Periphrastic Perfects in Greek and Sanskrit[*]

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1   Introduction: On periphrasis

Mark Hale's work has left a deep impression on me, as have the numerous discussions with him (and rants!) that I was privileged to enjoy during my time at Concordia University. One such interaction took place after a colloquium talk on participles and various other aspects of Greek and Sanskrit verbal morphology that I had just given. In the talk, I had argued that Greek and Vedic participles shared more verbal structure, i.e., verbal functional projections, with finite verbs than root-based "verbal adjectives" do (Ved. *-tá-*, Gk. *-τός*), and that this derives a number of properties of participles in those languages, including the behavior of participles of deponent verbs. As we will see below, this approach isn't exactly new, but its application to the verbal morphosyntax of the older Indo-European languages could, in my view, explain some of the syntactic and semantic properties of those formations. However, after the talk, Mark asked a question that could be paraphrased as follows: If it is true that participles in Vedic are "more verbal" than verbal adjectives in *-tá-*, why do they not occur in periphrastic constructions? In other words, wouldn't their inherent "verbiness" make them more likely candidates to be pressed into service in a periphrastic perfect or passive construction than the "less verbal" *-tá-*-adjectives (and other nominals) that we actually see in these constructions in Old Indic?

I confess that I didn't have a good answer then, but it did inspire me to think about what such an answer would look like, and that's what I would like to offer in Mark's honor. In the following, I will use a Minimalist approach combined with Distributed Morphology (DM) to sketch out how we can derive a range of periphrastic constructions by treating participles not as categorially specified, but as allomorphs of particular verbal functional heads in environments where agreement with and/or movement to T/AGR (or other functional heads of the "verbal spine") is not possible.

2   Background: Auxiliaries don't select

The account presented here builds on Bjorkman (2011), who discusses periphrastic constructions in a variety of languages (focusing on English, Latin, and Arabic) and argues against "selectional" approaches to auxiliaries in these constructions. That is, according to Bjorkman auxiliaries such as BE in the English passive (1a), and progressive (1b), are not selected by other syntactic elements and do not head their own projections.

(1)   a.   The cake **was** eaten.
      b.   The children **were** eating the cake.
      c.   The cake **was being** eaten.

Bjorkman calls the pattern in (1c) the *additive pattern* of auxiliary use: Both the passive (1a), and the progressive (1b) by themselves require use of a BE auxiliary, and the passive progressive (past, in this case) in (1c) appears to add these two auxilaries together. This differs from the *overflow pattern* illustrated by the Latin perfect passive in (2c): While the perfect active (2a), and the present passive (2b), are synthetic, the combination of perfect + passive in (2c) gives rise to a periphrastic construction with a BE auxiliary (examples modifed from Bjorkman 2011: 27).

(2)   a.   *Puellae crustulum*   ***consumpserunt***.
           girls   small.pastry.ACC eat.3PL.PFV
           "The girls ate the little pastry."
      b.   *Crustulum*   ***consumitur***.
           small.pastry eat.3SG.PRES.PASS
           "The little pastry is (being) eaten."
      c.   *Crustulum*   ***consumptum est***.
           small.pastry eat.PASS.PTCP be.3SG.PRES
           "The little pastry was / has been eaten."

Bjorkman's analysis of the overflow pattern builds on the discussion of the Latin perfect by Embick (2000; also Embick 1997: 226ff.), who argues that the periphrastic perfect is the result of a lack of verb movement to T. That is, synthetic verb forms in Latin are complex heads built by cyclic head movement and left adjunction, as standardly assumed in Distributed Morphology. Thus a pluperfect form such as *amāveram* 'I had loved' is the realization or spelled-out form of the complex head in (3b), itself the result of cyclic head movement as illustrated in (3a) (after Embick 2000: 196–7).

(3)   a.   b.
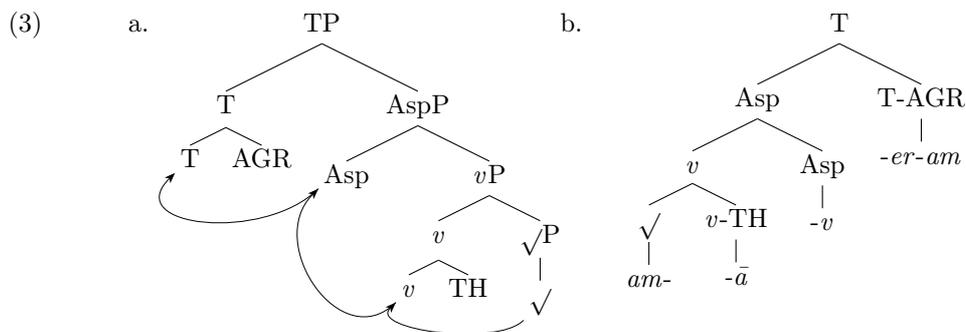
In (3), the root first moves to *v*, the projection that verbalizes and introduces the external argument. Theme or conjugation class features (such as first conjugation -*ā*-, in this case) adjoin to *v* and the resulting complex head then moves to Asp, and subsequently to T. Agreement features expressing person and number morphologically adjoin to T. In analytic forms, however, the movement is interrupted: Root-to-*v*-to-Asp movement takes place just as in synthetic forms, indicated by the solid arrows

in (4), but the resulting complex head cannot move to T, as indicated by the dotted line (example modified from Embick 2000: 214).

(4)
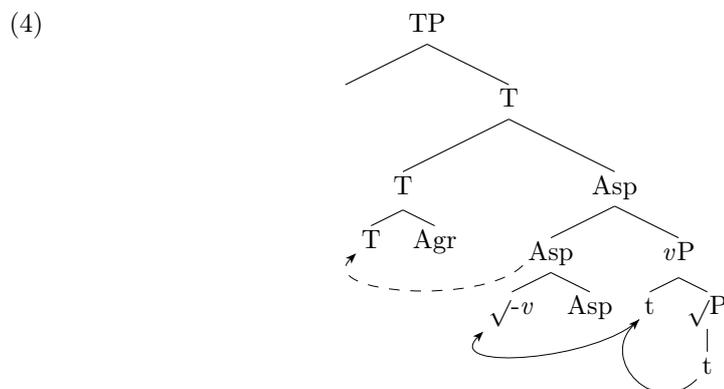
The result is what Bjorkman (2011) describes as the "overflow" pattern: The tense and agreement features on T are "stranded" and a dummy verb—the auxiliary BE—is inserted in order to phonologically realize them, while the complex $\sqrt{}$-v-Asp head in (4) is realized by a nonfinite form (a perfect participle, in the case of Latin). This account has several advantages, most notably dispensing with the need to independently characterize the category of auxiliaries ("AuxP") and participles ("PtcpP"). That is, a participle is a verb that has not moved to T.

Embick does not discuss *why* movement to T fails to take place in the perfect passive, but only states that movement to T is blocked in the perfect in the presence of the (interpretable) feature [PASS] on v (as well as in the case of deponent verbs, which Embick analyzes as lexically possessing a [PASS] feature on the root). Bjorkman (2011) modifies this account by tying the appearance of analytic forms to properties of Agree and to the *markedness* of certain features. Specifically, she argues that marked features block Agree, and that it is failure to Agree caused by marked features that triggers the insertion of nonfinite forms and auxiliaries in periphrastic constructions. Bjorkman furthermore argues that feature valuation proceeds via upwards agreement of the verb with interpretable features on functional heads ("Reverse Agree", e.g., Wurmbrand 2012, Zeijlstra 2012), rather than the other way around ("Standard Agree", e.g., Chomsky 2001). Her definition of Agree is given in (5).

