The Perfect

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1 Introduction

The perfect is one of the most complex constructions in temporal semantics. It shares properties with both tense and aspect, which is a source of constant confusion. It is therefore not easy to characterize its meaning in a few words. Intuitively, one is tempted to say that the perfect is used to simultaneously convey both anteriority and current relevance of the underlying eventuality. However, it is disputed in what way the perfect expresses anteriority, and there is no agreement among semanticists as to whether current relevance – whatever that is – is part of the truth-conditional meaning of the perfect.

A morpho-syntactic definition of the perfect is not easy to come up with either, as we can see from a quick look at the different constructions in (1):

(1) a. Eureka! (Old Greek)
b. I've found it! (English)
c. I find it already! (Colloquial Singapore English)
d. Našel! (Russian)
found-PAST-PF
e. Nameril sǎm go! (Bulgarian)
found-PART-PF am-1SG-PRES it-3SG-ACC

There are languages with synthetic 'perfects' such as Old Greek (1-a) or Latin, and many languages around the world express perfect-like readings through adverbs or particles like *already* or aspectual verbs like *finish*, as shown in typological studies (Östen Dahl & Velupillai, 2013). The particular use of the infinitive and a sentence-final *already* in colloquial Singapore English (1-c) has been argued to have emerged as a result of contact between English and local Chinese languages with their 'perfect markers' (Fong, 2005).

It is far from clear whether or how the presence of an auxiliary in the English example (1-b) contributes to the semantics of the perfect, especially if one thinks that the meaning of the perfect in *I've found it* is located not in the auxiliary, but in the participle[1], as in modern Russian which has lost the auxiliary/copula altogether, turning the perfect participle in (1-d) into a generalized past tense form. Nevertheless, for reasons of space, we have decided to limit the scope of this survey article to *the active participial*

[1] We will return to this point in section 3.

construction composed of a possibly tensed auxiliary and a past participle that we find in most modern Indo-European languages, here exemplified in (1-b) and (1-e).

At the syntax-semantics interface, the perfects in Old Greek or Singapore English, or Russian – where the form is no longer called a perfect – must necessarily behave differently from the analytic perfect in English or Bulgarian[2], for which we assume, following (Iatridou et al., 2001), (Pancheva, 2003) and many contemporary approaches, the structure in (2):

(2) a. $[_{\text{TP}}\ \text{TENSE}[_{\text{PerfP}}\ \text{PERFECT}[_{\text{AspP}}\ \text{ASPECT}[_{\text{VP}}\ \phi]]]]$ (general architecture)
b. $[_{\text{TP}}\ \text{PRES}[_{\text{PerfP}}\ \text{PERFECT}[_{\text{AspP}}\ \text{PF}[_{\text{VP}}\ \text{find}]]]]$ (spell-out of (1-b))

Tense, perfect and aspect are represented as functional heads. Other values for tense could be PAST (past perfect) or FUT (future perfect); while aspect will typically be perfective or imperfective. In English, perfective aspect is covert and assumed by default, while in Bulgarian the PF/IPF distinction is overtly marked on the participle.

Another difference between English and Bulgarian is the choice of auxiliary, which comes in two versions; the *have*-perfect which we find in (Modern) English, and the *be*-perfect in Slavic languages. Several Germanic and Romance languages make use of both these auxiliaries in the perfect. Despite their different origin,[3] the auxiliary selection in contemporary Indo-European languages is not in any obvious way correlated with semantic (temporal) effects. A *have*-perfect in English can correspond to a *be*-perfect in Bulgarian and vice versa. So, in various respects, even the strictly analytical perfect is morpho-syntactically an unstable category.

Our main goal is to try to understand the role of the perfect between tense and aspect, to address the issue of how the meaning of the analytic perfect is composed from the elements present in its morpho-syntactic representation, including the aspectual properties of the participle and the tense marking on the perfect auxiliary (*have/be*). Since the semantics of the perfect is clearly concerned with temporality and temporal relations, the interaction of the construction with temporal adverbials of different sorts must play a major role for any compositional approach.

In section 2, we present authentic corpus data from a dozen modern Indo-European languages with particular focus on the interaction with temporal adverbials. Several temporal puzzles related to adverbials such as *today, yesterday, for x time, since x time* continue to challenge theories of the perfect. While the importance of temporal adverbials is something every semanticist working on the perfect seems to agree on, the last 15 years have also seen an increasing interest in the role of competition between forms, notably how the perfect competes with the present and the past (Pancheva & von Stechow, 2004), (Schaden, 2009). This is something we will keep in mind in the presentation of the cross-linguistic data.

