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Aspect shifts in Indo-Aryan and trajectories of semantic change[1]
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Abstract: The grammaticalization literature notes the cross-linguistic robustness of a diachronic pattern involving the aspectual categories resultative, perfect, and perfective. Resultative aspect markers often develop into perfect markers, which then end up as perfect plus perfective markers. We introduce supporting data from the history of Old and Middle Indo-Aryan languages, whose instantiation of this pattern has not been previously noted. We provide a semantic analysis of the resultative, the perfect, and the aspectual category that combines perfect and perfective. Our analysis reveals the change to be a two-step generalization (semantic weakening) from the original resultative meaning.

1 Introduction

The emergence of new functional expressions and the changes in their distribution and interpretation over time have been shown to be systematic across languages, as well as across a variety of semantic domains. These observations have led scholars to construe such changes in terms of "clines", or predetermined trajectories, along which expressions move in time. Specifically, the typological literature, based on large-scale grammaticalization studies, has discovered several such trajectorial shifts in the domain of tense, aspect, and modality. Three properties characterize such shifts: (a) the categories involved are stable across cross-linguistic instantiations; (b) the paths of change are unidirectional; (c) the shifts are uniformly generalizing (Heine, Claudi, and Hünnemeyer 1991; Bybee, Perkins, and Pagliuca 1994; Haspelmath 1999; Dahl 2000; Traugott and Dasher 2002; Hopper and Traugott 2003; Kiparsky 2012).

A well-known trajectory is the one in (1). In this shift, morphological markers denoting resultative aspect diachronically generalize to denote the perfect, including the resultative perfect, and later to encompass the perfective as well (Dahl 1985, 2000; Bybee, Perkins, and Pagliuca 1994).

(1) RESULTATIVE $\gg$ PERFECT $\gg$ PERFECTIVE

Romance languages and Chinese are familiar instantiations of the successive changes in (1). Our own comparative study of distinct diachronic stages in Indo-Aryan, which we document here, reveals that Indo-Aryan also exhibits these two aspect shifts. This is an empirical claim about Indo-Aryan diachrony which has not been previously made in the literature.

The trajectory in (1) naturally gives rise to the four questions in (2).

(2) a. What is the semantic content of the resultative, the perfect, and the perfective categories?

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b. What logical relation between the meanings of these categories allows the construal of these trajectories as generalizations?

c. What are the mechanisms that effect trajectorial linguistic changes?

d. What motivates the change in any particular case?

In this paper we answer the first two of these questions through a close examination of the Indo-Aryan diachronic facts. We propose an analysis that explicates the logical relation between the resultative, the perfect, and the perfective aspects, thus enabling an account of the diachronic pattern as a two-step generalization (semantic weakening) from the original resultative meaning.

The first step towards understanding a particular semantic change is synchronic, empirically adequate analyses of the relevant categories. The second step is an appropriate characterization of the relation between them. Although notions like "generalization", "bleaching", and "extension" have been invoked in descriptions of the resultative to perfect to perfective shift (Bybee, Perkins, and Pagliuca 1994; Dahl and Hedin 2000; Schwenter 1994; Schwenter and Cacoullos 2008, among others), there has been no formally explicit reconstruction of these notions, much less one that embeds them within a semantic analysis of aspectual categories. Moreover, a persistent problem in the grammaticalization literature has been the employment of these notions to answer both questions (2b) and (2c), which are, in fact, completely separate from one another. As Deo (2014: 3) puts it, "neither bleaching nor generalization are construable as the mechanisms that effect language change. These terms can be understood as static descriptions of the relation between the meanings of an expression before and after the change."

The focus of this paper is to provide such a static description of the logical relation between the input and output categories of a particular grammaticalization path. From a semantic point of view, to say that the meaning of an expression gets generalized across two stages of a language is to say that the expression at Stage I entails the expression at Stage II.[2] We show how this is indeed the case for the path in question.

In Section 2 we describe the three distinct stages of Indo-Aryan with reference to the changing meaning of an originally (result) stative morphology, *-ta*, and establish that it systematically undergoes the resultative to perfect to perfective shift, a fact gone largely unnoticed in the vast literature on Indo-Aryan. In Section 3 we characterize the meanings of the aspectual operators that are involved in the analysis of *-ta* across the delineated stages. The first diachronic generalization effects a change such that an entailment of the resultative, namely that of the prior occurrence of an event of the type denoted by the lexical predicate, becomes conventionalized as part of the meaning of the operator at a later stage (the perfect stage). The second diachronic generalization associates with the aspectual operator a more general relation for instantiating eventuality descriptions within temporal intervals. In Section 4 we discuss the implications of our analysis for theories of language change. In particular, we touch upon (2d) in the context of Indo-Aryan, as well as upon the contrast between the conventionalization of semantic entailments and the conventionalization of invited inferences.

[2]Roughly speaking, an expression α_1 entails an expression α_2 of the same type iff α_2 describes a wider set of entities, or times, or circumstances, etc. (depending on their type) than α_1. It follows that if α_1 entails α_2, then the set of entailments of α_1 is a superset of the set of entailments of α_2. Weakening of meaning or generalization is thus reduction in the set of entailments associated with an expression.

2 Indo-Aryan Stages

2.1 The *-ta* form

The Indo-Aryan branch of Indo-European inherited the deverbal result stative form with the affix *-ta* (allomorph *-na*) (reconstructed for Indo-European as **-to/-no*). *-ta*, attested at all stages of Old and Middle Indo-Aryan, attaches directly to the root, and the resulting stem is adjectival, inflecting for number and gender like any other adjectival forms. Cognates to the Indo-Aryan *-ta/-na* forms include deverbal adjectives in Greek and past participles in Latin (inherited in the Romance languages), Gothic (inherited in Modern Germanic languages), and Slavic. Just like in Romance, Germanic, and Slavic, the *-ta/-na* form is non-finite and gets recruited to express aspectual and voice categories of the language's verbal system. It is well-known that, at least in Romance and Germanic, paradigms based on this form become central to the expression of past time reference in the language, often replacing older inflectional past tense forms.

For Old Indo-Aryan, the traditional view has it that predicative *-ta* forms express past time reference and are tightly integrated into the verbal paradigm (similar to Modern French, Italian, and German). This view is based on its uses in Epic and Classical Sanskrit, where it is one of the most common exponents of past tense. However, Jamison (1990) showed that this is not true in Vedic, where predicative *-ta* predominantly has present time reference and is uniformly stative.

In this paper, we show that the distribution and interpretation of predicative *-ta* changes between Vedic and the later stages of Indo-Aryan in a particular way. Specifically, we claim that it undergoes systematic expansion, instantiating at three historical stages the three points in the trajectory in (1). We establish this by providing original data for the distinct readings available to the *-ta* form at each of these stages, and distributional diagnostics, such as the presence of overt agent phrases, compatibility with particular temporal adverbials, use in narrative discourse, etc. The three stages of Indo-Aryan are given in Table 1. The rightmost column gives the texts representative of the delineated periods, from which we extracted the data. Approximate dates are from Witzel (1999), Jamison and Witzel (2002), Alsdorf (1936).[3]

Table 1: Chronology

TIMELINE	STAGE	LANGUAGE	SOURCE
1900BCE-1100BCE	I	**Early Vedic**	Ṛgveda (RV)
1000BCE-200BCE	II	**Later Vedic**	Baudhāyana Dharma Sūtra (BS) Bṛhaddevatā (BD) Bṛhadāraṇyaka Upaniṣad (BAU)
300 BCE-700CE	III	**Middle Indo-Aryan**	Vasudevahiṁḍi (VH)

[3]These are approximate periods and the first of these, especially, only gives the broad window within which Northern and Northwest India were settled (Jamison and Witzel 2002: 6). The composition of the texts that have been used for our research, for the most part, took place in the later parts of each of the three delineated chronological stages.