(5)   *Agree* (Bjorkman 2011: 42)
       Agree is a relationship between two features such that an unvalued feature [F:_] receives a value of a feature [F:val] of the same type iff:
       a.   A head α containing [F:_] is c-commanded by a head β containing [F:val].
       b.   There is no head γ containing a matching feature [F:(val)], such that γ c-commands α and β c-commands γ.

As Bjorkman points out, this formulation in many ways reflects the intuition behind early generativist approaches to verbal morphology such as "Affix Hopping", namely that inflectional tense, aspect and agreement morphology originates in designated

functional projections above the verbal stem (or root). The combination of inflectional morphology with the verb is then dependent on locality requirements (i.e., of head movement) and language-specific post-syntactic/"morphological" requirements (i.e., affixes need a particular type of host). Crucially, this combination can fail, namely when a functional head with the relevant type of inflectional features intervenes (cf. (5b)), leaving the higher agreement features stranded. Auxiliaries are used to pick up precisely such stranded features, effectively acting as a repair strategy.

So what types of features are possible intervenors? Bjorkman argues that only *marked* features are visible for Agree and can therefore potentially act as intervenors. Markedness refers here to contrastive markedness of syntactic (or "synsem") features, not morphological markedness, in that both the marked and the unmarked/elsewhere value of a given feature can be morphologically realized, but only the marked value will be relevant to the syntactico-semantic Agree relation. Moreover, markedness varies cross-linguistically—for example, Bjorkman argues that while perfective is the marked value of Asp in Latin, it is the default (unmarked) value of Asp in Arabic. This means that we expect cross-linguistic differences in which values trigger periphrastic constructions.
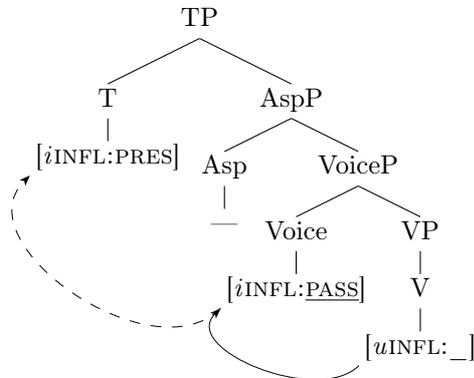
To see how this works in detail, consider Bjorkman's analysis of the Latin perfect passive. Bjorkman argues that the marked feature of Asp in Latin is [iINFL:PFV] (an interpretable perfective feature) and that the marked feature of Voice (the projection that introduces the external argument, corresponding to Embick's v) is [iINFL:PASS] (marked features are underlined in the trees below). In the perfect active, the verb can agree directly with the marked inflectional feature on Asp because there is no marked feature on Voice, hence no intervenor (cf. "γ" in the definition in (5)). Moreover, because head movement in this account depends on a prior Agree relation, the verb can now also move to Asp, indicated by the bold arrow in (6). This movement brings it in a local relationship with T, with which it agrees (dashed line in (6)).

(6)   Latin perfect active: *consumpserunt* 'they ate' (Bjorkman 2011: 72)
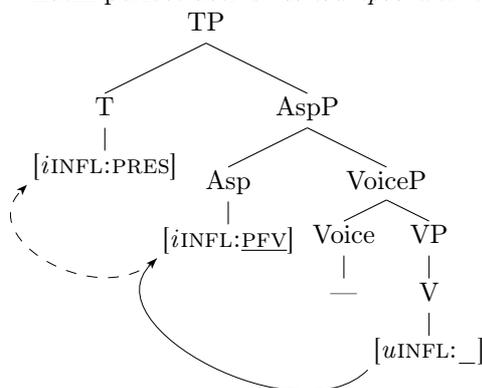
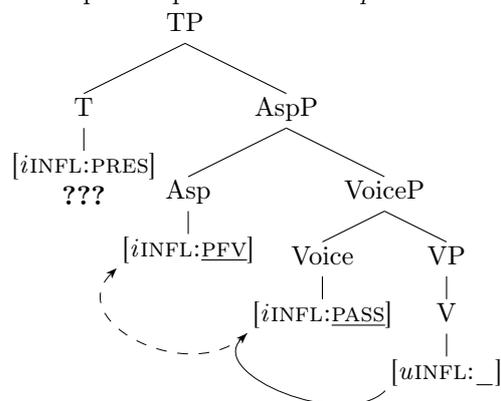

As a result, no inflectional features are stranded and we end up with a synthetic verb form. A similar derivation results in a synthetic present passive: The verb agrees with the marked feature [PASS] on Voice and moves to Voice (bold arrow in (7)). Because there is no marked feature on Asp, it can then agree directly with the inflectional feature on Tense, and again no features are stranded.

(7) Latin present passive: *consumitur* 'it is eaten' (Bjorkman 2011: 72)

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                    TP
                   /  \
                  T    AspP
                  |   /    \
          [iINFL:PRES]  Asp   VoiceP
                   ↑    |    /      \
                   ⌐   —  Voice      VP
                   ⌐       |         |
                   ⌐  [iINFL:PASS]   V
                   ⌐        ⌐        |
                            ⌐    [uINFL:_]
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Now consider what happens in the perfect passive. In this case, the verb agrees with and moves to Voice as in (7), where it can agree with the marked perfective feature on Asp (indicated by the dotted line in (8)). However, because of the marked [PASS] feature on Voice, movement from Voice to Asp is blocked.[1] The marked feature [PFV] on Asp therefore acts as an intervenor for further agreement, so that the verb cannot agree for tense, and the interpretable feature [PRES] on T is stranded. The stranded tense and agreement features are then picked up by the default auxiliary BE.

(8) Latin perfect passive: *consumptum est* 'was consumed':

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                    TP
                   /  \
                  T    AspP
                  |   /    \
          [iINFL:PRES]  Asp    VoiceP
             ???    |     /      \
              [iINFL:PFV] Voice    VP
                   ↑      |        |
                   ⌐ [iINFL:PASS]  V
                   ⌐      ⌐        |
                          ⌐    [uINFL:_]
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There are several advantages to this approach. First, it dispenses with the need to stipulate designated functional projections for auxiliaries and participles. Second, it explains why periphrastic constructions such as (8) effectively "supplete" a paradigm: They morphologically realize the same syntactic structure as the synthetic forms, the only difference lies in the features (or feature combinations) of these structures. This

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1   Bjorkman also discusses empirical evidence in favor of the view that language-specific parametrization of verb movement as relationship between two heads is justifiable: Thus, French has generalized V-to-T movement, but no V(-to-T)-to-C, while mainland Scandinavian languages have generalized V(-to-T)-to-C movement in main clauses, but no independent V-to-T movement in subordinate clauses.

is made especially clear in the case of *deponents*, which have active syntax, but passive morphology: Deponents, too, form periphrastic perfect passives, which preserve the active syntax, cf. (9).[2]

(9)   a.   *hortor* 'I exhort': *hortātus/-a sum* 'I have exhorted'
      b.   *loquor* 'I speak': *locūtus/-a sum* 'I have spoken'
      c.   *sequor* 'I follow': *secūtus/-a sum* 'I have followed'

Finally, where and when periphrastic constructions surface depends on language-specific variation in the markedness and visibility of features for Agree. In the following sections, I will sketch how to apply this approach to periphrastic constructions in Greek and Sanskrit, and argue that Greek has a variant of the additive pattern, while the Sanskrit periphrastic perfect shows a variant of the overflow pattern.