In section 3, we will introduce the three most influential semantic theories of the perfect: the anteriority theory, the result state theory and the extended now theory. Then, by stating the semantics of temporal adverbials in a formally precise way, we will test the predictions of the different theories against empirical data from various

[2]For the specific context in which Archimedes uttered his famous synthetic perfect, it would perhaps be more idiomatic to use a perfective aorist in Bulgarian: *Otkrikh go!* (literally: discovered it!). To avoid any further confusion we will stick to authentic corpus translations in the rest of the paper.

[3]The *be*-perfect clearly derives from a copula-construction. The origin of the *have*-perfect is still under debate. de Acosta (2012) claims that the latter "is a periphrasis denoting the achievement of a result or a persisting resultant state. This implies that the relationship between possessive and auxiliary *habban* is less direct than previously claimed."

languages.

We remain agnostic as to whether it is possible to give a semantically uniform analysis of *have/be*-perfects across languages. In fact, this goal has proven difficult to achieve even within a single language, although the debate continues in the literature.

2 Perfect readings in a cross-linguistic perspective

In what follows, we illustrate the most characteristic readings of the perfect from a European micro-typological perspective.[4]

For convenience, the data come from three parallel corpora, Parasol, the Oslo Multilingual Corpus and the RuN-Euro corpus, that contain translations of various works of literature.[5]

We will draw the reader's attention to two partly related points: the types of adverbials which trigger or interact with the various readings of the perfect, notably definite positional adverbials, 'perfect level' adverbials and durational adverbials, and the competition from other tenses such as the present and past.

2.1 The Experiential perfect

The 'experiential' reading (Comrie, 1976) is a label which suggests that the instantiations of the past events in question are relevant for the subject's experience at the reference time, e.g. at the present *now* in the present perfects in (3) and (4) below.

(3) **En** In all my seventeen years I **have tasted** only the cooking of two people, Aunt Glosspan and myself.
(Roald Dahl, RuN-Euro Corpus)

Ge Zeit meines Lebens, also siebzehn Jahre lang, habe ich nur
time of-my life, thus seventeen years long, have-PRES I only
Gerichte gegessen, die Tante Glosspan oder ich gekocht
food eaten-PART that aunt Glosspan or I cooked-PART
hatten.
have-PAST

Ru Vse svoi semnadcat' let ja el pišču, prigotovlennuju tol'ko
all self seventeen years I ate-PAST-IPF food, prepared only
dvumja ljud'mi – babuškoj Glosspan i mnoju samim.
by-two people – grandmother Glosspan and my self

[4]For reasons of space we will not discuss some more peripheral readings such as the 'hot news perfect' (McCawley, 1971)/'perfect of recent past' (Comrie, 1976) or the 'evidential perfect' found in Swedish and Bulgarian (Lindstedt, 2000).

[5]Different subsets of languages are represented in the examples, mostly for practical reasons such as reasons of space, availability of translations and our biased wish to illustrate specific patterns in Germanic, Romance and Slavic.

The original will be marked in bold face. Abbreviations: Du = Dutch, En = English, Ge = German, No = Norwegian, Sw = Swedish; Fr = French, It = Italian, Ro = Romanian, Sp = Spanish; Bu = Bulgarian, Ru = Russian, SC = Serbo-Croatian.

Since we do not present any quantitative or systematic corpus analysis, we cannot make any strong methodological claims in this survey article. Nevertheless, the advantages of using naturally occurring translations from different languages drawn from the same controlled context of use should be obvious. See (Klis et al., 2017) for a methodology dubbed *translation mining* where data from parallel corpora are used to systematically analyze the perfect in five Western European languages.

(4) En Since 1976 I have been hospitalized six times.
No Siden 1976 **har** jeg **vært** innlagt i alt seks ganger.
since 1976 have-PRES I been-PART hospitalized in total six times
(Bergljot Hobæk Haff, Oslo Multilingual Corpus)
Ge Seit 1976 bin ich insgesamt sechsmal in der Klinik gewesen.
since 1976 am-PRES I in-total six-times in the hospital been-PART
Fr Depuis 1976, j'ai été internée six fois.
Since 1976 I've-PRES been-PART hospitalized six times.

The experiential reading is 'quantificational' in the sense that there is at least one event of the type denoted by the VP which occurs in the (large) interval leading up to the tense time or *reference time*, as this notion is famously used in the literature on the perfect following Reichenbach (1947). The interval preceding or terminating at the reference time, on the other hand, is sometimes called *the perfect time span* (Iatridou et al., 2001), which in our two examples is overtly designated by the time adverbials *in all my seventeen years* and *since 1976*. The quantificational structure inside the perfect time span is here also overtly marked, *two (times)* and *six times*, respectively, demonstrating repeatability of the event, a common characteristic of the experiential reading, see e.g. (Mittwoch, 2008).

2.2 The Resultative perfect

The *resultative* reading obtains when an event in the (typically recent) past brings about a result state which holds at the reference time. The resultative perfect occurs only with telic VPs, as exemplified below.

