfective preterite *ro·ort* '(s)he has slain' < *ork-t-.

Tocharian and Anatolian are a different matter; it looks like the thorn-cluster metathesis never occurred in those languages, and even the earlier extension of the *s-insertion rule to coronal-plus-dorsal clusters might not have occurred in them either. (The latter is less certain, though. A sequence of sound changes *TK > *TsK > *TK is perfectly reasonable; moreover, the second change definitely did occur in Tocharian: see Ringe, *On the chronology of sound changes in Tocharian,* Vol. 1 (New Haven 1996: American Oriental Society), p. 72 with references.) But that's best discussed in the con-text of a further example, as follows.

One of the best thorn-cluster examples is a word for 'carpenter', Skt. *tákṣā* = Av. *tašā* = Gk. τέκτων /téktɔːn/; the ancestral form must have been (nom. sg.) *téḱtsō, underlyingly */tétḱon-s/. (The word-final sequence became *-ōn by a phonological rule called Szemerényi's Law; then word-final *-n was dropped after *ō. Greek restores the

final consonant from the other forms of the paradigm.) But *tétḱ- is not a likely PIE root; it seems much more likely that the stem should be analyzed as */té-tḱ-on-/, with initial reduplication and the zero grade of a root *téḱ-. I think Schindler was the first to think that through, and once he had come to that conclusion, various other things fell into place as follows.

In the first place, there's the related Sanskrit verb root *takṣ-* 'make (out of wood)'. Synchronically this root has a "Narten present", with *tākṣ-* in the active indicative singular (3sg. *tā́ṣṭi*) and *tákṣ-* in rest of the paradigm, and that was already true in Proto-Indo-Iranian, since Avestan has 3sg. *tāšti*. But Narten presents are often innovations, made by adding an extra *á* in the active ind. sg. to a root that already has *á* in other forms (and of course *á* + *á* = *ā́*)—or the same process with *é*'s, if it happened early enough—and that seems to be what happened here. If the default stem was originally reduplicated *té-tḱ-, then the active ind. sg. must originally have been *té-teḱ-, and the development of the stem in pre-Indo-Iranian must have been as follows (using the 3sg. and 3pl. to exemplify the two alternants of the stem): first,

3sg. *téteḱti, 3pl. *tétḱn̥ti > 3sg. *téteḱti, 3pl. *téḱtsn̥ti

by regular sound change; then, because the paradigm was no longer transparent—*téteḱ- was obviously reduplicated, but *téḱts- wasn't—the former was replaced:

3sg. *téteḱti, 3pl. *téḱtsn̥ti → 3sg. *tḗḱtsti, 3pl. *téḱtsn̥ti,

yielding the attested Narten present—or the same thing could have happened, mutatis mutandis, after all the e-vowels had become a-vowels in PIIr. That might explain why some forms of this verb's perfect, also usually a reduplicated formation, *apparently* lack reduplication in the Rigveda (our oldest Sanskrit document): 3pl. *takṣur* and 2nd person dual *takṣatʰur* could actually be extreme archaisms, with *takṣ-* reflecting the original reduplicated sequence *te-tḱ-, and the usual perfect stem *tatakṣ-* can be a transparent innovation.

Is there any confirmation of this from other IE languages? Surprisingly, Greek offers support in an interestingly indirect way. The original root *téḱ- survives without major change in aorist τεκεῖν /tekê:n/ 'to give birth to'. (So maybe the PIE root originally meant 'produce, create'.) The corresponding present is τίκτειν /tíkte:n/ 'to give birth to (children sequentially); to be (in the process of) giving birth to'. Obviously it could contain a thorn cluster reflex, but the first syllable exhibits an unexpected /i/ and

the stem is thematic—that is, it ends in the alternating vowel /e ~ o/—unlike the Indo-Iranian present stem. But those are actually not problematic differences at all. Though PIE had some presents reduplicated with *e (like the one reconstructed above) and others with *i, Greek has shifted nearly all of the former into the latter class (the last holdout is τετραίνειν /tetráine:n/ 'to bore (holes sequentially), to be (in the process of) boring'), so we actually expect to find /i/ as a reduplicating vowel in the Greek reflex. Moreover, Greek has added the thematic vowel to nearly all present and aorist stems ending in (surviving) consonants—so that detail is expected too. We don't know what order those innovations occurred in, but a plausible sequence of developments would be the following:

> 3sg. *tétek̑ti, 3pl. *tétk̑n̥ti > 3sg. *tétek̑ti, 3pl. *ték̑tsn̥ti (as above)

> → 3sg. *títek̑ti, 3pl. *tík̑tsn̥ti (when learners could still recover the fact that the stem was reduplicated);

> then present participle *tík̑ts-n̥t- → *tík̑ts-ont-; then *tík̑ts-ont- → *tík̑ts-o-nt- (that is, learners reanalyzed the vowel of the participle suffix as the alternating thematic vowel, George Cardona, p.c.);

> 3sg. *títek̑ti, 3pl. *tík̑tsn̥ti → 3sg. *títek̑ti, 3pl. *tík̑tsonti (that is, the vowel of the participle spread into the phonologically similar 3pl.);

> 3sg. *títek̑ti, 3pl. *tík̑tsonti → 3sg. *tík̑tseti, 3pl. *tík̑tsonti (thematization of the entire paradigm)

> >→ Proto-Greek 3sg. *tíktei, 3pl. *tíktonti > Attic 3sg. τίκτει /tíktei/, 3pl. τίκτουσι /tíkto:si/.