3   Periphrastic perfects in Classical Greek

3.1   The paradigm

Table 1 summarizes the periphrastic constructions discussed in Smyth and Messing (1956: 182–3) for Classical Greek.[3]

First off, and very much unlike (Vedic) Sanskrit, Greek actually uses its active and middle participles in periphrastic perfect constructions. In other words, the question "why is the verbal adjective used in periphrastic constructions, rather than the participle" that we formulated above for Vedic does not hold for Greek. Second, Greek forms active and/or nonactive/middle participles to at least six different tense/aspect stems, which means that we might in principle expect a large variety of periphrastic constructions based on different participles + auxiliary verbs. But in Archaic/Homeric Greek, we only find periphrastic constructions involving the perfect participle (+ εἶναι 'be' and ἔχειν 'have'). The periphrastic perfect construction also predominates in Classical Greek, though there we also begin to see increased use of periphrastic constructions with the aorist and present participles (cf. Bentein 2013b). For reasons of space, I concentrate on the periphrastic perfects with εἶναι. Based on this restricted set of forms, our aim is now to determine which feature combinations trigger the use of these periphrastic constructions.

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2   Embick and Bjorkman both assume that deponents are inherently specified for [PASS], and that both syntactically and lexically specified [PASS] acts as an intervenor (Bjorkman) or blocks movement (Embick). My own view differs in that I do not assume that deponents (defined only as agentive verbs with passive morphology and excluding intransitive nonagentive verbs such as *morior* 'die', etc.) are lexically specified for [PASS], but acquire their passive/nonactive inflection in the same way that canonical passives do: by lacking an external argument DP in the specifier of Voice; see Grestenberger 2018, 2019. This difference will not be relevant, however, because both approaches derive the periphrastic forms of deponent verbs (in whichever definition), at least in Greek and Latin. For Sanskrit, see section 4.

3   This may reflect a somewhat idealized picture, as the actually attested situation in pre- and post-Classical Greek is a lot messier with respect to the forms that are actually used; cf. Aerts 1965; Bentein 2012a, 2012b, 2013b for more detailed surveys and discussions.

Table 1: Periphrastic perfect constructions in Classical Greek

		Ptcp.act.	Ptcp.mid.	Aux.act. BE	Aux.mid. BE	
a.	Pf. act.	λελυκώς lelukós		εἰμι eimi		'have released'
b.	Pf. pass.		λελυμένος leluménos	εἰμί eimí		'have been released'
c.	Plupf. act.	λελυκὼς lelukòs		ἦν ễn		'had released'
d.	Plupf. pass.		λελυμένος leluménos	ἦν ễn		'had been released'
e.	Pf.act. subj.	λελυκὼς lelukòs		ὦ ỗ		'shall release'
f.	Pf.pass. subj.		λελυμένος leluménos	ὦ ỗ		'shall be released'
g.	Pf.act. opt.	λελυκὼς lelukòs		εἴην eíēn		'might release'
h.	Pf.pass. opt.		λελυμένος leluménos	εἴην eíēn		'might be released'
i.	Fut.pf. act.	λελυκὼς lelukòs			ἔσομαι ésomai	'will have released'
j.	Fut.pf. pass.		λελυμένος leluménos		ἔσομαι ésomai	'will have been released'

The forms in Table 1 suggest that we are dealing with the *additive* pattern as in English (cf. (1)), in which a periphrastic construction is always present in a particular context—in this case, the perfect. We also observe that the features of Voice are uniformly expressed on the participial part of the periphrastic construction, in that the active participle is used in the active forms, and the middle (nonactive) participle in the middle/passive form, while the auxiliary is *always* morphologically active—with the exception of the future perfect, which will be treated below as a special case.

Moreover, periphrastic perfects from deponent verbs—verbs which are agentive (transitive), but take middle endings—and *media tantum* verbs in general are also formed with the *middle* perfect participle plus the active auxiliary, e.g., ... καὶ λέγουσιν ὡς οὐδέν κακὸν οὐδ' αἰσχρὸν **εἰργασμένοι εἰσίν** 'and they say that they have done neither bad nor shameful things' (Lys. 12.22, cf. also Thuc. 3.52, ἐργάζομαι 'work, perform service'), or δεδεγμένος (δέχομαι 'take, accept') in (10), which, though lacking an overt auxiliary, is clearly the main predicate of its clause, as shown by the coordination with a clause with a finite verb.[4]

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4   Deponency in Greek, as in Sanskrit, is largely restricted to the present stem; that is, inherited deponents and media tantum in general make only presents (see Grestenberger 2014 on this pattern). While we also find aorists secondarily built on such stems in Greek (e.g., πονέομαι 'toil': ἐπονησάμην; σκέπτομαι 'look, examine': ἐσκεψάμην), perfect stems are much rarer. This

(10) ὁ   μὲν δὴ ταύτην τὴν   γνώμην
he.NOM PTCL PTCL this.ACC.F the.ACC.F opinion.ACC.F

ἀπεφαίνετο   εἴτε   δὴ **δεδεγμένος**
declare.IPF.3SG.NONACT either accept.PF.PTCP.NONACT.NOM.SG

χρήματα παρὰ Μαρδονίου,   εἴτε καὶ ταῦτά   οἱ ἑάνδανε
stuff   from Mardonios.GEN or   this.N.PL. him please.IPF.3SG.ACT

"But he declared this opinion, either because he had accepted things(/bribes)
from Mardonius, or because those (plans) pleased him: ...." (Hdt. *Hist.* 9.5)

To summarize, voice features, including voice alternations and "tantum"-behavior, are
expressed on the participle in the Greek periphrastic perfect, while mood, tense, and
agreement features are found on the auxiliary. In the next sections, we will attempt
to derive this pattern.

3.2   The indicative

Deviating slightly from Bjorkman's feature lattice described above, I assume that the
relevant features of Voice to be captured are "active" and "nonactive" (a.k.a. "middle")
rather than "active" and "passive", with "nonactive" encompassing passive among other
functions of "middle" voice morphology (cf. Grestenberger 2018, Grestenberger 2021).
We will moreover assume that the [NONACT] feature of Voice (rather than [ACT]; see
Grestenberger 2018, 2021 for arguments) is the more highly specified one, and that
in the absence of this feature, Voice will be expressed with active morphology by the
Elsewhere principle. The [NONACT] feature is used here as a stand-in for the Spell-
Out condition in (11) (based on Embick 1998, 2004: 150), which states that [NONACT]
reflects a VoiceP without an external argument DP (Voice[-D] or Voice[-ext.arg.]).

(11)   Spell-Out condition on nonactive morphology (Alexiadou et al. 2015: 101–2)
       Voice → Voice[Nonact]/_ No DP specifier

As for markedness in the sense of Bjorkman, we note that in Table 1 both the active
and the nonactive forms of the perfect are periphrastic, and that Voice features alone
do not seem to trigger periphrasis in other parts of the Greek verbal system. This
suggests that while (11) determines a more highly specified environment for the Spell-
Out of nonactive morphology, this does not mean that [NONACT] is a syntactically
specified feature on Voice in the way [PASS] is in Latin (in Bjorkman's approach).
This may explain why we see Voice morphology on the inflectional endings in Greek,
rather than between verbalizing morphology and the inflectional endings where we
would expect it to surface given the order of functional projections in the verbal
spine. In other words, we do not expect this feature to block movement or agreement.
In the following, I will use "Voice[-ext.arg.]" instead of the potentially confusing "no
DP specifier" condition.