(5) En Where have you buried the poor body?
It Dove **avete** **sepolto** il povero corpo?
where have-2SG-PRES buried-PART the poor body
(Umberto Eco, ParaSol corpus)
Ge Wo habt Ihr den Toten begraben?
where have-PRES you the body buried-PART
Du Waar hebt u het arme lichaam begraven?
where have-PRES you the poor body buried-PART
Sw Var har ni begravt den arma kroppen?
where have-PRES you buried-PART the poor body
Sp ¿Dónde habéis enterrado el pobre cuerpo?
where have-2SG-PRES buried-PART the poor body
SC Gde ste sahranili jadno telo?
where are-2SG-PRES buried-PART-PF poor body
Ru Gde vy pokhoronili nesčastnoe telo?
where you buried-PAST-PF poor body

The WH-element specifies the location of the body after the burying event, picking out the resultant state of the burying, see (Kiparsky, 2002) for discussion of similar examples. The internal argument (the theme) of the eventive telic VP in the perfect, i.e. the body, becomes the subject of the resultant state (Mittwoch, 2008). With transitive telic verbs as in (5), auxiliary selection languages such as Italian, German and Dutch will invariably use a *have*-perfect.

(6) En They have already come.
It **Sono** già **venuti**.
are-3PL-PRES already come-PART
(Umberto Eco, ParaSol corpus)
Ge Sie sind schon gekommen.
they are-PRES already come-PART
Du Zij zijn al gekomen.
they are-PRES already come-PART
Sw De har redan kommit.
they have-PRES already come-PART
Sp Ya han llegado.
already have-3PL-PRES come-PART
SC Već su pristigli.
already are-3PL-PRES come-PART-PF
Ru Oni uže Ø-Copula tut.
they already Ø-PRES here

In (6), the resultative perfect signals that the subject of the past arrival event is still at the location of the speaker. The word *already* further contributes to the sense that the speaker's focus of attention is at the present state (Inoue, 1979),[6] cf. also the Russian translation with a simple present. Auxiliary selection languages like Italian, German and Dutch use the *be*-perfect with unaccusative verbs.

The resultative perfect (Portner, 2003) – called 'stative' in (McCawley, 1971) and 'perfect of result' in (Comrie, 1976) – is considered to be the original perfect reading in Germanic and Romance (de Acosta, 2012). It is arguably the prototypical reading, the first one acquired by children (Mittwoch, 2008).

Despite certain differences between resultative and experiential perfects, the latter being compatible with *both* telic and atelic VPs, the two are sometimes grouped together under the label 'existential perfect' (McCawley, 1971), (Iatridou et al., 2001). What they have in common is to signal the existence of at least one past eventuality. For telic VPs it is in fact rather difficult to come up with criteria that would separate the experiential from the resultative, as emphasized in (Mittwoch, 2008). For Dowty (1979) and his followers the resultative component is a conventional implicature of a somewhat murky status. For this reason, we have included the Russian translations in (3) and (5) above. In Russian, a Slavic language in which the Old Slavic perfect has lost the auxiliary and the participle has become a generalized past, the experiential-resultative distinction is grammaticalized and correlates with a contrast between an imperfective past in the former and a perfective past in the latter (Grønn, 2004).

2.3 The Universal perfect

The universal perfect predicates the eventuality described by the participle of an interval starting somewhere in the past and terminating at the reference time.

Here are some characteristic corpus examples:

(7) a. How long have I been in here?

[6]Note that **they already came* with a simple past is degraded in English, where *already* preferably combines with stative/progressive predicates and the perfect, perhaps suggesting that the perfect can be treated as a stativizer.

b. For generations now, the industrial community has warned young businessmen to keep away from Iron John.
c. I have known Jimmie now for nine years.
d. Since then, silence has reigned supreme.
e. [...] the nation's owls have been behaving very unusually today.

As we can see from these examples in the present perfect, the state of affairs holds not only in the past but also in the present, hence the alternative labels 'perfect of persistent situation' (Comrie, 1976) or 'continuative perfect' (Portner, 2003).

The universal perfect, as the name suggests, involves universal quantification over the perfect time span. The predicate holds of every subinterval of the interval designated by the (durative) adverbial: *how long, for generations now, now for nine years*, respectively. The participle must accordingly be homogeneous, a criterion which for English includes statives such as *to know Jimmie*, habituals like (repeatedly)*warn*, or dynamic verbs in the progressive such as *behaving unusually*, cf. (Dowty, 1979), (Portner, 2011). As pointed out by Iatridou et al. (2001), the universal reading does not come in isolation, but is always triggered by an appropriate adverbial (or the progressive). See also (Portner, 2011) for discussion of this point.