In the earliest stages of Indo-Aryan (Early Vedic), we find that *-ta* generally attaches to the root of a change of state verb whose meaning makes reference to a result state. The *-ta* form has two distinct but related readings. On the first, **purely stative** reading, observed in both attributive and predicative positions, it predicates a stative property corresponding to the verb's result state of the verb's direct object argument, just like the English past participles (e.g., *hide x* $\rightarrow$ *x is hidden*, *hidden x*). Despite the restriction to change of state verbal roots with an associated result state, the *-ta* form need not entail the existence of a prior event of the type denoted by the corresponding verb. This is like the contrast between *The town is hidden behind the mountains*, which does not imply a prior hiding event, and *The treasure is hidden behind the mountains*, which commonly implies a prior hiding event. On the second, **resultative** reading, the *-ta* form is in a predicative position and the sentence entails the existence of a prior event of the type denoted by the corresponding verb, just like *The treasure has been hidden behind the mountains*, on the resultative construal of the perfect, implies both a prior hiding event and that the treasure remains hidden at reference time. It is the second reading that is of primary concern to this paper because, as we view it, it is with respect to that reading that *-ta* undergoes semantic change. The distribution of *-ta* forms on the first reading remains constant throughout.

Before we discuss the structure of the semantic change from Stage I to Stage II and beyond, let us introduce the relevant readings by relating them to the readings of the English Perfect and Past perfective clauses.[4] The resultative perfect applies to predicates of events with associated result states and asserts that the relevant state holds at the reference time as a result of an event of the type denoted by the verb having occurred. For instance, (3a) implies that the cake is now in the oven as a result of John's putting it there. The existential perfect applies to predicates of any type and has a backshifting effect: it asserts that the predicate holds at some time before the reference time. (3b) implies the past occurrence of many separate visits to Korea by John. On the universal perfect reading, the predicate is understood to have continuously held throughout an interval stretching from some time in the past up to the reference time, as in (3c). With perfective aspect a predicate is asserted to hold within the reference time. Contrasting with the perfect aspect, a typical use of perfective aspect is in narrative discourse to advance the reference time, compare (4a) with (4b). The English perfect morphology, unlike the German or French perfect, does not express perfective aspect and cannot be used in narratives (de Swart and Molendijk 2001; Pancheva and von Stechow 2004).

(3) a. *John has put the cake in the oven.*

b. *John has visited Korea many times.*

c. *John has lived in Korea for the last three years.*

(4) a. *John iced the cake. He (then) went shopping.*

b. *# John has iced the cake. He (then) went/has gone shopping.*

At Stage II, *-ta* exhibits the resultative, the existential, and the universal perfect readings, patterning like a familiar perfect marker. In Stage III, while retaining its resultative,

[4]For discussion of the descriptive issues and analytical choices pertaining to the syntax and semantics of the perfect see Alexiadou, Rathert, and von Stechow (2003).

existential, and universal readings, *-ta* is also regularly used in narrative discourse and is compatible with past referring definite frame adverbials giving rise to the implication that the described eventuality occurred within the time specified by the frame adverbial. Table 2 summarizes the expansion of readings across the three stages.

Table 2: The readings of *-ta* over time

READINGS	Resultative Stage I	Perfect Stage II	Perfective Stage III
Resultative perfect	√	√	√
Existential perfect	∅	√	√
Universal perfect	∅	√	√
Eventive/Past	∅	∅	√

2.2 *-ta* and the broader tense-aspect system

The Old Indo-Aryan verbal system consists of several paradigms covering distinct combinations of temporal, aspectual, and modal categories (see overviews in Delbrück [1888] 1968; Whitney 1889, 1892; Kiparsky 1998; Dahl 2008; Deo 2012). In particular, the finite verbal system has three forms that convey past temporal reference – the Imperfect, the Aorist, and the reduplicated Perfect. On Kiparsky's (1998) analysis, the system works as follows. The Aorist expresses the resultative perfect and recent past meanings, while the reduplicated Perfect forms "stative presents" for a class of achievement predicates and conveys past reference with other predicates. The reduplicated Perfect, despite its name, encompasses the varieties of the English Perfect that we discussed above, but does not strictly correspond to it because of its frequent use for past time reference. The Imperfect, unlike its Greek and Latin counterparts, is aspectually neutral and allows for both imperfective and perfective interpretations.

The *-ta* form, at this stage, appears much less frequently than in the later stages, and is clearly not part of the finite verbal system of the language. This is different from its status in Middle Indo-Aryan (and throughout New Indo-Aryan), where, following the loss of the older finite forms, it is fully integrated into the tense-aspect system. Modeling this set of changes is beyond the scope of this paper, but see our speculative discussion in Section 4.

Finally, we note that Indo-Aryan, at all stages, is an optional copula language, which means that all non-verbal predicates (including *-ta* forms, which are adjectival) may appear without an overt finite copula inflecting for person and tense. Thus, in the absence of an overt copula, *-ta* predicates appear with only gender and number inflection – distinguishing them from overtly finite verbs. Nonetheless, copula-less clauses are finite and get their temporal reference from context. We treat *-ta* clauses with and without overt copulas as being semantically equivalent. Their increasing integration into the finite verbal system over the history of the language fully supports this view.

2.3 Early Vedic: Stage I

2.3.1 Plain stative and result-stative readings of *-ta*

Much of the literature on Sanskrit treats *-ta* as used to refer to events occurring in an indefinite or proximate past time (e.g., Whitney 1889: 340, 362; Speijer [1886] 1973: 4), or as expressing exclusively the result state of an action (Jamison 1990), or a completed action whose results persist in the present (e.g., Keith 1909: 247). We agree with the latter authors that *-ta* does not have a past perfective reading at Stage I (Vedic), but we distinguish between two *stative* readings available to *-ta* – a distinction in use that has already been noticed by Vedic scholars focusing on the temporal and aspectual semantics of the Sanskrit verbal system (Wackernagel 1954: 583; Delbrück 1968: 385).[5]

These two readings — the plain stative and the result stative reading — are illustrated below in examples (5)–(8).[6] (5) illustrates the predicative uses of the *-ta* form with purely stative readings.[7] In (5a), the *-ta* form predicates of the tree the state of being fixed/established in a certain location, and it certainly does not imply the existence of any event that resulted in the coming about of this state. (5b) is part of a characterizing description of Maruts (minor storm deities), which enumerates stable attributes of these deities rather than describing a result state obtaining from a prior event. The visors are understood as being in a spread-out position without there being a prior event by which they come to be in such a position.

(5) a. *káḥ svid vṛkṣó* ***níṣṭh-ito*** *mádhy-e árṇas-o*
Which indeed tree.NOM.SG fix-PERF.M.SG middle-LOC.SG sea-GEN.SG
yá-m taugryó nā̄dhi-táḥ paryáṣasvaj-at
which-ACC Taugrya.NOM.SG supplicate-PERF.M.SG cling-IMPF.3.SG
'Which tree (was it) that *was fixed* in the middle of the sea, to which Taugrya (the son of Tugra), in a state of supplication, was clinging to?'
(RV.1.182.7)

b. *agníbhrā̄jas-o vidyút-o gábhastiy-oḥ śípr-ā̄ḥ*
fire.glowing-NOM.PL lightening-NOM.PL hand-LOC.DU visor-NOM.PL
śī̄rṣá-su ***víta-tā̄*** *hiraṇyáy-ī̄ḥ*
head-LOC.PL spread-PERF.M.PL golden-NOM.PL
'Lightenings glowing with fire are on your hands; visors wrought of gold *are spread* on your heads.'

[5]The Modern Greek cognate of *-ta*, the participle in *-tos/ti/to*, exhibits only the plain stative reading and contrasts with *-menos/meni/meno* participles which exhibit the result stative reading. For discussion and other references see Anagnostopoulou (2003).

[6]We gloss *-ta* as PERF regardless of its distribution and readings at distinct stages of Indo-Aryan. The other glosses are as follows: PRES = present; PST = past; IMPF = Old Indo-Aryan Imperfect; PFCT = Old Indo-Aryan Perfect; IMP = imperative mood; OPT = optative mood; PASS = passive voice; NEG = negation marker; NOM = nominative; ACC = accusative; DAT = dative; INS = instrumental; ABL = ablative; GEN = genitive; LOC = locative; VOC = vocative; M = masculine; F = feminine; N = neuter; SG = singular; DU = dual; PL = plural; PRT = particle; FOC = focus particle.

[7]As is often the case in Vedic clauses with non-verbal predicates, including predicative *-ta* clauses, (5a) and (5b) do not include an overt copula, which would explicitly provide tense information. The temporal reference of such tenseless clauses must therefore be established in the context of the text in which they appear. Here we follow the choices made in Geldner's (1951) translation or in Jamison (1990). For the later periods, temporal reference is based on our interpretation of the context.