The feature content of the perfect is more difficult. Table 1 suggests that just
as in Latin, the Greek perfect contains a marked feature that acts as an intervenor
for Agree. However, unlike in Latin, this cannot simply be PFV, since we do not

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means there are not many instances of perfect participles of deponent verbs, in periphrastic
constructions or otherwise.

get the same pattern of periphrastic behavior in the aorist, nor in the present stem, for that matter.[5] In other words, we need a feature that uniquely distinguishes the perfect stem from the aorist and present stem. Reed (2014) proposes a DM account for the Greek verbal system that uses binary features on Asp and determines the relevant stems as follows: The aorist is [+aor,-perf], the present is [-aor,-perf], and the perfect is [-aor,+perf]. While this would suffice as far as the formal account goes, it does not offer any insight into the semantic distinction between aorist, perfect, and present. In particular, it does not explain why the periphrastic perfect and pluperfect constructions (λελυκώς εἰμί, λελυκὼς ἤν etc.) came to functionally replace the inherited *synthetic* perfect and pluperfects (λέλυκα, ἐλελύκη) in Classical and post-Classical Greek, and why, at the same time, the synthetic perfect increasingly merges formally with the aorist into a perfective/anterior preterit-like stem (cf. Haspelmath 1992, Bentein 2012b, 2013a).

Given that the (Homeric/pre-Classical) synthetic perfect, and especially the perfect participle, are usually characterized as expressing an resultant/attained state (i.e., a "resultative" in the sense of "state resulting from a previous event", cf. Chantraine 1926, Schwyzer 1939: 768, Haspelmath 1992, Bentein 2012a, 2012b, 2013a, Napoli 2017), it makes sense to characterize the feature that distinguishes the pre-Classical synthetic perfect from the aorist as RES (result). Moreover, since the periphrastic perfect and pluperfect also express a (resultative) state,[6] it looks like these periphrastic constructions effectively replace the synthetic perfect in its resultative use (while the anterior past use merged with the aorist). This would then suggest that the feature [RES] was reanalyzed in some fashion between Homeric and Classical Greek. One possibility is that it changed from an unmarked to a marked feature, in which case it would suddenly block the previous synthetic form from appearing. The other possibility is that it was always marked, but originally sat in a position that did not prevent Agreement (or movement) from taking place. It was then reanalyzed into a higher position, and ended up being in the way (a combination of these two developments is also possible).[7] Either way, the result would be a marked feature [RES] on Asp, as illustrated in (12), which represents the structure of the a–d forms in Table 1.
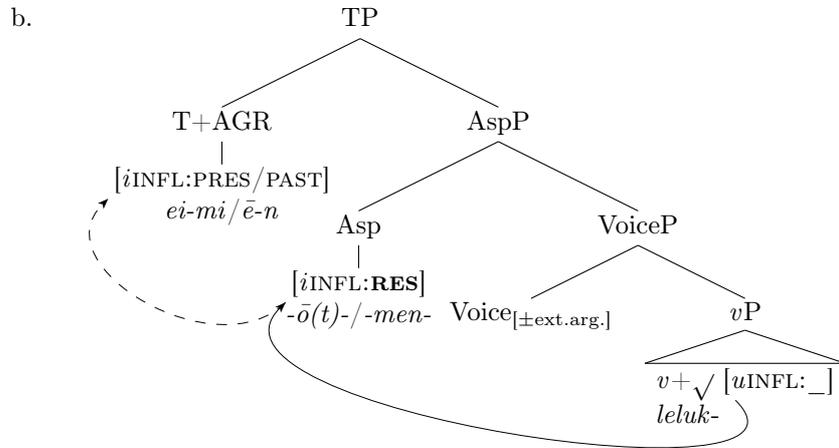
(12) a. Perfect/pluperfect active/nonactive indicative:

        le-lu-k-ō(t)-/-men-
        PF-release-PF-PTCP.ACT/PTCP.NONACT
        ei-mi/ē-n
        BE-1SG.PRES.ACT/BE-1SG.PAST.ACT

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5   Though the aorist and the present participle do begin to be used in periphrastic constructions in CG: the aorist participle in anterior/perfective periphrastic constructions, and the present participle in stative and progressive periphrastic constructions. Moreover, we begin to see more variation in terms of auxiliary selection (εἶναι vs. ἔχειν vs. μέλλειν, θέλειν in the future), cf. Bentein 2013b on the Classical and Bentein 2012a on the post-Classical situation; on the development of the periphrastic future see Markopoulos 2009.

6   "Such forms are more common in the pluperfect and in general denote *state* rather than *action*." (Smyth and Messing 1956: 182; also Aerts 1965, Napoli 2017). See Bentein 2012b for some caveats regarding the functions of periphrastic perfects.

7   This "upwards reanalysis" could belong to the "perfective cycle" (resultative > anterior > perfective/past), in which features from lower projections like *v* (result, completion) are reanalyzed as belonging to higher functional projections (Asp, T), cf. van Gelderen 2018: 221ff. with refs.

b.

TP
T+AGR   AspP
$[i\text{INFL:PRES}/\text{PAST}]$
ei-mi/ē-n
Asp   VoiceP
$[i\text{INFL:}\textbf{RES}]$
-ō(t)-/-men-   Voice$_{[\pm\text{ext.arg.}]}$ *v*P
$v+\sqrt{}\,[u\text{INFL:}\_]$
leluk-

Given our assumptions so far, we expect that the [uINFL] feature on $v/\sqrt{}$ agrees with and moves to Voice, then agrees with and moves to Asp. Here, further movement is blocked because of the marked feature [RES] on Asp. If this were Latin, upward agreement with T/AGR (indicated by the dotted line in (12)) would still be possible and we would expect a synthetic form to surface. In order to capture the Greek additive pattern, I therefore depart from Bjorkman's approach outlined in section 2 and assume that synthetic forms in Greek in fact depend on *movement* rather than on *agreement*, effectively as Embick has argued for Latin. That is, agreement with T/AGR and the other functional heads in (12) actually depends on prior movement, and since movement is blocked by [RES], the higher T/AGR features cannot be realized on the verb and need to be picked up by the copula BE.[8]

The participial morphology in (12) realizes Asp under different conditions. In Grestenberger 2018, 2020 I have argued for the following Spell-Out rules for Ancient Greek participles, based on Embick 2000: 218 (for Latin).

(13)   Spell-Out conditions for AG participles:
    a.   Asp ↔ *-men(os)*/ Voice[-ext.arg.] __
    b.   Asp ↔ *-nt-*: Elsewhere

In other words, the "middle" participle -μεν(ος) has the same distribution as the finite middle endings: It occurs when Voice does not have a DP specifier/an external argument. Crucially, in order for the context-sensitive allomorphy in (13) to occur, Asp must be linearly adjacent to Voice, but not T—otherwise we would expect a regular nonactive *finite* form. That is, participial morphology spells out Asp when Asp cannot move to T. This may be the case in nonfinite adjunct clauses (including absolute constructions such as the genitive absolute construction) which may simply lack the relevant clause structure, or, as in this case, because the "perfect" feature [RES] intervenes and blocks movement. However, in order to account for the allomorphy in the perfect active participle and the realization of Asp in finite forms, we need

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8   I assume for now that both [PRES] and [PAST] are specified on T in Ancient Greek (cf. Bjorkman 2011: 71 & fn. 43 for Latin), though this has no bearing on the analysis presented here.

to refine the Spell-Out rules for Asp in (13). First, consider the impressive array of participial forms in Classical Greek, summarized in Table 2.

Table 2: Classical Greek participles

		Active	Nonactive
a.	Present	λῠ́-ων, -o-**ντ**-ος	λῡό-**μεν**-ος
b.	Aorist	λῠ́σ-ᾱς, -α-**ντ**-ος	λῡσά-**μεν**-ος
c.	Perfect	λελυκ-ώς, -**ότ**-ος	λελυ-**μέν**-ος
d.	Future	λῠ́σ-ων, -o-**ντ**-ος	λῡσό-**μεν**-ος
(e.	Future perfect		λελῡσό-**μεν**-ος)
f.	Aorist passive	λυϑ-είς, -έ-**ντ**-ος	
g.	Future passive		λυϑησό-**μεν**-ος

The present, aorist, perfect, and future participles in rows a–d are straightforward: They consist of the verbal stem (root plus verbal stem-forming morphology) plus the suffix *-nt-* ("active participle") or *-men-* "middle participle", plus gender/case morphology (though with some complicated phonological and morphological fusion rules). The only exception is the perfect active participle, whose suffix is better described as *-ot-/-os-*;[9] this allomorphy must be formalized as a context-sensitive Spell-Out rule. Moreover, we need an entry for Asp in finite contexts, when it has moved to T; that is, it must be in a particular local relationship to T.