So far as I can see, this is not problematic.

Things get more complicated and less certain when we start to bring in evidence from other languages. A Hittite stem *taks-* supposedly meaning 'join, fit' is sometimes connected with the Indo-Iranian and Greek verbs. But its meanings actually range over 'undertake, unite (including *taksul taks-* 'conclude a peace treaty'), prepare' (Norbert Oettinger, *Die Stammbildung des hethitischen Verbums* (Nürnberg 1979: Hans Carl), pp. 217-9) and even 'wield' (H. Craig Melchert, *Anatolian historical phonology* (Amsterdam 1994: Rodopi), p.93). There is no semantic reason why the Hittite verb has to be cognate with the others, and (as Oettinger points out) the fact that its phonology disagrees with that of 'bear' is actually a reason to reject any connection; a plausible preform would be *dek̑s- (Melchert, loc. cit. with references), from a completely different root. So the

hypothesis that *TK-clusters survive unchanged in Anatolian can be allowed to stand.

A possible Tocharian cognate is uncertain for different reasons. Klaus Schmidt identified a Tocharian B word *taktsāntsa* 'capable (of)' in an unpublished text, plausibly a reflex of the 'carpenter' word (cited by Manfred Mayrhofer, *Etymologisches Wörter-buch des Altindoarischen,* I. Band, Lieferung 8 (Heidelberg 1990: Winter), p. 614). If the word is correctly reported and interpreted, it actually preserves the thorn cluster out-come that Schindler hypothesizes—and that's potentially a problem, since Toch. A *tkaṃ* 'earth' doesn't seem to have undergone the thorn-cluster metathesis. But the form and meaning of Toch. B *taktsāntsa* can't be verified until the text is publicly available for specialists to examine. K. T. Schmidt's opinions about some of other Tocharian words have not stood up to closer scrutiny; I know that because I accepted a couple of them in my book, and Doug Adams pointed out (in a review of the book) that Schmidt was almost certainly mistaken about them.

Another possible cognate with the same phonetic outcome is Toch. B *ktsaitstse* 'old', which some scholars have suggested is ultimately derived from *dʰgʷʰey- 'perish'. But Toch. A *ktsets* 'finished, perfect', which is obviously cognate with the Tocharian B word, suggests that the latter's meaning 'old' did not evolve from 'decrepit' or the like—and in that case the Tocharian words probably have nothing to do with 'perish' (Douglas Adams, *A dictionary of Tocharian B* (Amsterdam 1999: Rodopi), pp. 242-3).

So for Tocharian we have two possibilities that we can't yet choose between: either *taktsāntsa* is something completely unconnected (even if its form is correctly reported) and Tocharian didn't undergo the thorn-cluster metathesis (judging from the Tocharian A word for 'earth'); or else Schmidt is right about *taktsāntsa,* Tocharian did undergo the metathesis, and Toch. A *tkaṃ* 'earth' reflects a PIE form with a vowel be-tween the first two consonants (or, conceivably, a form in which *t-* was reintroduced by paradigmatic levelling).

Other possible cognates are much less informative. Latin *texere* 'to weave' could easily reflect metathesized *tékts-, but it could just as easily reflect *ték-s-, i.e. the unre-duplicated root with an s-suffix of some kind. Derived nouns in various languages also look like they reflect *ték-s- (Greek τέχνη /tékʰnɛː/ 'craft' < *téksnā, Old High German *dehsala* 'ax' < PGmc. *þehslō-n- < *tekslā, etc.), but at least some might exhibit a condi-tioned reflex of metathesized *tékts- before consonants. There's nothing that adds signif-

icantly to what we already know from Indo-Iranian and Greek.

Finally, there is the rather different case of 'yesterday'. The relevant forms are:

Sanskrit *hyás;*

Greek χθές /kʰtʰés/;

Latin *herī,* adj. *hesternus;*

Old Irish *indé,* Welsh *doe;*

Old English *ġiestran(dæġ),* OHG *gestaron;* Gothic *gistradagis* 'tomorrow' (!);

Albanian *dje.*

Only the Greek and Celtic forms show typical thorn-cluster reflexes; Sanskrit has a reflex of **ǵʰy-,* while Italic and Germanic have reflexes of **ǵʰ-.* (The prehistory of the Albanian word is unclear, as is often the case.) The best solution was proposed by Schindler in one of his early articles: this is not really a "thorn-cluster" word at all, but an archaic compound **ǵʰ-dyés,* with a locative of one of the stems meaning 'day' (cf. Skt. *sa-dyás* 'on the same day, immediately') prefixed with the same deictic that appears as the initial consonant of Latin *hic* 'this'. There was no metathesis because the coronal stop was already after the dorsal, and of course no inserted *s for the same reason; the different languages have just simplified the initial consonant cluster in different ways.