(RV. 5.54.11)

(6) is an example of a prenominal attributive *-ta* form, derived from the root *su* ‘press’, that agrees in case and number with the head noun it modifies, *soma*.

(6) *índrāvaruṇā sutapāv imá-ṃ* ***su-tá-ṃ***
Indra.Varuṇa.VOC.DU soma.drinker.VOC.DU this-ACC press-PERF-ACC.M.SG
sóma-ṃ piba-tam
soma-ACC.M.SG drink-IMP.2.DU
‘O Indra and Varuṇa, the pressed-juice (Soma) drinkers, drink this *pressed* Soma.’
(RV 6.68.10a)

The plain stative reading of *-ta* forms contrasts with their result stative reading. The latter asserts the existence of a prior event and the result state it brings about. This is the familiar resultative reading of the perfect aspect, where the result state of the event is understood to hold at the contextually salient reference time. This reading of *-ta* becomes salient in the presence of agentive and instrumental phrases, as well as adverbial modifiers of the underlying eventive predication. In (7a) the three short clauses with *-ta* describe three events essential to the preparation of the Soma drink and undertaken in order to offer the drink to Indra. In (7b) the result stative reading becomes salient because of the presence of the agentive phrase. In (7c) and (7d) the result stative reading is again made prominent by the presence of the benefactive dative-marked arguments.

(7) a. *nṛ-bhir* ***dhū-táḥ*** ***su-tó*** *áśna-iḥ* *áv-yo*
man-INS.PL wash-PERF.M.SG press-PERF.M.SG stone-INS.PL wool-GEN.SG
vā́ra-iḥ ***páripū-taḥ***
filter-INS.PL strain-PERF.M.SG
‘It (the Soma) *has been washed* by men, *pressed* with the help of stones, *strained* with wool-filters.’
(RV 8.2.2)

b. *johū́tro agní-ḥ prathamá-ḥ pit=éva*
neighing.NOM.M.SG agni-NOM.M.SG first-NOM.M.SG father.NOM.M.SG=FOC
iḷáspad-e mánuṣ-ā yát ***sámid-dhaḥ***
worship.seat-LOC.SG man-INS.SG PRT kindle-PERF.M.SG
‘Agni, neighing, the first one, as a father, *has been kindled* by man upon the seat of worship.’
(RV. 2.10.1)

c. *ayáṃ hí te śunáhotre-ṣu sóma índra*
this FOC you.GEN.SG S-LOC.PL soma.NOM.M.SG indra.VOC.SG
tvā-yā́ ***páriśik-to*** *mád-āya*
you-DAT.SG sprinkle-PERF.M.SG delight-DAT.SG
‘This Soma juice *has been sprinkled* among the Sunahotras, in love, for your delight, Indra.’
(RV 2.18.6c)

d. *tú-bhyaṃ* ***su-tó*** *maghavan* *tú-bhyam*
you-DAT.SG, press-PERF.M.SG maghavan.VOC.SG you-DAT.SG
ā́bhṛ-tas
offer-PERF.M.SG
'For you, Maghavan, it (the Soma) *has been pressed*, for you, it *has been offered*.'
(RV. 2.36.5)

(8) illustrates the two readings of a *-ta* form with the same verbal root *yuj* 'yoke'. In (8a) the state of being yoked is predicated of the bull and the dolphin. A prior yoking event is inferrable, but arguably not part of the meaning of the sentence. In (8b) the state of being yoked is understood to be brought about by a prior event of yoking, which is clearly what the adverbial modifier *by means of prayer* is associated with.

(8) a. *yád* *áyā-taṃ* *dívodās-āya vartí-ḥ...* *revád*
when come-IMPF.2.DU D-DAT.SG abode-ACC.SG riches.ACC.SG
uvā́h-a *sacan-ó* *rátho* *vā́ṃ* *vṛṣabhá-ś* *ca*
carry-PFCT.3.SG good-M.PL chariot.NOM.SG you.GEN.DU bull-NOM.SG and
śiṃśumā́ra-ś *ca* ***yuk-tā́***
dolphin-NOM.SG and yoke-PERF.M.PL
'When you (Aśvins) *came* to Divodāsa, (to his) abode, your chariot *carried* rich goods. A bull and a river dolphin *were yoked* to it.'
(RV 1:116:18, cited in Jamison 1990: ex. [23])

b. *ā́tiṣṭha* *vṛtrahan* *rátha-ṃ* ***yuk-tā́*** *te*
mount.IMP.2.SG Vṛtra.slayer.VOC.SG chariot-ACC.SG yoke-PERF.M.DU your
bráhmaṇ-ā *hárī*
prayer-INS.SG steed.NOM.M.DU
'Mount the chariot, O Slayer of Vṛtra (Indra), your steeds *have been yoked* by means of prayer.'
(RV 1:84:3)

2.3.2 *-ta* as the resultative operator

We have established that *-ta* has a result stative reading distinct from the plain stative reading, characteristic of its Indo-European origin as a deverbal adjective. Now we proceed to show that, in Early Vedic, as an aspectual operator, it has only the resultative reading and not the larger range of readings associated with the perfect (specifically, the existential and the universal perfect readings). As mentioned in Section 2.2, this larger range of readings is available to the reduplicated perfect at this stage (Renou 1925; Dahl 2008, among others). Moreover, *-ta*, contra most standard grammars, also does not have a perfective reading, with past eventive reference at this stage (contrast with the Aorist, whose perfective status is under no doubt, cf. Delbrück 1968; Hoffman 1967; Kiparsky 1998; Dahl 2008).

A close survey of Vedic data by Jamison (1990) shows that predicative *-ta* forms are uniformly stative at this stage and overwhelmingly make reference to result states (see also Keith 1909: 247). Jamison claims that the vast majority of instances of *-ta* forms without the copula at this stage refer to a present result state. We offer three empirical arguments to

corroborate her finding that *-ta* forms do not have existential perfect or eventive readings at this stage.

First, we conducted a small study of Sanskrit verbs (n=92) for which the *-ta* form is first attested at Stage I.[8] The hypothesis was that the availability (as inferred from attestation) of the *-ta* form at this stage should vary with lexical subclasses, if *-ta* denotes result states. Result states are expected to be more easily accessible with change of state verbs. The study revealed a striking asymmetry between predicates which encode a change of state and those which do not with respect to the attestation of *-ta* forms at Stage I. As Table 3 shows, the *-ta* participial form is attested for 80% of verb roots encoding change of state but only for 10.5% of simple verb roots. This distribution of *-ta* strengthens the case for its being associated with the resultative aspect at this stage.

Table 3: Distribution of a sample of *-ta* forms attested in the Ṛgveda (Stage I)

VERBS	CHANGE OF STATE			OTHERS
	BARE	PREVERBED	TOTAL	
Number of roots	44	10	54	38
-ta attested	33	10	43	4
% *-ta* forming roots	75%	100%	**80%**	**10.5%**

Second, we examined all instances of *-ta* forms for some very frequent change of state verbs in the Ṛgveda in order to determine the readings they exhibited in context. This set of verbs is given in Table 4. None of the predicative instances of verbs in this set exhibited the existential perfect or past perfective reading. Although the set of verbs investigated is small, the consistent absence of an existential or past eventive reading for the *-ta* forms in context supports the case for its resultative status.

Table 4: Attested (non-)resultative readings for *-ta* forms of high-frequency change of state verbs in the Ṛgveda (Stage I)

verb	*-ta* form	Count	Existential/Past reading
su 'press out'	*suta*	58	0
yuj 'yoke'	*yukta*	46	0
idh 'kindle'	*iddha*	30	0
badh 'bind'	*baddha*	15	0
gṛbh 'grasp'	*gṛbhīta*	15	0
vi+tan 'spread'	*vitata*	15	0

Third, we investigated the co-occurrence of *-ta* forms with indefinite past referring and frequency adverbials. The reasoning is that if the *-ta* form can trigger eventive reference

[8]The information for the first attested *-ta* forms for lexical roots and the roots themselves has been gleaned from Grassman ([1872] 1964) and Whitney (1885).

for the sentence it occurs in, then it should be possible for the predicate to be modified by indefinite past and frequency adverbs. However, this expectation is not met in the textual data. As shown in Table 5, of all occurrences of three representative adverbials, namely *purā* 'of old, earlier', *pūrvam* 'before', and *purudhā* 'often', only one each appear with the *-ta* form, and two of these three instances occur in the part of the text known to be authored much later than the original text (the 10th Book).