The updated Spell-Out rules or Vocabulary Items for Asp are given in (14). The perfect active participle suffix in (14a) is the most idiosyncratic one, and therefore the most highly specified allomorph of Asp—the lexical entry (14a) pretty much formalizes the context "perfect active participle", which may not be elegant, but seems unavoidable given its highly restricted distribution. Asp in (14b) is specified for concatenation (indicated by ⌢) with T—this is Asp in (finite) synthetic forms. (14c) is the condition on realization of -μεν(ος) which we have aleary encountered in (13),[10] and (14d) is the elsewhere form ("active" *-nt-*).

(14)   Vocabulary Items for CG Asp, revised

    a.   Asp[RES] ↔ *-ot-/-os-* /v/Voice[+ext.arg.]⌢_

    b.   Asp ↔ Ø/_⌢T

    c.   Asp ↔ *-men-* /Voice[-ext.arg.]⌢_

    d.   Asp ↔ *-nt-*

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9   Nom.sg.m. *-ōs* < *-ŏ̆(t)s* ← PIE *-u̯ŏ̆s-/-us-*; Nom.sg.n. *-os* < *-u̯os*; the original weak stem allomorph underlies the feminine perfect participle, e.g., Nom.sg. *-ũĩα* < *-usi̯a* < *-us-ih₂*. The replacement of *-(w)ŏ̆s-/-us-* by *-ŏ̆t-* in the weak stem is discussed by Rau (1998).

10   The fact that the *-men-* of the middle perfect participle carries the accent may suggest that we need a fifth entry, i.e., Asp[RES] ↔ *-mén-* /Voice[-ext.arg.]⌢_, essentially an inherently accented variant of the suffix. However, since the perfect active suffix likewise attracts the accent, one could speculate that this is a property of Asp[RES] rather than one of its allomorphs and thus due to the interaction of the morphological structure of perfects with the assignment of word-level accent. For reason of space, I have to leave this issue aside and hope that someone better versed in Greek prosody will address it—for example Dieter Gunkel, to whom I am grateful for pointing out this problem.

Note that under this view, verbal stem-forming morphology, i.e., "present" and "aorist" stem-forming morphology, is treated not as aspectual morphology (viewpoint aspect) but as verbalizing morphoplogy/lexical aspect. This follows from the approach outlined so far, in which participial morphology realizes Asp, since verbal stem forming-morphology regularly co-occurs with participial morphology (cf. Table 2). But I believe that it is also independently warranted: Verbal-stem forming morphology in the present and aorist stem (and, to a lesser extent, the perfect stem) displays a great deal of allomorphy that is highly idiosyncratic and root-dependent; it also occurs immediately adjacent to the root, which speaks for a very "low" functional projection. For that reason, and glossing over the details for now, I treat verbal stems as spelling out the root + (different "flavors" of) v in participles and finite verbs alike. This treatment also covers the "passive" perfective morpheme -$\vartheta(\eta/\varepsilon)$- in row f in Table 2, which behaves like a verbal stem-forming suffix in terms of distribution.[11] It also works for the "simple" future in row d., but the future perfect and future perfect passive (rows e & g) are a bit more complicated—we will return to them momentarily.
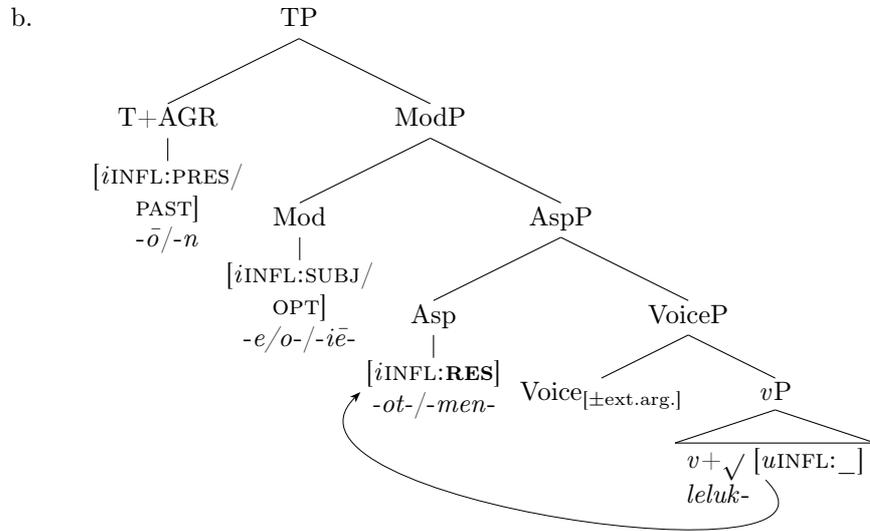
3.3 The modal forms

The pieces we have in place so far account for the forms in rows a–d in Table 1. We must now say something about the modal forms (rows e–h) and the future perfect forms (rows i–j). In the former, we see that optative and subjunctive morphology is expressed on the auxiliary. It is reasonable to assume that both express marked Mood features on a designated functional projection, i.e., ModP in (15). As in the indicative, agreement and movement takes place up to Asp, where [RES] blocks further movement. Therefore, both the Mod and the T/Agr features of (15) are expressed on the auxiliary in the CG periphrastic perfect, a point that distinguishes the Greek "additive" pattern from that seen in English: Recall that English expresses stranded features on separate auxiliaries, as in the passive progressive (1c above). The fact that this is not the case in CG suggests that movement from Mod to T is possible in Greek (recall fn. 2 on language-specific parametrization of head-to-head movement). We also observe this type of movement in the future perfect, which we still have to address.

(15)   a.   Perfect optative/subjunctive active/nonactive:

le-lu-k-ō(t)-/-men-
PF-release-PF-PTCP.ACT/NONACT
ō/e-iē-n
BE.SUBJ.1SG.PRES.ACT/BE-OPT-1SG.PAST.ACT

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11 See Grestenberger 2021 for a more detailed analysis of the Ancient Greek -$\vartheta\eta$-passive.

b.

TP
├── T+AGR
│   [*i*INFL:PRES/PAST]
│   -ṓ/-n
└── ModP
      ├── Mod
      │   [*i*INFL:SUBJ/OPT]
      │   -e/o-/-iḗ-
      └── AspP
            ├── Asp
            │   [*i*INFL:**RES**]
            │   -ot-/-men-
            └── VoiceP
                  ├── Voice[±ext.arg.]
                  └── *v*P
                        └── *v*+√ [*u*INFL:_]
                              leluk-

The analysis developed so far actually explains two characteristics of the periphrastic future perfect[12] that might seem odd at first glance: The fact that the periphrastic future perfect uses the *perfect* participle (row c in Table 2) rather than the future perfect participle (row e in Table 2), and second, the fact that we get nonactive/middle inflection on the auxiliary rather than the expected active-as-default inflection (like in rows a–h in Table 1). That is, we get a periphrastic future perfect passive λελυμένος ἔσομαι when we might expect *λελῡσόμενός εἰμι.