While the progressive in English forces the universal reading, e.g. in (7-e), a pure stative can sometimes create an ambiguity between a universal and existential reading in English and Scandinavian. The ambiguity is often illustrated with *for*-adverbials in English:

(8) a. For hundreds of years his family has toiled here.
b. For hundreds of years his family had toiled here.
c. Here his family has toiled for hundreds of years.
d. Here his family had toiled for hundreds of years.

In (7-b)–(7-c) above, the presence of *now* in addition to the *for*-adverbial forces a universal reading, where the embedded predicate also holds at the speech time. In general, what matters is the position of the adverbial. (Dowty, 1979) noted that a preposed, topicalized *for*-adverbial triggers the universal reading. Thus, the sentence-initial *for*-adverbial in (8-a) and (8-b) invites universal quantification over the perfect time span while (8-c) and (8-d) with a sentence-final durative adverbial are ambiguous.

So far, we have focused on examples in the present perfect. But in a compositional approach the availability of various perfect readings, including the U/E-distinction, should not depend on the tense marking of the auxiliary. The same range of perfect interpretations are expected to be available in tenseless perfects (e.g. under modals: *must have P-ed*), in the future perfect (*will have P-ed*) or in the past perfect (*had P-ed*).

In the actual corpus example from which we have constructed the minimal pairs in (8), the context disambiguates the past perfect in combination with the sentence-final adverbial in favor of an E-reading.

(9) En Here his ancestors had toiled for hundreds of years.
No Her **hadde** fedrane **slite** i hundrevis av år.
here had-PAST ancestors toiled-PART in hundreds of years
(Kjartan Fløgstad, Oslo Multilingual Corpus)
Ge Hier hatten seine Vorväter jahrhundertelang geschuftet.
here had-PAST his ancestors hundreds-of-years-long toiled-PART

2.4 Competition with the present

Containing two temporal layers, the present perfect has a Janus face: It says something both about the past and the present. The higher temporal layer, the reference time in (Reichenbach, 1947), gets its value from tense proper; and the lower temporal layer serves to locate the eventuality at least partly in the past. The perfect operator – whatever that is – mediates between the two layers. A composite tense like the present perfect is therefore in competition with both the morphological simple present and the simple past. We believe that translation data can be fruitfully used to study this competition.[7]

In most languages with the Indo-European *have/be*-perfect the universal reading of the present perfect is unavailable, and the present is used instead. For instance, in (10) below, the English original has a present perfect with a durative measure adverbial *how long* and the underlying VP must hold both at the utterance time and for some time extending backwards into the past, but the translations available in the corpus all prefer a simple present for this scenario:

(10) **En** How long **have** I **been** in here?
(J. K. Rowling, ParaSol Corpus)
Ge Wie lange bin ich schon hier?
how long am-PRES I already here
Du Hoe lang lig ik hier al?
how long lie-PRES I here already
Fr Ça fait combien de temps que je suis là?
it makes how-much of time that I am-PRES here
Ro De când zac aici?
from when lay-1SG-PRES here
Bu Ot kolko vreme săm tuk?
from how-much time am-1SG-PRES here
SC Koliko sam već ovde?
how-long am-1SG-PRES already here

However, the perfect in Mainland Scandinavian languages (Larsson, 2009) seems to behave like in the English perfect and clearly has a universal reading, as we see in the Norwegian example below:

(11) En Since then, silence has reigned supreme.
No Siden den tid **har** tausheten **hersket** uavbrutt.
Since that time has-PRES silence-the reigned-PART uninterruptedly
(Jostein Gaarder, Oslo Multilingual Corpus)
Ge Seit damals herrscht ununterbrochenes Schweigen.
Since then reigns-PRES uninterrupted silence
Fr Depuis ce temps-là, le silence règne sans partage.
Since that time the silence reigns-PRES without sharing

[7]de Swart (2016) motivates a contrastive corpus-based approach to the perfect: "So, the study of translations reveals important insights about cross-linguistic variation. It provides a way to empirically test claims that have been made in the theoretical literature on distributional patterns and restrictions on interpretations. It also reveals the distribution of labor between PRESENT PERFECT, SIMPLE PAST and SIMPLE PRESENT, as translators will switch to different forms to convey the meaning of the source language in the target language. [...] The competition-based approach is even more attractive when we place it in a multilingual setting."

Note, incidentally, that the perfect level adverbial *since* (or *siden* in Norwegian) can only be combined with perfect tenses in English and Norwegian, unlike *seit/depuis* in German and French, respectively.