Table 5: Past referring adverbials with *-ta* forms

Adverbial		Occurrence	modification of *-ta*
purā	'of old, earlier'	45	1 (RV 6.60.4)
pūrvam	'before, in the past'	8	1 (RV 10.97.1)
purudhā	'often'	9	1 (RV 10.27.21)

We take these facts, together with Jamison's (1990) quantitative study, to show that *-ta* realizes only the resultative aspect at Stage I. The next section discusses the generalization of *-ta* to the perfect category in Stage II, which is the language of Late Vedic (Vedic prose).

2.4 Late Vedic: Stage II

Two changes characterize Late Vedic: (a) the availability of the existential and the universal perfect readings for *-ta* forms; and (b) the extension of *-ta* to lexical predicates which do not encode change of state.[9] The original resultative perfect reading (ongoing result state) is still available to *-ta*, indicating an expansion in the set of readings from Stage I to Stage II rather than a non-generalizing change.

The following examples illustrate the existential reading of *-ta*. In (9a), the verb *dṛś* 'see' does not imply a change of state. The sentence with *dṛṣ-ṭa* simply makes reference to a prior seeing of the formulae (the formulae are considered divine, incapable of being written by human effort), not to any result state associated with such a seeing. This is a case where an existential reading is associated with a lexical predicate that does not encode change of state. The existential reading may also be available with lexical verbs that do encode a result state. In (9b) *smṛ* 'teach' can be associated with the result state of successful knowledge transfer. The context provides a description of barley (grains), which are being praised. (9b), in this context, only refers to the pronouncement on the part of the sages regarding the sin-banishing abilities of barley. There need be no implication that any state has resulted from this event; the existential reading is salient. (9c) is another illustration of a

[9]It is difficult to precisely draw a line of clean separation between Stage I and Stage II corresponding to Vedic verse and Vedic prose. Specifically, there is no exhaustive study of Vedic verbs that establishes that *-ta* appears only with change of state predicates in Early Vedic (Stage I). Nevertheless, *-ta* is overwhelmingly used to describe result states. Early Vedic texts (the Mantras) were composed over a long period and represent multiple linguistic layers. What we are able to clearly show in this section is that Stage III (the period characterized by Middle Indo-Aryan and possibly Epic and Classical Sanskrit) is preceded by a period during which *-ta* functions as the perfect with existential, universal, and resultative readings. At this stage, covering the bulk of the Vedic prose, "the tendency is to assimilate the part.[iciple] to the present" (Keith 1909: 248). This tendency is most clearly visible in the *Dharmasūtras*, the youngest texts within Vedic prose.

sentence with the existential reading, where the *-ta* form is based on the non-change-of-state verb *vac* 'speak'.

(9) a. *mantrā nānāprakār-āḥ sy-ur* ***dṛṣ-ṭā***
formula.NOM.M.PL various.sort-NOM.M.PL be-OPT.3.PL see-PERF.M.PL
ye mantridarśi-bhiḥ
which.NOM.PL seer-INS.PL
'The formulas, which have been seen by the sages (or seers), may be of various sorts.'
(BD 1.34)

b. *nirṇoda-ḥ sarvapāpā-nāṁ pavitra-m ṛṣi-bhiḥ*
banishment-NOM.SG all.sin-GEN.PL filter-NOM.N.SG sage-INS.PL
smṛ-tam
taught-PERF.N.SG
'(You) have been taught by the sages as the filter (for) banishment of all sins.'
(BS 3.6.5.1)

c. *iti trayā-ṇām ete-ṣām* ***uk-taḥ*** *sāmāsik-o*
thus three-GEN.PL these-GEN.PL state-PERF.M.SG general-NOM.SG
vidhi-ḥ
rule-NOM.SG
'Thus, the general rule about these three (Gods) has been stated.'
(BD. 1.79)

(10) illustrates the use of *-ta* with stative predicates, where the relevant inference is that the state denoted by the lexical verb continues to hold throughout some interval from a time in the past until the reference time. This is the universal perfect reading. The context before (10a) describes how the original father produced (*ajanayat* Imperfect) seven kinds of foods and how he apportioned (*abhājayat* Imperfect) them. One of these foods (viz. milk) he gave (*prāyacchat* Imperfect) to the animals. Since this apportioning, milk has been the basis for living and non-living beings. The *-ta* modified predicate *prati+sthā* 'rest' denotes the state which has held since the completion of the apportioning event.[10] (10b) is a similar example from a later text with the verb *man* 'think'. In this case too, the belief or thought is considered to have held throughout an interval stretching from a past time up until the present.

(10) a. *ta-smin sarva-ṃ* ***pratiṣṭh-itaṃ*** *yat ca prāṇi-ti yat ca na*
it-LOC all-NOM.SG rest-PERF.N.SG which and live-PRES.3.SG which and NEG
'On it (milk) everything has rested; that which lives and that which does not.'
(BAU. 1.5.1)

[10]Note that the universal reading of the perfect is absent in several languages, such as Greek and Russian. In these languages, the universal reading is expressed by the present tense forms. *-ta* forms with stative predicates occurring in Vedic prose may often be translated in the English present tense (e.g., Keith 1909). However, the fact that this translation is possible with a form expressing resultative or perfect meaning provides evidence that the form allows universal perfect readings.

b. *loka.saṁgrahaṇa.artha-ṃ* *hi* *tad* *amantr-āḥ*
world.adultery.purpose-ACC.SG PRT then non.mantra-NOM.F.PL
striy-o ***ma-tāḥ***
women-NOM.F.PL think-PERF.F.PL
'It is due to their adulterous nature that women have been thought un-entitled to knowledge of the Vedas.'
(BS 1.5.11.7)

The final example in this section serves to illustrate the continuation of the original resultative reading available to the *-ta* form.

(11) *saṁjñā* *tu* *viśva-m* *iti* *eṣā*
term.NOM.F.SG PRT collective-NOM.SG thus this.F.SG
sarvāvāpt-au ***nipāt-itā***
all.comprehensiveness-LOC.SG lay.down-PERF.F.SG
'The term *viśvam* (collective) has thus been laid down in (the sense of) all comprehensiveness.'
(BD. 2.134)

2.5 Middle Indo-Aryan: Stage III

The Middle Indo-Aryan languages (illustrated here by their most literarily developed dialect Mahārāṣṭrī Prākrit) are characterized by a simpler past marking system, having lost most of the inflectional past tense morphology of Old Indo-Aryan. The inflectional system of verbal contrasts in Old Indo-Aryan changed to a relatively morphologically impoverished inflectional system in Middle Indo-Aryan, with loss of most of the past referring categories. Pischel ([1900] 1981), on the basis of careful textual study, reports that the Imperfect, the Aorist, and the Perfect occur in Middle Indo-Aryan texts only as a few scattered forms for a few verbs.[11] Bloch ([1934] 1965: 228–233) reaches the same conclusion. The result of this morphological loss is that *-ta* becomes the default morphology for past time reference. This change is, in fact, also evident from the period of at least the Epic Sanskrit texts from the Old Indo-Aryan stage. So, in addition to its perfect readings retained from Late Vedic, *-ta* exhibits a past perfective reading.

Every study of Middle Indo-Aryan grammar recognizes the perfective use of the *-ta* form as central to its distribution (Pischel 1981; Bloch 1965; Bubenik 1996, among others). In addition to relying on this observation from the literature, we use two distributional diagnostics to argue that *-ta* sentences can be used to describe culminated past events. First, in contrast to earlier periods, *-ta* is the only form available for narrating sequences of past events. In simple narrative discourse, where consecutive sentences typically move reference time forward, verbs in these sentences inflect with *-ta*. Second, in contrast to the earlier period, *-ta* appears with definite past referring adverbials.

[11]The single instance of the Imperfect retained in Middle Indo-Aryan is the Imperfect form of the verb *as* 'be' (Pischel 1981: 421–22).The Aorist occurs relatively more frequently (Pischel 1981: 422–24), while the Perfect is preserved only as an archaism for a few verbs.