However, the first point (the use of the perfect rather than the future perfect) participle actually follows from the proposal that the perfect/[RES] feature on Asp blocks movement to higher projections and triggers Spell-Out of Asp as a participial form. Therefore any inflectional features relating to tense and modality, like [FUT], will have to be "picked up" by the auxiliary, just as in the subjunctive and optative in (15). In fact, under this view we do not expect the "future perfect participle" to be formed at all, because its formation presupposes movement of Asp[RES] to Mod, which is precisely what we have ruled out. As it turns out, this is almost correct: There is only one example of a future perfect participle in CG, διαπεπολεμησόμενον 'the war would have been ended' (Thuc. 7.25.9, διαπολεμέω 'to fight a war to the end'; cf. Smyth and Messing 1956: 179), which may have to be emended to διαπολεμησόμενον (that is, a future participle).[13]

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12 The synthetic forms of the future perfect are rarely active; as in the future itself, middle inflection is the norm (the handbooks cite Att. act. ἑστήξω and τεθνήξω as exceptions, e.g., Schwyzer 1939: 783, Smyth and Messing 1956: 180). Moreover, synthetic forms rarely occur outside of the indicative. Much more commonly, the future perfect active and passive are formed periphrastically, in the way illustrated in rows i–j in Table 1.

13 The expected future participle is actually an attested manuscript variant, though the future perfect form is generally preferred by editors because 1) it is attested in the generally reliable Vaticanus manuscript and 2) a perfective-anterior sense seems to be a better fit for the passage. Concerning the latter point, however, it must be stressed that the future itself, while not anterior, was un(der)specified for perfectivity, and the translation "the war would be at an end" (Smith 1958: 47) is certainly compatible with a future participle.

This just leaves the second point to be addressed, namely the question of why the auxiliary of the future perfect is always *middle*. This issue is all the more pressing as εἰμί is otherwise not an alternating verb; in fact, it is an inherited *activum tantum*.

The answer to this follows from independently attested properties of the CG future, which more often than not surfaces with *nonactive* endings, even if the corresponding aorists and presents are active (cf., e.g., Schwyzer 1939: 781). This results in a very distinctive pattern of "semi-deponency" for many stems, cf. Table 3.

Table 3: CG semi-deponents

Present: active	Future: nonactive	Meaning
aeíd-ō	*aeí-so-mai*	'(will) sing'
akoú-ō	*akoú-so-mai*	'(will) hear'
hamartán-ō	*hamartḗ-so-mai*	'(will) miss, fail'
baín-ō	*bḗ-so-mai*	'(will) walk, go'
plé-ō	*pleú-so-mai*	'(will) sail'

In Grestenberger 2016, I have argued that the future marker *-se/o-* realizes Mod rather than T(ense) (cf. Giannakidou 2014); diachronically, it probably continues one (or several) desiderative stem-forming suffixes inherited from PIE (*$-h_1s(e/o)$- or variants thereof). This desiderative origin of the future may be what is responsible for the (quasi-)obligatory nonactive morphology.[14] Synchronically, it is possible that Mod[FUT] selects Voice without an external argument and introduces a volitional (or "affected" argument), in which case the condition on nonactive morphology in (11) applies and we expect obligatory nonactive morphology to surface (cf. Grestenberger 2016: 7–8).[15] Whatever feature is ultimately responsible for this pattern, the same feature of Mod must also be the cause of the nonactive morphology in the periphrastic future perfect. This confirms that the participle in all forms in Table 1 spells out Asp (and lower projections), while the auxiliary picks up the features of higher projections, namely Mod and T+Agr.

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14 Kemmer (1993: 79ff.) argues that inherently desiderative or volitional verbs tend to take non-active morphology cross-linguistically, and it may be the case that the desiderative origin of the future suffix explains its predilection for nonactive morphology in Greek (see also Fortson, this volume, for a more detailed discussion of the history of the "future deponents").

15 Cf. also Fortson, this volume, who suggests that the future may introduce or express affectedness or subject involvement for these classes of verbs. Alternatively, one could model the obligatory nonactive morphology in the future/future perfect as a fairly surface-y morphophonological requirement of Mod[FUT]⌒T/Agr.

(16)   a.   Future perfect

       le-lu-(k)-ot/men-   *e-so-mai*
       PF-release-PF-PTCP.ACT/NONACT BE-FUT-1SG.NONACT

      b.
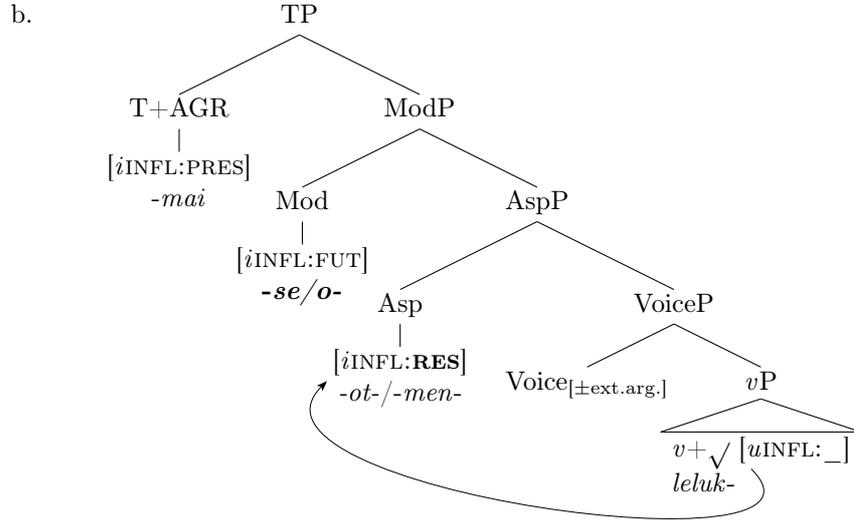
In (16), [RES] on Asp blocks movement and triggers insertion of the active or middle participle, depending on the context (= Voice), just as in the indicative and the other modal forms. The auxiliary [BE] is then inserted to pick up the stranded features on Mod and T (again, as in the optative and subjunctive). However, in this case the feature is [FUT], which triggers insertion of obligatory *nonactive* endings on the auxiliary, parallel to the "semi-deponent" forms in Table 3. This is corroborated by the behavior of the future perfect of *deponents*, in which the perfect *middle*/nonactive participle plus the nonactive future auxiliary is used (Smyth and Messing 1956: 183):

(17)   *apo-le-logē-**mén**-os*   *é-so-mai*
       PRVB-PF-speak-PTCP.NONACT-M.SG BE-FUT-1SG.PRES.NONACT
       "I will have defended myself"

Deponent participles in Greek show the same syntactic and semantic behavior as the corresponding finite forms (Grestenberger 2018, 2017), so the participle in forms like (17) realizes Asp in the context Voice[-ext.arg.], preserving the mismatch that characterizes agentive nonactive verbs ("narrow deponency", Grestenberger 2018, 2019). The fact that the auxiliary also takes nonactive endings shows that its inflectional morphology has independent requirements that have nothing to do with the Spell-Out of Asp and the argument structure of the predicate. In fact, we will see in the next section that this is very different from the way deponents behave in periphrastic perfects in Sanskrit.

3.4   Summary

I have argued in this section that participial morphology in the CG periphrastic perfect spells out Asp that has not moved to T. Movement to T is blocked by a marked feature on Asp, namely (reanalyzed) [RES]. The result is a type of "additive pattern" of periphrasis, except that all features that are stranded above Asp are expressed on the BE-auxiliary, rather than on separate auxiliaries, suggesting that head movement above Asp is independently possible.[16] This account derives the fact that only the perfect participles occur in periphrastic constructions (because of Asp[RES]), but that *all* participles can occur in tenseless environments, i.e., nominal adjuncts (≈ attributive participles) and sentential adjuncts (≈ predicative participles), in which movement to T does not occur because there is no T (or there is "T[-FIN]"). Deponents and *media tantum* in general are expected to preserve the syntax and semantics of the finite forms, and surface with *middle* participles, which is also correct. The middle morphology of the future auxiliary follows from independently needed assumptions concerning the future suffix *-se/o-*.