Also, with *for*-adverbials, on the universal reading of the perfect, we observe a contrast between English/Norwegian on the one hand and the German present on the other:

(12) **En** For generations now, the industrial community **has warned** young businessmen to keep away from Iron John.
(Robert Bly, Oslo Multilingual Corpus)
No I flere generasjoner nå har industrisamfunnet
in many generations now has-PRES industrial-community
advart unge menn om å holde seg borte fra Jernhans.
warned-PART young men from to keep self away from Iron-John
Ge Seit nunmehr Generationen warnt die Industriegesellschaft ihre
since now generations warn-PRES the industry their
jungen Geschäftsleute davor, dem Eisenhans zu nahe zu kommen.
young businessmen from the Iron-John to approach to come

(13) **En** I **have known** Jimmie now for nine years.
(Oliver Sacks, Oslo Multilingual Corpus)
No Jeg har kjent Jimmie i ni år nå.
I have-PRES known-PART Jimmie in nine years now
Ge Ich kenne Jimmie jetzt seit neun Jahren.
I know-PRES Jimmie now since nine years

As we noted above, without a proper temporal adverbial (e.g. *since x time, for x time, today* etc.), the U-reading is not available even in English, perhaps due to pragmatic blocking from the simple present:

(14) a. I know Jimmie now.
b. ??I've known Jimme now.

Various Germanic and Romance languages pattern with German (von Stechow, 2002; Rathert, 2004) with respect to the missing U-reading. (Arosio, 2011) argues that the French and Italian present perfect is a genuine past tense – whether the predicate continues to hold at and after the speech time may at best follow as a contextual implicature. Similarly, in Dutch and Romanian, the simple present is used as a translation of the universal perfect in (15).

(15) **En** [...] the nation's owls **have been behaving** very unusually today.
(J.K. Rowling, ParaSol Corpus)
Du [...] de uilen in ons land zich vandaag buitengewoon vreemd
... the owls in our country self today very strange
gedragen.
behave-PRES
Ro [...] peste tot în oraş bufniţe cu un comportament cât se
... round every in town owls with a behavior as-much-as SE
poate de ciudat!
can-PRES DE weird
SC [...] su se naše nacionalne sove danas
... are-3PL-PRES SELF our national owls today

ponašale vrlo neobično.
behaved-PART-IMP very unusually

Bu [...] dnes sovite v stranata sa projavili
... today owls-the in country-the are-3PL-PRES showed-PART-PF
mnogo stranno povedenie.
very strange behaviour

The adverbial *today* is an *improper past time adverbial* (McCoard, 1978), (Dowty, 1979), which here in (15), in the role of restricting the perfect time span, refers to the time of the utterance day which precedes and includes the speech time. In principle, the adverbial also allows for an existential reading of a present perfect, where the predicate is said to hold at some subinterval of the perfect time span, a subinterval which typically does not include the speech time. Slavic languages, with their explicit aspect marking on the participle, can overtly encode the U-E-distinction in such cases. Accordingly, in the Serbo-Croatian translation above, the imperfective is used to enforce a universal reading (cf. the progressive in the English original), such that the time of the eventuality is a superinterval of the perfect time span. However, the Bulgarian translation in the same context is arguably slightly inaccurate as the perfective marking on the participle triggers an existential reading of the perfect, where the event holds at a (presumably non-final) subinterval of the perfect time span, thus reporting a truly past state of affairs.

There is no consensus when it comes to explaining the nature of these cross-linguistic differences. One possibility explored in the literature is that the denotation of the present is different in, say, English and German (Portner, 2003), (Pancheva & von Stechow, 2004). While the present is considered to simply denote the utterance time in English, it is arguably a non-past in German. This in turn may give rise to subtle cross-linguistic variation in the meaning of the present perfect. Some researchers advocating an extended now treatment of the present perfect (see section 3.3 below) argue that the perfect time span includes the right boundary, i.e., the speech time, in English, but is allowed to merely abut the speech time in German (von Stechow, 2002), (Rothstein, 2008) and French/Italian (Arosio, 2011). Alternatively, one could try to account for the data encountered above independently of the meaning of the perfect itself, relegating effects of U- and E-readings to aspectual properties of the perfect participle (progressive in English and PF/IPF in Slavic vs. aspectually neutral participles in German and French etc.) in specific combinations with temporal adverbials.

Whichever are the relevant factors, the competition perspective has been in the foreground in recent work (Pancheva & von Stechow, 2004), (Schaden, 2009), especially when it comes to the next section below.