The narrative fragment in (12) illustrates the perfective readings available to *-ta*. The main predicate in each of the sentences in (12) is a *-ta* form. The story describes the events before the sacrifice of a goat, beginning with the departure of the family (with their friends and relatives) to the sacrificial stake. Every successive sentence after the first one is understood to describe an eventuality that is temporally ordered after the eventuality described in the previous sentence.[12] Thus, the going (12a) is understood to occur prior to the goat-taking (12b), which is before the worshipping (12c), which is followed by the elders' announcement (12d) and the leaving of the son (12e).

(12) a. *tato te mittabāndhava-sahi-ā...* ***ga-yā***
then they.NOM.M.PL friends.relatives-with-NOM.M.PL go-PERF.M.PL
'Then they went there with their friends and relatives.'

b. *chagalo vi ya maṇḍe-uṃ tatth=eva* ***ni-o***
goat.NOM.M.SG also and decorate-INF there=FOC take-PERF.M.SG
'And the goat also was taken there to be decorated.'

c. *gandhapupphamallapuyāvises-eṇa ya* ***acchi-yā***
sandal.flower.garlands.worship.ingredients-INS.SG and worship-PERF.M.PL
devayā
god.NOM.M.PL
'The Gods were worshipped with sandalwood paste, flower garlands, the ingredients of worship.'

d. *gharamahattara-ehi ya* ***bhaṇi-yam*** *chagalao āṇ-ijja-u*
house-elders-INS.PL and say-PERF.N.SG goat-NOM.SG bring-PASS-IMP.3.SG
'And the house elders said: Let the goat be brought.'

e. *tato ta-ssa putto... chagalay-am āṇe-uṃ* ***ga-to***
then he-GEN.SG son.NOM.M.SG goat-ACC.SG bring-INF go-PERF.M.SG
'At that, his son... went to bring the goat.'
(VH:D 29.25-28)

The other piece of evidence that the *-ta* form has past eventive reference is that it may be modified by definite past adverbials. Definite time adverbials specify particular intervals within which eventualities are realized. The *-ta* form, when modified in this way, indicates that a completed event obtains within the time denoted by the definite time adverbial. The impossibility of modification by definite temporal adverbials is one of the defining features of the English present perfect. The *-ta* form (which may have present reference in the absence of tense auxiliaries), on the other hand, can be freely modified in this way. In this respect, it patterns like the German or French perfect, which are also observed to have undergone a perfect-to-perfective shift.

(13) a. ***tato*** *kaiva-esu divas-esu aikkan-t-esu...* ***diṭ-ṭhā*** *me*
then many-LOC.PL day-LOC.PL pass-PERF-LOC.PL see-PERF.F.SG I-INS
taruṇajuvati
young.woman.NOM.F.SG

[12] Also see VH:KH 3.10–17, VH:KH 7.7–11, VH:KH 23.8–12, Vh:D 29.19–23, VH:D. 31.1–8, VH:D. 34.18–25 as examples in support of the claim that *-ta* forms allow eventive reference and in narrative discourse are understood to advance reference time.

‘Then, upon the passing of many days, I saw the young woman.’

b. ***tamm-i ya sama-e...*** *so mahiso ṇ-eṇa kiṇe-uṇa*
that-LOC.SG and time-LOC.SG that buffalo.NOM.M.SG he-INS.SG buy-GER
mār-io
kill-PERF.M.SG
‘And, at that time, having bought that buffalo, he *killed* it.’
(VH:KH 14:21)

The following examples show that the earlier perfect readings of the *-ta* form continue to be available at this stage. (14a) illustrates the resultative reading; (14b) illustrates the existential reading, while (14c) illustrates the universal reading for *-ta*. This means that the change involves an expansion in the set of readings available to the *-ta* form.

(14) a. *amhe-hiṃ maṇussajamma-ssa phala-ṃ sayala-ṃ*
we-INS.PL human.life-GEN.SG consequence-NOM.N.SG all-NOM.N.SG
gihi-yaṃ
grasp-PERF.N.SG
‘We have grasped all the consequence of human existence.’
(VH:KH.5.8)

b. *tubbhe-hiṃ mamā-o vi airitta-ṃ dukkha-ṃ*
you-INS.SG I-ABL.SG even more-NOM.N.SG sorrow-NOM.N.SG
pa-ttam
receive-PERF.N.SG
‘Have you received (experienced) even more sorrow than me (at any point in time)?’
(VH:DH.35.25)

c. *kim mann-e devī passamāṇī*
why think-PRES.1.SG lady.NOM.F.SG watching.NOM.SG
nicchalcchī ***ṭhi-yā***
unmoving.eyes.NOM.SG stand-PERF.F.SG
‘Why, I wonder, has the watching lady, stood (been standing) with an unmoving gaze?’
(VH:KH.9.7)

3 Analysis

3.1 Preliminaries

In the previous section, we provided evidence for the instantiation of the resultative to perfect to perfective shifts in Indo-Aryan, through the changes in the interpretation of the *-ta* form from Vedic to Late Vedic to Middle Indo-Aryan. In this section we characterize the meaning of the aspectual operators implicated in the analysis of predicative *-ta* forms across the three distinct stages and show how each shift involves a generalization of the meaning of the relevant aspectual operators. We are assuming that saturated clausal predications,

sentence radicals, denote properties of eventualities which get instantiated by aspectual operators. Most of our assumptions are standard, but we make a new proposal about the lexical denotation of change of state predicates with associated result states and introduce an aspectual operator, dubbed PERV, whose meaning encompasses that of perfect and of perfective.

Let $\mathcal{E}$ be a domain of eventualities, sorted into a set of events $\mathcal{E}^E$ and a set of states $\mathcal{E}^S$, and $\mathcal{T}$ a domain of non-null temporal intervals (with points as a special case) partially ordered by the relation of temporal precedence $\prec$ and by the subinterval relation $\sqsubseteq$. A function τ from $\mathcal{E}$ to $\mathcal{T}$ gives the time span of an eventuality. Basic eventive predicates have an eventuality argument of the sort E (event); basic stative predicates have an eventuality argument of the sort S (state). Sentence radicals arising out of such predicates then are either eventive or stative predicates. Aspectual operators, such as the perfect and the perfective that we discuss below, apply to such sentence radicals to yield predicates of times within which the properties denoted by sentence radicals are instantiated. Instantiation of properties of eventualities involves the familiar existential quantification over the Davidsonian event variable. In (15) we define how properties are instantiated for both predicates of eventualities and predicates of times.

(15) **Property Instantiation**

$$\textsc{Inst}(P, i) \;=\; \begin{cases} \exists e \in \mathcal{E}\,[P(e) \;\wedge\; \tau(e) \sqsubseteq i] & \text{if } P \subseteq \mathcal{E} \\ P(i) & \text{if } P \subseteq \mathcal{T} \end{cases}$$

The relation of instantiation (INST) between a predicate of events P and a time interval i holds iff there is at least one event e of type P occurring anywhere within i. The relation INST between a predicate of times P and a time interval i holds iff P holds of i.

We assume that a semantic tense operator, dependent on a contextually determined reference time, instantiates a property of eventualities/times within/at that time. As we discussed in Section 2.2, Indo-Aryan, at all stages, is an optional-copula language, which means that not all predicative *-ta* clauses will have overt morphosyntactic tense. Still, all of them will have semantic tense. There is agreement between the semantic tense and the morphosyntactic manifestation of tense when present. We use the operator TNS indexed to a time variable i whose content is given in (16). The time of utterance Now is always available as a potential reference time, i.e., as a value for i.

(16) Relative to context c and contextual variable assignment g_c,
$\textsc{Tns}_i = \lambda P\, \textsc{Inst}(P, g_c(i))$

We additionally define two notions that we will use in the discussion to follow. The first one is the notion of the temporal correlate $P[i]$ of a predicate of eventualities P, given in (17). $P[i]$ is the set of time intervals that correspond to the time span of any event of type P.