In the next section, we will see that the Sanskrit periphrastic perfect differs crucially in where and how the relevant features of the "verbal spine" are expressed.

4   The periphrastic perfect in Sanskrit

4.1   The paradigm

Late Vedic and Classical Sanskrit (CS) have a periphrastic perfect construction beside the regular reduplicated synthetic perfect (inherited from PIE) that is formed using the accusative of a verbal (abstract) noun in *-ā* plus the finite synthetic perfect of an auxiliary (originally *kṛ* 'do, make', later *as* 'be', more rarely *bhū* 'be(come)'); see Delbrück 1888: 426f., Whitney 1896: 392ff., Gotō 2013: 123, Ozono 2016.

The distribution of the Sanskrit periphrastic perfect poses several interesting problems. Kiparsky (2005) points out that the CS periphrastic perfect is only used when the formation of the expected reduplicated synthetic perfect is prevented because of a synchronic restriction against reduplication of certain root structures, namely V̄C and VCC (of course, some VC- and VCC-roots have inherited synthetic perfects in Vedic and CS, e.g., *īdhé* 'has ignited' vs. *indhā́m cakre*, *īḍe* 'has praised' vs. *īḍā́m cakre*, etc.). Moreover, some roots that can be regularly reduplicated, such as *vyā*, *bhī*, and *vid*, also form periphrastic perfects if the inherited perfect is not used as an anterior perfect, but as a "stative"/present (or has otherwise "lexicalized"/noncompositional semantics), e.g., *veda* 'knows' vs. *vidā́m cakāra* 'has known'; *bibhāya* 'is afraid' vs. *bibhayā́m cakāra* 'has feared', etc. Finally, periphrastic perfects are also regular for causative and other "secondary" verbal stems, which do not allow reduplication.

In all instances, we find verbal stem-forming morphology on the verbal noun, but perfect, voice, tense and agreement morphology on the auxiliary. Crucially, this is also the case for deponent verbs: Deponents always select the *middle* perfect form of the auxiliary, whereas verbs which alternate between active and middle morphology

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16   Alternatively, adjacent heads above Asp may be spelled out as a "span" of the type suggested by, e.g., Svenonius (2016).

in the non-perfect stems also alternate in the perfect auxiliary. Table 4 gives some examples.

Table 4: Sanskrit periphrastic perfects

	Root/Base	Verbal noun	Aux. act.	Aux. mid.	Meaning
Pres.	*vyā̆*	*vyayắm*	*cakā́ra*		'has covered'
	bhī̆	*bibhayắm*	*cakā́ra*		'was afraid'
	vid	*vidắm*	*cakā́ra*		'has known'
Caus.	*budh*	*bodhayắm*	*cakā́ra*		'has caused to wake up'
	gam	*gamayắm*	*cakā́ra*		'has caused to go'
Desid.	*han*	*jighā̆ṃsắm*	*cakā́ra*		'has wanted to kill'
Denom.	*mantra-*	*ā̆-mantrayắm*		*cakre*	'has addressed'
Dep.	*ī̆ḍ*	*ī̆ḍắm*		*cakre*	'has praised'
	idh	*indhắm*		*cakre*	'has ignited'
	ī̆kṣ	*ī̆kṣắm*		*cakre*	'has seen'

Table 4 presents a very different picture from what we have seen in CG, in that we find only verbal stem-forming morphology on the verbal noun, while "higher" features such as voice, aspect, tense and agreement morphology are expressed on the auxiliary.

4.2 Analysis

We will assume that the distribution of active vs. nonactive morphology in Sanskrit follows the same Spell-Out condition on Voice as in Greek, namely (11) above. That is, nonactive is expected in the context of Voice[-ext.arg.]/Voice[-D] and active is unmarked (see Grestenberger 2018, 2021 for further motivation). Things again become trickier once we get to aspect: Unlike in the CG periphrastic perfect, in CS the perfect feature itself cannot be the problem that causes periphrasis, because the auxiliary itself *is* structurally a synthetic perfect. So forming a synthetic, reduplicated perfect does not seem to be the issue, and neither is forming a synthetic causative, desiderative, or denominal *present*. The fact that only perfects from denominal, causative, desiderative, and other "secondary" stems turn up as periphrastic constructions suggest that we are in fact dealing with a variant of the "overflow pattern" described in section 2, in which periphrastic forms only show up for a particular combination of marked features. The features in question must have something to do with v (or particular variants thereof) and Asp/Perf. This could suggest that "marked" v (causative, etc.) blocks further movement of the verb and needs to be spelled out as a nonfinite form. But this Spell-Out takes place much lower in the structure than in CG; crucially, below Voice. We therefore get a diathetically unspecified verbal noun—but with overt verbal stem-forming morphology.

So far, we predict that verbal stem-forming morphology/"marked v" will always lead to a periphrastic form, which is wrong: The non-perfect forms of the causative, desiderative, etc., are of course synthetic. We need to say something about how "marked v" and the perfect interact. I propose that the same general mechanisms

that gave us the overflow pattern in Latin can also derive the CS pattern, provided that [PERF] is a marked feature on Asp that acts as an intervenor for Agree and blocks movement. With these assumptions, the derivation of a synthetic "marked" present stem such as a causative will proceed as in (18). The root can move to v to form a causative verbal stem, but further movement is blocked because v_{Caus} is marked. However, no other marked features intervene (recall that ACT/NONACT are morphological rather than semantic specifications; there is no marked feature on Voice either in the active or in the middle), and because agreement does *not* depend on prior movement in Sanskrit, the [uINFL:_] feature on the verbal stem can probe upwards and agree with T. The result is a synthetic form, (18).

(18)   a.   *bodh-aya-ti*   'causes to wake up, awakens (tr.)'
 $\sqrt{}$-CAUS-3SG.PRES
       b.
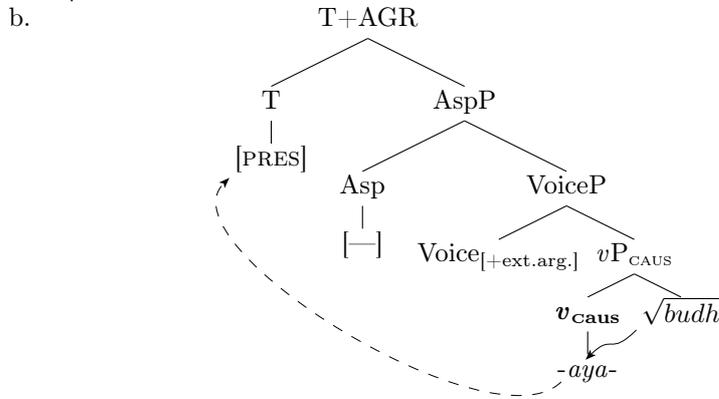
This also works for the perfect when not formed to a secondary stem: In this case, v is semantically unmarked, so the root can move all the way up to Asp, where further movement is blocked by the marked [PERF] feature on Asp. However, agreement with T is possible from this position, so once again we get a synthetic form, (19).