2.5 Competition with the past

We can easily find examples in our corpora where the tables are turned and English is the language that avoids the use of a perfect, preferring a simple past:

(16) En Who told you?
It Chi ve lo **ha** **detto**?
who you that has-PRES said-PART
(Umberto Eco, ParaSol Corpus)
Ge Wer hat Euch das gesagt?
who has-PRES you that said-PART

Du Wie heeft u dat verteld?
who has-PRES you that told-PART
Sp ¿Quién os lo ha dicho?
who you that has-PRES said-PART
SC Ko vam je to rekao?
who you is-PRES that said-PART-PF

One of the most striking distributional patterns involving the perfect and simple past across languages is observed with definite positional adverbials like *yesterday* or *last year*. These adverbials are incompatible with the present perfect in certain languages, notably English, Mainland Scandinavian and Spanish, but not in others (French, German, Dutch etc.), cf. (17) and (18):

(17) **En** Harry Potter **got** a Nimbus Two Thousand last year. (*has got)
(J. K. Rowling, ParaSol Corpus)
No Harry Potter fikk en Nimbus 2000 i fjor. (*har fått)
Harry Potter got-PAST a Nimbus 2000 last year (*has got)
Ge Harry Potter hat letztes Jahr einen Nimbus Zweitausend
Harry Potter has-PRES last year a Nimbus Two-thousand
bekommen.
got-PART
Du Harry Potter heeft vorig jaar een Nimbus gekregen.
Harry Potter has-PRES last year a Nimbus got-PART
Fr Harry Potter, lui, a eu un Nimbus 2000 l'année
Harry Potter he has-PRES got-PART a Nimbus 2000 the-year
dernière.
last
Ro Harry Potter a primit un Nimbus 2000 anul trecut.
Harry Potter has-PRES got-PART a Nimbus 2000 year last
Bu Khari Potăr oščte minalata godina poluči Nimbus dve
Harry Potter already last-the year got-PAST-PF Nimbus two
khiljadi. (OK: e polučil)
thousand (OK: is-3SG-PRES got-PART-PF)

(18) En You heard it yesterday. (*have heard)
Sw Det hörde ni ju i går. (*har hört)
that heard-PAST you yes in yesterday (*have heard)
Sp Ya lo oísteis ayer. (*habéis oído)
you that heard-PAST yesterday (*have heard)
It Lo **avete udito** ieri.
it have-2PL-PRES heard-PART yesterday
(Umberto Eco, ParaSol Corpus)
Ge Ihr habt es gestern gehört.
you have-PRES it yesterday heard-PART
Du Dat hebt u gisteren gehoord.
that have-PRES you yesterday heard-PART
Bu Nali čukhte včera. (OK: ste
right heard-2PL-PAST-PF yesterday (OK: are-2PL-PRES

čuli)
heard-PART-PF)

SC To ste juče čuli.
that are-2SG-PRES yesterday heard-PART-PF

The division between two groups of languages as demonstrated in (17) and (18) is the source of what has been dubbed *the present perfect puzzle* (Klein, 1992).[8]

The ban on a present perfect in English with definite past adverbials like *yesterday*, despite the fact that the present perfect sentence can be true if the underlying event occurred yesterday, shows that the problem "is not with the temporal relations described, but with how they are described" (Portner, 2011). We take the interaction with temporal adverbials to be at the heart of a whole range of puzzles which a theory of the perfect should try to explain.

Furthermore, in all languages with the *have/be*-perfect, other perfects, such as tenseless perfects, the future perfect or the past perfect, cooccur with definite positional adverbials modifying the time of the underlying event.

(19) En Yes , she had been to school on Monday.
No Jo, hun **hadde** **vært** på skolen om mandagen.
Yes, she had-PAST been-PART to school-the on monday-the.
(Bergljot Hobæk Haff, Oslo Multilingual Corpus)
Fr Oui, le lundi elle était bien allée à l'école.
yes the monday she was-PAST-IPF well went-PART to the-school

(20) **En** In the first forty days a boy **had been** with him.
(Ernest Hemingway, RuN-Euro Corpus)
It Nei primi quaranta giorni lo aveva accompagnato un
in first forty days him had-PAST accompanied-PART a
ragazzo.
boy
Bu Prez părvite četirideset dni be vzimal edno
in first-the forty days was-3SG-PAST took-PART-IPF a
momče săs sebe si.
boy with him self

In the right context, the temporal adverbial can also modify the higher reference time in, say, a past perfect. So while the present perfect is incompatible with these adverbials, other perfects even create an ambiguity, as in the Norwegian original below and the French translation. By not using a positional adverbial *in 1021*, but instead an adverbial designating the higher reference time *by 1021*, the English translation disambiguates the Norwegian original:

(21) En By 1021 he had christened the people of the valleys.

[8]The Slavic 'perfect-languages', Bulgarian and Serbo-Croatian, differ from the two other groups inasmuch as the presence of a past positional adverbial does not in any clear way correlate with the choice of inflectional vs. analytic tense form. One finds the present perfect with or without adverbials, but unlike in German, Dutch and Italian, there is no general preference for the present perfect over inflectional past tenses (e.g. the aorist) in reference to completed past events. However, there is still a distinction between the perfective past (aorist) which is actually used in the Bulgarian translations of (17) and (18) vs. the alternative, hypothetical use of a perfect in the same context. The aorist signals that the speaker has indeed witnessed the event, while the (evidential) perfect would suggest that the speaker may only have indirect evidence for it (Lindstedt, 2000).