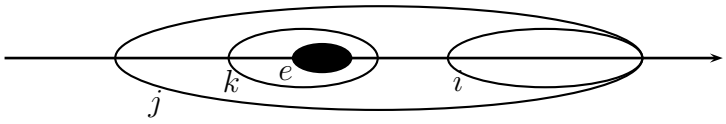
(17) For any $P \subseteq \mathcal{E}$, $P[i] = \lambda i \exists e[P(e) \wedge i = \tau(e)]$

The second one is the notion of non-final instantiation, given in (18). The idea is that $\textsc{NfInst}(P, j, i)$ holds as long as there is some e of type P within j but before i (a final subinterval of j).

(18) $\textsc{NfInst}(P, j, i)$ is defined only if i is a final subinterval of j
$\textsc{NfInst}(P, j, i) = \exists k[\textsc{Inst}(P, k) \wedge k \sqsubseteq j \wedge k \prec i)]$ if defined

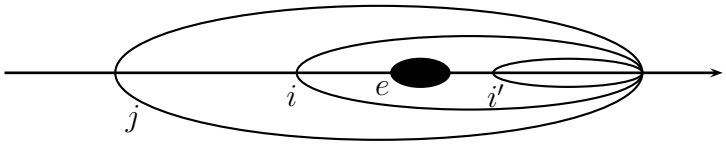
To illustrate, suppose that e is an event of type P. Then, in the situation depicted by the picture below, where i is a final subinterval of j, and k precedes i, it holds that NFINST(P, j, i) since e is within k.[13]

Figure 1: Non-final instantiation: Case 1



By contrast, suppose that we have the situation depicted in the picture below, where i and i' are both final subintervals of j, and that e is the only event of type P occurring within j. Then, because e occurs within i, it does not hold that NFINST(P, j, i) but it does hold that NFINST(P, j, i').

Figure 2: Non-final instantiation: Case 2



3.2 *-ta*: Lexical stativizer and resultative perfect

The ambiguity of predicative *-ta* forms between the **purely stative** and the **result stative** readings that we motivated in Section 2 shows two distinct functions of *-ta*: one as a lexical, derivational operator operating on change of state verbs, the other as a phrasal aspectual operator over sentence radicals. The historical changes under discussion involve the latter function. Below we briefly outline our view of *-ta* as a lexical operator and then go on to analyze its meaning as an aspectual operator. Let us note at this point that our focus in this paper is on characterizing the semantics of the relevant aspectual operators, so as to be able to construe the historical changes as meaning generalization. In our discussion below we identify *-ta* with aspectual operators but this is not essential. In principle, one could also view *-ta* as a morphosyntactic element that agrees with an abstract aspectual operator, rather than directly denoting the operator.

First, let us consider the contribution of the verbs that *-ta* combines with. Based on various kinds of empirical evidence, Kratzer (2000), Piñón (1999) and von Stechow (2003) have made a convincing case that certain eventive verbs have denotations making reference to result state predications. We adopt this idea and implement it in the following way. Change of state verbs are associated with two denotations: an eventive denotation and a paired eventive-stative denotation. Both denotations involve predicates of eventualities in a logical language. A **paired denotation** has a predicate of events as its first member and a relation between individuals and states as its second member.[14]

[13] According to (18), NFINST(P, j, i) would still hold in this situation if there is also an event of type P within i.

[14] Schematically, it is of the form $\langle \lambda e P(e),\ \lambda x_1 \ldots \lambda x_n \lambda s Q(s)(x_n) \ldots (x_1) \rangle$.

For example, a verb like *yoke* has a purely eventive denotation, shown in (19a), as well as a paired denotation, shown in (19b).[15] For the sake of concreteness, we have chosen to associate the arguments of eventive predicates via thematic roles and the arguments of stative predicates via the ordered argument method but this is not essential to our analysis. We assume that meaning postulates regulate the identification of arguments across the two predications.

(19) a. $\lambda y \lambda x \lambda e$ put-yoke-on$(e) \wedge$ Agent$(e, x) \wedge$ Patient(e, y)

b. $\langle \lambda e$ put-yoke-on$(e), \lambda y \lambda s$ have-yoke-on$(s)(y) \rangle$

Given this schema for lexical denotations of change of state verbs, we can now characterize the contribution of *-ta*. As a lexical operator, *-ta* applies to a verb with a paired denotation and yields an adjective whose denotation is the stative component of the verb's paired denotation. For instance, applying *-ta* to the verb *yoke* would have the denotation in (20). This is just the stative component of (19b).

(20) $\lambda y \lambda s$ have-yoke-on$(s)(y)$

The eventive component of the meaning of the original predicate is not made available for semantic composition.[16] Any implications about the existence of a prior event of the relevant type resulting in the truth of the stative predication are inferential.

Pairs such as those in (19b) are also projected to the syntax and enter semantic composition, where the arguments of the stative predicate will be saturated.[17] The output will be paired eventive-stative sentence radicals. *-ta* in its function as an aspectual operator applies to such sentence radicals. We identify the meaning of *-ta* with that of the aspectual operator RESPERF, which is shown in (21). RESPERF applied to paired eventive-stative sentence radicals yields the temporal correlate of the stative component. This involves instantiation of the eventive and stative components of the pair via **paired property instantiation**, defined in (22). In words, INST^2 holds between a pair $\langle P, Q \rangle$ and an interval i iff there is an event e of type P and a state s of type Q such that s stands in the result relation with e and i is the time span of s.

[15] The descriptive term for the state predicate in a paired denotation is determined by the event predicate it is paired with. Thus, if the event predicate is as in (a) below, then the corresponding paired denotation would be as in (b).

a. $\lambda y \lambda z \lambda x \lambda e$ connect-to-with-yoke$(e) \wedge$ Agent$(e, x) \wedge$ Patient$(e, y) \wedge$ Theme(e, z)

b. $\langle \lambda e$ connect-to-with-yoke$(e), \lambda z \lambda y \lambda s$ connected-to-with-yoke$(s)(y)(z) \rangle$

[16] As discussed by Koontz-Garboden (2010), the operation effected by lexical *-ta* as characterized here is non-monotonic. However, the purely stative readings observed in (5a-b) necessitate this move. Koontz-Garboden's particular solution to the semantics of derived statives cannot cover these cases.

[17] Applying a paired denotation to an individual argument d results in a paired denotation in which d saturates an argument of its stative component. E.g., for a paired denotation with a two place stative predicate:

$$\langle \lambda e P(e),\ \lambda x \lambda s Q(s)(x) \rangle (\mathrm{d}) =_{def} \langle \lambda e P(e),\ \lambda x \lambda s Q(s)(x)(\mathrm{d}) \rangle = \langle \lambda e P(e),\ \lambda s Q(s)(\mathrm{d}) \rangle$$

(21) $\textsc{ResPerf} = \lambda R \lambda i\ \textsc{Inst}^2(R, i)$ defined only if $R = \langle P, Q \rangle$ with $P \subset \mathcal{E}^E$ and $Q \subset \mathcal{E}^S$

(22) **Paired Property Instantiation**
$\textsc{Inst}^2(\langle P, Q \rangle, i) \ = \ \exists e \in \mathcal{E}^E\ \exists s \in \mathcal{E}^S\ [P(e)\ \wedge\ Q(s)\ \wedge\ \mathsf{result}(e, s)\ \wedge\ i = \tau(s)]$

We assume that for any event e and state s if $\mathsf{result}(e, s)$, then $\tau(e) \prec \tau(s)$, and allow for multiple states, with different time spans, to be related to an event e via result, i.e., we do not take result to be functional and can thus avoid having to refer to maximal states. Otherwise, we remain agnostic here on how exactly result should be axiomatized, for instance, whether it involves the notion of causation.

The logical form of sentences with a sentence radical $\langle P, Q \rangle$ would be as in (23).

(23) $\textsc{Tns}_i(\textsc{ResPerf}(\langle P, Q \rangle))$

The reference time r specified by tense has to be one of the elements of $\textsc{ResPerf}(\langle P, Q \rangle)$. Given that $r \in \textsc{ResPerf}(\langle P, Q \rangle)$ only if $r \in Q[i]$ (i.e., the temporal correlate of Q), the characteristic entailment of the resultative perfect that the reference time is included in the time span of the result state is captured.

To illustrate, let us consider a somewhat simplified resultative perfect variant of the Vedic (8a), rendered in English as in (24). Its sentence radical would be as in (25), and application of ResPerf would yield (26). Application of tense to (26) with the reference time set to Now would yield (27).