(19)   a.   *bu-bodh-a*   'notices/pays attention to' ($<$ *'has become aware of')
             PF-$\sqrt{}$-3SG.PF
       b.
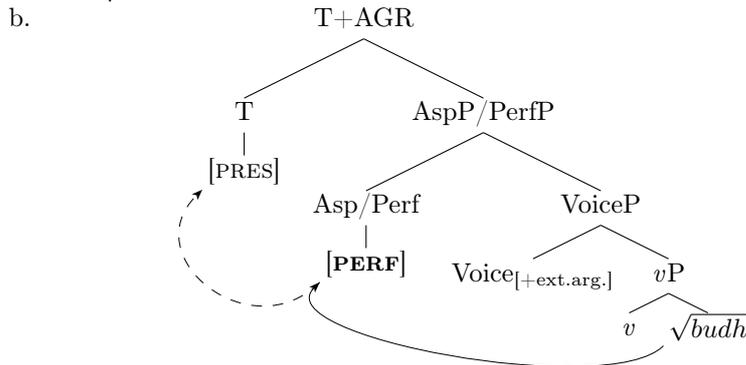
As in Latin, combining the two features leads to problems. First, the root moves to marked v_{CAUS} like in (18). But now further movement is blocked, while at the same time, the marked [PERF] feature on Asp intervenes and blocks agreement with T.
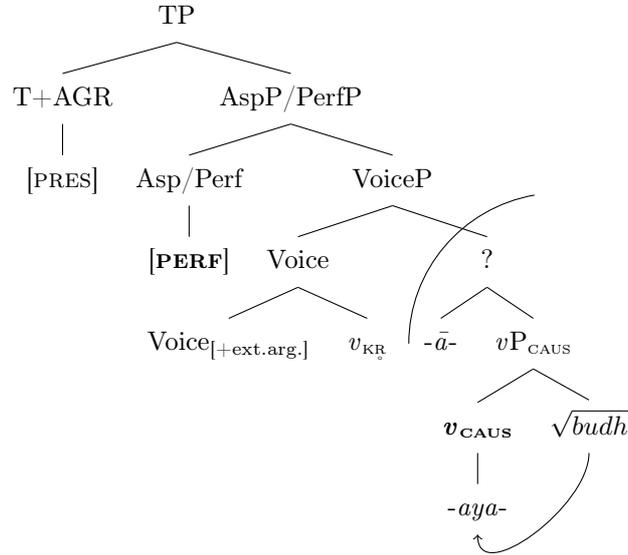
(20)   a.   *bodh-ay-ā-   ca-kār-a*   'has caused to wake up'
                √-CAUS-VN PF-DO-3SG.PF

   b.
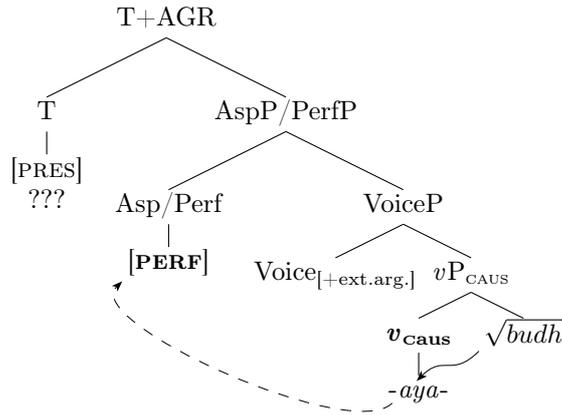
We now expect a nonfinite form that spells out √-*v*-Voice-Asp, and a dummy auxiliary that realizes the features on T/Agr, as in Latin. What we actually get is a nonfinite form that spells out √-*v* and an auxiliary that spells out Voice-Asp-T/Agr. In order to capture this, we need to say more about two ingredients of this construction: the verbal noun suffix -*ā*- and the status of the auxiliary *kṛ*. Diachronically, we are dealing with a *do*-support-like structure in which the verbal noun started out as the direct object of a "light verb" DO/MAKE, so that (20) would literally have meant 'has done a causing to wake up'. The fact that the root that is used is *kṛ* 'make' and that we occasionally also get *bhū* 'become' suggests that we might be dealing with a type of *do*-support, which is generally analyzed as originating in *v* (see Bjorkman 2011: ch. 4, To appear for a detailed discussion of the difference between auxiliary constructions and *do*-support). Bjorkman suggests that DO is the "elsewhere realization of *v*" when *v* is for some reason not realized together with the verbal root itself (a departure from the "mainstream DM" approach, in which *do*-support arises because of a structural adjacency requirement of T and *v*).

   With respect to the Sanskrit periphrastic perfect, it is immediately clear that there is indeed a (diachronic) culprit that would have prevented the root from being realized together with higher verbal projections, namely the intervening nominal suffix -*ā*-. However, this suffix did not prevent the root and *v* from combining, since we do see *v*-morphology on the verbal noun (e.g., causative -*ay(a)*- in (20)). I tentatively assume for now that "*kṛ*-support" adjoins to Voice when *v* and Voice are not adjacent (like in the standard DM account of English *do*-support. This results in the revised structure in (21) for the Sanskrit periphrastic perfect, in which the verbal noun forming suffix marks a boundary (possibly to be identified with a phase head) for upward agreement and movement.

(21)   a.   *bodh-ay-ā-* *ca-kār-a*   'has caused to wake up'
            √-CAUS-VN PF-DO-3SG.PF

       b.

TP
├── T+AGR
│   │
│   [PRES]
└── AspP/PerfP
      ├── Asp/Perf
      │   │
      │   [**PERF**]
      └── VoiceP
            ├── Voice
            │   ├── Voice[+ext.arg.]
            │   └── v_{KR}
            └── ?
                 ├── -*ā*-
                 └── vP_{CAUS}
                       ├── **v_{CAUS}**
                       │   │
                       │   -*aya*-
                       └── √*budh*

The discussion of the exact nature of the projection labelled "?" must be deferred for now, but the analysis so far would suggest that it is a functional projection of the verbal spine (parallel to Greek participial morphology spelling out Asp in section 3), and it is tempting to identify this projection with the "default voice" head proposed by Wurmbrand (2015) and Wurmbrand and Shimamura (2017) for certain types of restructuring verbs.

5   Summary and conclusion

In this short contribution, I have compared the Classical Greek and Sanskrit periphrastic perfect constructions and sketched out an analysis that derives them from independently established mechanisms of syntactic word formation such as movement, agreement, and feature "strength" (or, in this case: markedness). While some of these mechanisms are still a matter of debate (e.g., "Reverse Agree"), and some questions remain unanswered (which features are "marked" in which languages and why), for the most part the analysis relies on independently motivated assumptions about agreement, movement, and Spell-Out. We moreover saw how subtle differences in the way languages make use of marked features derive parameters of variation between closely related systems (Sanskrit and Greek, in this case), and how these may be linked to language-specific diachronic developments.

The remaining open questions center around the relationship between head movement and word formation, especially with respect to the realization of "stranded" features on the auxiliary in Greek vs. Sanskrit.

The behavior of the periphrastic perfects of deponents in Greek and Sanskrit, (22), provides an interesting minimal pair that illustrates this, and at the same time allows us to triangulate the exact location of the mismatch.

(22) a. *de-deg-__mén__-*   *ei-mi*
         PF-$\sqrt{}$-PTCP.**NONACT** BE-1SG.PRES.ACT
         "I have accepted"
      b. *īḍ-ā̆- ca-kr-__e__*
         $\sqrt{}$-VN PF-DO-3SG.PF.**NONACT**
         "He/she has praised"

While the "mismatching" nonactive morphology sits on the participle in Greek, it surfaces on the auxiliary in Sanskrit together with the feature [PERF], suggesting that in Sanskrit the auxiliary inherits the deponent behavior of particular verbal stems. I have argued elsewhere that this is because this behavior itself results from the interaction of a noncanonical "low agent" below VoiceP with Voice[-ext.arg.] (Grestenberger 2018). Depending on whether word formation via movement is interrupted above or below VoiceP, we thus see deponent morphology surface above or below VoiceP as well.

I have not addressed the use of the *ta*-participle in Vedic here, nor the many other periphrastic participial constructions in Greek, but I hope to have shown what a relatively minimalist approach to deriving them may look like.

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