No I 1021 **hadde** han **kristnet** dølene.
in 1021 had-PAST he christened-PART peasants-the
(Anders Ole Hauglid, Oslo Multilingual Corpus)
Fr Il avait christianisé les paysans en 1021.
he had-PAST christened-PART the peasants in 1021

The intriguing contrast between (17) and (18) on the one hand and (19), (20) and (21) on the other has led people to think that the difference between the languages somehow relates to the syntax and/or semantics of the present tense which features in the present perfect (Portner, 2011). But, as we will see next, the puzzle continues to plague most if not all theories of the perfect.

3 Theories of the perfect

In the introduction we established a three-way distinction between the functional heads tense, perfect and aspect.

(22) a. the nation's owls have been behaving very unusually today.
b. [$_{\text{TP}}$ PRES[$_{\text{PerfP}}$ PERF[$_{\text{AspP}}$ IPF[$_{\text{VP}}$ owls behave unusually]]]]

Being located between aspect and tense, the perfect could be seen as a sort of second, embedded tense (Iatridou et al., 2001) with a semantic type that takes a set of times as input and returns a set of times. However, the compositional details are still unsettled in the literature, and there are various alternatives on the market that would rather consider the perfect a second aspect, as we will see below.

Two different approaches which take these issues seriously are (Dowty, 1979), who spelled out the extended now (XN) account in great detail, and (Kamp et al., 2013), who defend the result state theory in the most elaborate way.[9] These authors, from their different perspectives, also propose a semantics for several of the temporal adverbials which are crucial for an understanding of the temporal semantics of the perfect.

As for *today* and other definite positional adverbials, we will here assume the following format, where the subscript c takes care of the contextual-deictic dependence on the utterance time.

(23) $[\![\text{ today/yesterday }]\!]_c = \lambda P_{<it>} \lambda t.t \subseteq today_c/yesterday_c \,\&\, P(t)$

The question of where to put adverbials like *today* in the skeleton in (22-b) is a key one and will receive different answers depending on the theory. Time adverbials with the semantic type[10] in (23) can only adjoin to a node denoting a set of times, but the architecture opens up for several candidate attachment sites.

Dowty (1979) and Kamp et al. (2013) are representatives of competing semantic approaches which share the goal of a unified semantic account of the perfect which, in combination with tense, aspect and temporal adverbials, should correctly predict the distribution of E/U-readings. But there are also those who accept a genuine ambiguity of the perfect, e.g. (Kiparsky, 2002) and (von Stechow, 2002).

While the basic goal shared by semanticists working on the perfect is to capture the type of anteriority it indicates (Portner, 2011), there is less discussion on what element

[9] Their unfinished manuscript available from Kamp's homepage came to 400 pages as of 2017.

[10] We use subscript 'i' for the type of time intervals and later we will use 'v' for the type of event(ualities). The type 't' is the familiar type for truth-values. Thus, $P_{<it>}$ is a predicate of times.

actually corresponds to PERF in the overt morpho-syntax. The structure in (22-b) doesn't really tell us whether the perfect operator is located in the participle (PerfP = PartP) or in the *have/be*-auxiliary (PerfP = AuxP).

Iatridou et al. (2001) argue that *have* and *be*-perfects in fact should be represented by two different structures. They provide data from reduced relative clauses in Bulgarian and Italian suggesting that the auxiliary *be* is semantically empty:

(24) Bu Zapoznakh se s ženata, [napisala knigata].
acquainted-1SG-PAST self with woman-the written-PART-PF book-the
'I met the woman who had written the book.'
It Il treno [arrivato entro le 3] è ripartito subito.
the train [arrived-PART by the 3] is-PRES left-PART immediately
'The train which had arrived by 3 left again immediately.'

The perfect meaning is expressed here by the participle alone. Similar data are not available for *have*-perfects in Italian (and Bulgarian has only the *be*-perfect). However, *have*-deletion is in fact possible in embedded perfects in Swedish (Julien, 2002):

(25) Sw Jag tror han sett henne.
I think-PRES he seen-PART her
'I think he has seen her.'

On independent grounds, Musan (2002) and Sæbø (2009) come to the conclusion that the perfect meaning is *always* located in the participle, a position that invites a semantic analysis of the auxiliary simply as the identity function. Alexiadou et al. (2003) argue against this view, since, according to these authors, perfect level adverbials – temporal adverbials modifying the perfect time span – must have narrow scope with respect to the perfect operator, but these adverbials are not necessarily contained in PartP. So for Alexiadou et al. (2003), the perfect, a backward shifter, is rather expressed by the auxiliary – in analogy to the forward shifter *will*.