(24) *The dolphin has been yoked to the chariot.*

(25) $\langle \lambda e\ \mathsf{connect\text{-}to\text{-}with\text{-}yoke}(e), \lambda s\ \mathsf{connected\text{-}to\text{-}with\text{-}yoke}(s)(\mathrm{d})(\mathrm{c}) \rangle$

(26) $\lambda i \exists e \in \mathcal{E}^E\ \exists s \in \mathcal{E}^S [\mathsf{connect\text{-}to\text{-}with\text{-}yoke}(e) \wedge \mathsf{connected\text{-}to\text{-}with\text{-}yoke}(s)(\mathrm{d})(\mathrm{c}) \wedge \mathsf{result}(e, s) \wedge i = \tau(s)]$

(27) $\exists e \in \mathcal{E}^E\ \exists s \in \mathcal{E}^S [\mathsf{connect\text{-}to\text{-}with\text{-}yoke}(e) \wedge \mathsf{connected\text{-}to\text{-}with\text{-}yoke}(s)(\mathrm{d})(\mathrm{c}) \wedge \mathsf{result}(e, s) \wedge \mathsf{Now} = \tau(s)]$

3.3 From resultative perfect to perfect

For any pair $\langle P, Q \rangle$ and any $i \in \textsc{ResPerf}(\langle P, Q \rangle)$, there is an interval j of which i is a final subinterval such that j contains an event e of type P which precedes i. In other words, the subset relation in (28) holds for the following two sets of times: the set of times in the temporal correlate of Q and the set of times that are final subintervals of intervals within which P is instantiated non-finally.

(28) $\lambda i\ \textsc{Inst}^2(\langle P, Q \rangle, i) \subseteq \lambda i \exists j\ \textsc{NfInst}(P, j, i)$

The expanded distribution of *-ta* in Late Vedic, where it combines with verbs of any kind without restrictions, amounts to the conventionalization of this entailment of the resultative perfect as a new meaning for *-ta*. In Stage II then, *-ta* is polymorphic. It is identified with the aspectual operator ResPerf applying to paired property sentence radicals, as in Stage I, but also with the aspectual operator Perf applying to sentence radicals of the regular, non-paired, type. The meaning of Perf is given in (29).

(29) $\text{PERF} = \lambda P \lambda i \exists j [i \sqsubseteq_{final} j \ \wedge \ \text{NFINST}(P, j, i)]$

This is, in effect, the "extended now" analysis of the perfect (McCoard 1978; Dowty 1979; Iatridou, Anagnostopoulou, and Izvorski 2001, among others).[18] If P is an eventive or stative sentence radical and the reference time is the time of utterance, the meaning of the sentence would be as in (30): P is asserted to be instantiated within intervals preceding Now.

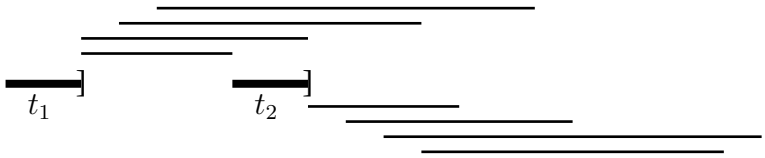
(30) $(\text{PERF}(P))(\text{Now}) = \exists j \exists k \exists e \ [P(e) \wedge k \prec \text{Now} \wedge \tau(e) \sqsubseteq k \wedge k \sqsubset j \wedge \text{Now} \sqsubseteq_{final} j]$

The existential and universal readings are a consequence of the semantic properties of the predicate P to which PERF applies; these determine certain relations between elements of P and elements of $\text{PERF}(P)$. To show how the existential and the universal readings arise, we will consider here only PERF applying to eventive and stative sentence radicals, though the same point can be made for temporal properties as well.

Take an eventive predicate P. For any $t \in P[i]$, there is a subset $\textit{Sub}_t(\text{PERF}(P))$ of $\text{PERF}(P)$ such that for every $t' \in \textit{Sub}_t(\text{PERF}(P))$, $t \prec t'$. If P is empty, then so will $P[i]$ and $\text{PERF}(P)$. This captures the truth conditions of the existential reading of the perfect.

The figure below illustrates the idea. Let t_1 and t_2 be elements of some $P[i]$. That is, they are the time spans of some events of type P. Given that t_1 and t_2 have this property, then there are guaranteed to be non-empty subsets $Sub_{t_1}(\text{PERF}(P))$ and $Sub_{t_2}(\text{PERF}(P))$ of $\text{PERF}(P)$.[19] The lines above t_1 represent members of $Sub_{t_1}(\text{PERF}(P))$ and those below t_2 represent members of $Sub_{t_2}(\text{PERF}(P))$. All the members of $Sub_{t_1}(\text{PERF}(P))$ begin no earlier than the right boundary of t_1, and equivalently for $Sub_{t_2}(\text{PERF}(P))$. So if the reference time r is, say, one of the elements of $Sub_{t_1}(\text{PERF}(P))$, then it will be the case that $\text{PERF}(P)(r)$ since $t_1 \prec r$.

Figure 3: Eventive predicates: existential readings



Take now a stative predicate P that holds over a given time. Given the divisiveness of stative predicates and their temporal correlates,[20] there are $t \in P[i]$ and subsets $\textit{Sub}_t(\text{PERF}(P))$

[18] We take the "extended now" analysis to be as follows:

a. $\text{PERF}_{XN} = \lambda P \lambda i \exists j [i \sqsubseteq_{final} j \ \wedge \ \text{INST}(P, j)]$

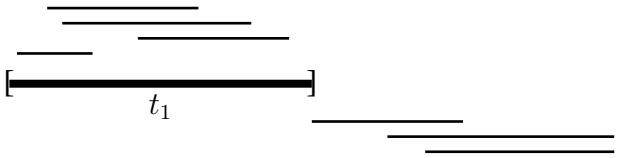
This would allow for the existential reading of the perfect with eventive predicates and both the universal and existential readings with stative predicates. As argued in Iatridou, Anagnostopoulou, and Izvorski 2001, the perfect can have both universal and existential readings with stative predicates, and adverbials can disambiguate between the two.

[19] Notice that t_2 itself can be a member of some such subset determined by t_1 and that any member of $Sub_{t_2}(\text{PERF}(P))$ will also be a member of $\text{PERF}(\textit{twice}(P))$.

[20] A predicate P is divisive iff its denotation is closed under the relevant subpart relation, such as the subinterval relation for temporal predicates.

of PERF(P) such that for every $t' \in$ *Sub*$_t$(PERF(P)) the convex interval $[t, t']$[21] is itself an element of $P[i]$. If the reference time r happens to be within such a subset of PERF(P), then the universal reading arises. Otherwise, the existential reading arises. To illustrate this pictorially, let t_1 in Figure 4 be the time span of some state that is a member of a stative predicate P. The lines above t_1 represent some members of $P[i]$, which by the reasoning above are also members of PERF(P). For a reference time r falling within such a subset of PERF(P), the universal reading is supported. By contrast, the lines below t_1 represent members of PERF(P) that are not in $P[i]$. For a reference time r falling within such a subset of PERF(P), only the existential reading is supported.

Figure 4: Stative predicates: universal and existential readings



3.4 From perfect to perfective

In the transition from Stage II to Stage III the condition for non-final instantiation is generalized to instantiation and *-ta* is identified with the aspectual operator PERV, whose meaning is given in (31).

(31) PERV $= \lambda P \lambda i \exists j\, [i \sqsubseteq_{final} j \ \wedge\ \text{INST}(P, j)]$

PERV subsumes the readings of PERF and in addition allows for instantiation within the reference time, the hallmark of a perfective reading. As we showed in section 2.5, at Stage III *-ta* is compatible both with the strict perfective reading[22] and with the existential and universal perfect readings.[23] PERV captures all of these kinds of readings.[24] If $i = j$ or if $i \sqsubset_{final} j$ and P is instantiated within i, the strict perfective reading arises. This kind of situation is illustrated in Figure 5 restricting attention to e'. Here, the time span of e' is contained within the reference time i, giving us the familiar Reichenbachian semantics for the perfective. Moreover, PERV is also compatible with the perfect reading, as is illustrated in Figure 5 restricting attention to e. In this case, P is instantiated within j but the time-span of e is before i. Thus i is one of the elements of PERF(P).

In narratives, sentences with eventive predicates typically advance reference time, so that the following sentence is understood to hold at a later reference time (Kamp 1979; Partee 1984). In this paper we do not work out the dynamics of reference time advancement, but we can assume that in a narrative sequence like that of (12) each sentence is evaluated relative to the reference time set by the context thus far and then resets the reference time to a later time. That reference time is then given as an argument to the temporal abstract

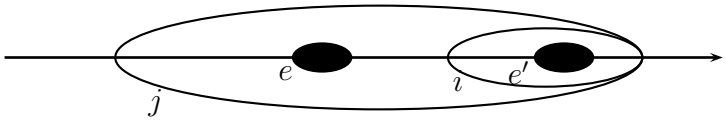
[21] $[t, t']$ is a convex interval with t as an initial subinterval and t' as a final subinterval.

[22] By this we mean the perfective reading as commonly understood in the literature.

[23] The resultative perfect reading is always available, on the condition that the sentence radical has an appropriate paired denotation.

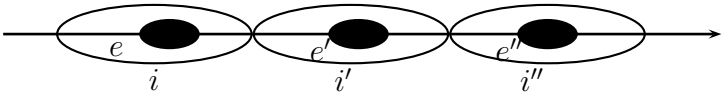
[24] This is in contrast to the standard treatments of the perfective, which build on the Reichenbachian $e \subseteq r$ intuition.

Figure 5: The generalized perfective



obtained by applying PERV to the sentence radical of the following sentence.[25] Suppose that e in Figure 6 is the event of worshipping described in (12c) and that it occurs within the reference time i. Then, the reference time will be advanced to i', where the saying event e' described in (12d) is located. Finally, the reference time is advanced once more to i'', where the going-to-bring-the-goat event e'' described in (12e) is located.

Figure 6: Advancement of reference time



4 Semantic generalization: Implications

We have characterized the meanings of *-ta* as an aspectual operator at the three diachronic stages and demonstrated the semantic relatedness of resultative (RESPERF), perfect (PERF), and perfect+perfective (PERV). This is our answer to question (2a), posed in Section 1. Diachronically, *-ta* undergoes successive generalization of its meaning. This is our answer to question (2b), posed in Section 1. Our proposal rests on the conventionalization of entailed meaning and the generalization of the relation instantiating event descriptions in time. It, therefore, holds promise of application to other instances of this type of cross-linguistic shift.

4.1 Semantic generalization vs. invited inferences

Our semantically-rooted account contrasts with the pragmatic inferencing approach that has been invoked for explaining semantic change (Traugott and Dasher 2002; Eckardt 2006). On this view, pragmatically derived "invited" inferences associated with an expression are diachronically *semanticized* or conventionalized as part of the meaning of that expression. For instance, Eckardt (2006) proposes that the emergence of the prospective aspect in English is the result of the conventionalization of the invited inference of imminent event occurrence available to a transparent *going to V* construction.

[25] In this paper we use temporal adverbs as diagnostics for certain readings but we do not provide an analysis of them.

On the invited inferences approach, conventionalized meaning is distinct from the original compositionally available meaning and the form may be ambiguous between the diachronically former and latter meanings at some stage. Semantic generalization, by contrast, requires that some element of meaning of the original expression is lost diachronically, resulting in a more general *single* meaning for the expression.

There has been no proposal to date characterizing the trajectory in (1) as involving the conventionalization of some invited inferences. We believe that the lack of such an account is not accidental. Conventionalization of pragmatic inferences is better suited to characterize changes involving the recruitment of lexical categories into the functional domain. The changes of the trajectory in (1), described and analyzed in this paper, involve categories *within* the functional domain. We speculate that the domains of the two types of changes vary along these lines but leave a fuller treatment for further research.

4.2 Motivating semantic generalization

Our account may explain how the diachronic changes involve semantic generalization, but it does not address the motivating factors for the occurrence of each shift. Here we offer some speculative remarks on why the shifts might have occurred. As discussed in Section 2.2, the Old Indo-Aryan finite verbal tense-aspect system (Stage I) contains a number of past referring categories, which overlap with *-ta* in some of their uses. The Aorist expresses the perfective, while the reduplicated Perfect realizes the more general perfect aspect, with stative present readings limited to some predicates. The Imperfect is a neutral past tense, and is often used in narrative contexts and gives rise to an eventive reading (Delbrück 1968; Whitney 1892). In the second stage, the reduplicated perfect generalizes to include the past perfective reading, overlapping in this domain with the Aorist and the Imperfect. By the time of Epic Sanskrit these three past referring categories have become interchangeable and there is an increase in the frequency of the *-ta* form. While this lack of distinction has been well-established in the literature, it is a puzzle why the Imperfect, the Aorist, and the Perfect are interchangeable at the Epic Sanskrit stage. It is conceivable that the writers of the Sanskrit Epics, are, in fact, speakers of a language with a Middle Indo-Aryan (Stage III) type system, characterized by a single perfective form and no further distinctions within the perfective domain. We know that the Middle Indo-Aryan Prakrits were the vernacular languages in the region at least since 300 BCE (based on Aśokan inscriptions). On the other hand, Sanskrit was the learned language of prestige. Middle Indo-Aryan native speakers, whose language was characterized by a single aspectual category that allowed reference to past situations—the *-ta* form—may well have mapped the distinct Vedic paradigms onto this single category, when writing in Sanskrit. This can account for why the three paradigms appear to be undifferentiated in terms of their distribution. It also accounts for the increased frequency in the usage of *-ta* (Avery 1875), an anticipation of the later Middle Indo-Aryan system, where this is the only exponent of the perfective and perfect aspects.

The three finite categories are lost almost entirely by Stage III (Pischel 1981) and their functions taken over by the *-ta* form. At Stage III, *-ta* realizes the complex aspectual category PERV (perfect+perfective) and has the entire range of readings available to the older, lost Perfect and Aorist.

A plausible motivation for this generalization of *-ta* is the diachronic loss of forms that

express perfect and perfective meaning. The semantic shift, thus, may be seen as going hand-in-hand with a morphological change that affects the semantic categories expressed by the broader verbal paradigm of Indo-Aryan. We do not have spontaneous changes in the meaning of *-ta* but rather these changes are triggered by the need for morphology that can express the semantic categories previously expressed by older forms. This change is, of course, spread over several centuries and must have involved a period over which *-ta* increased in relative frequency over the Perfect and the Aorist. There is a clear morphological advantage that *-ta* enjoys over the Perfect and the Aorist: it is built on the root, and constructs an invariant stem that inflects with the set of adjectival endings. The Perfect and Aorist stems involve reduplication and other morphological changes to the root, and the perfect further involves a distinct set of personal endings. The case can be made that the increasing use of *-ta* is facilitated by its relative lack of morphological complexity and predictable derivation, but that remains a speculative point, and is ultimately orthogonal to the purposes of this paper.

5 Conclusion

Our semantic analysis shows that the trajectory in (1) involves semantic changes that lead to increasingly general aspectual categories, which are arguably part of the universal inventory of functional categories. To the extent that this change is not derived on analogy with any existing patterns in the language, it must be non-exemplar-based in nature. On the other hand, given that the trajectory is robustly attested cross-linguistically, it must be rooted in some (as yet undetermined) universals of grammar. Kiparsky (2012) makes the novel proposal that grammaticalizing changes (at the phonological, morphological, syntactic, as well as semantic levels) can be understood as abstract analogical changes, in which the model for the change comes directly from the structure of universal constraints, rather than from concrete existing patterns. In his words:

> To the extent that there are language-independent constraints defining asymmetries in markedness or complexity, analogy may be driven by those constraints. Analogy can then give rise to patterns which are not instantiated in a parallel exemplar, or even patterns which are not yet instantiated at all. These patterns reflect preferences grounded in UG and/or in pragmatics or perception/production factors. If analogical change is grammar optimization, then the existence of grammaticalization, in this sense, follows as a logical consequence. (Kiparsky 2012: 21)

A more ambitious goal would be to determine the nature of the universal constraints and to specify the language-internal factors that trigger grammaticalization at a particular time. We suggested some factors that might have triggered it in Middle Indo-Aryan. Our proposal makes predictions that can be tested by textual research that traces the changing frequencies of *-ta* and its competitors across time.

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