Perhaps a way out is the compromise solution suggested by Stowell (2008) who claims that the perfect meaning component is in the participle and that the auxiliary is needed to somehow "check" its presence. An argument for this view is that the *have*-auxiliary will always disambiguate the perfect from the passive.

In the compositional semantics, the perfect is in any case located above viewpoint aspect and below tense. Let us now instead focus on possible meanings for the perfect operator. We will review below the three most prominent semantic approaches: the anteriority theory, the result state theory and the extended now theory.

3.1 The anteriority analysis

In the influential Reichenbachian tradition, the English perfect is interpreted as an indefinite past. For Reichenbach (1947) both the perfect and simple tenses like the present and past are defined as holistic relations of precedence ($\prec$) and coincidence ($=$) between three points of time: S (speech time), R (reference time) and E (event time).

(26) a. Present: $R = S$
b. Past: $R \prec S$
c. Future: $S \prec R$
d. Perfect: $E \prec R$

Complex perfect tenses involve a combination of these relations:

(27) a. Present perfect: E $\prec$ R & R = S
b. Past perfect: E $\prec$ R $\prec$ S
c. Future perfect E $\prec$ R & S $\prec$ R[11]

With the additional stipulation that the reference time and event time coincide in the simple past (R= E & R $\prec$ S), we get the desired contrast with the present perfect, for which the reference time is *after* the event time.

Reichenbach's original system ignores the interaction with aspects such as the perfective/imperfective distinction. In later neo-Reichenbachian interval-based approaches, e.g. (Hornstein, 1990) or (Klein, 1994), the perfect is itself an aspect: it introduces a relation between the event time and the reference time (Klein's topic time). Like the (im)perfective viewpoint aspect, the perfect maps properties of events into properties of times. Thus, in a compositional framework Klein's anteriority meaning of the perfect would be:

(28) $[\![\text{PERFECT}_{\text{Klein-style}}]\!] = \lambda P_{<vt>} \lambda t \exists e[e \prec t \,\&\, P(e)]$

The perfect is here an existential quantifier that introduces an event prior to the reference time. The variable e can be an event proper or a state. Following Reichenbach, the reference time is the time denoted by the semantic tense. For examples like (6) in English, repeated below, we thus get:

(29) a. They have already come.
b. $[_{\text{TP}}\text{PRES}[_{\text{AspP}}\text{PERF}[_{\text{VP}}$they come]]]
c. $\exists e[e \prec \textit{now} \,\&\, \text{they come}(e)]$

Reichenbachian accounts of the perfect are intended to capture the idea of *current relevance*, the intuition that the speaker's assertion concerns the tense time, i.e., the post time of some past event, and not the past event itself (Portner, 2011). For instance, in a present perfect, what is true at the speech time should be more important for the speaker than details concerning the instantiation of the event. Portner mentions Inoue (1979), Klein (1992) and (Giorgi & Pianesi, 1998) as typical representatives of this approach. However, it remains an open question how one can make this intuition – the importance of the tense time – formally precise.

In fact, apart from the ontological commitment to events, this analysis is virtually indistinguishable from the quantificational (indefinite) Past-operator of Prior (1967). The semantic perfect amounts to an embedded PAST.[12]

However, in the Serbo-Croatian version of (6)/(29) the participle (*pristigli–come*) is morphologically marked with perfective aspect. The denotation of AspP is thus:

(30) $[\![\text{AspP}]\!] = \lambda t \exists e[e \subseteq t \,\&\, \text{they-come}(e)]$

For English this is a stipulation. Still, a cross-linguistically more coherent version of the anteriority theory, where the perfect scopes over viewpoint aspects such as IPF and

[11]Note that this configuration does not force the P-event in *will have P-ed* to occur after S, although the empirical data known to us seem to suggest that we have a pragmatical enrichment in the future perfect: S $\prec$ E.

[12]Note that Arthur Prior himself didn't distinguish between PAST and PERF. For an early advocate of the anteriority analysis like Inoue (1979, 563), "truth functionally the present perfect is identical to the past tense".

PF, suggests an analysis of the perfect as a relative past:

(31) $[\![\text{PERFECT}_{\text{relative-past}}]\!] = \lambda P_{<it>} \lambda t \exists t' [t' \prec t \,\&\, P(t')]$

Applying the relative past to AspP in (30) gives us:

(32) $\lambda t \exists t' \exists e [e \subseteq t' \,\&\, \text{they-come}(e) \,\&\, t' \prec t]$

In the next step, t will be equated to the speech time *now*.

We can use the anteriority-perfect (or relative past version if we assume viewpoint aspect below perfect) to account for the Italian and German present perfect with past positional adverbials in (18), repeated below:

(33) It Lo avete udito ieri.
Ge Ihr habt es gestern gehört.
En *You have heard it yesterday.

While the temporal adverbial *ieri/gestern* can modifiy the relative past through its intersective semantics, arguably resulting in the correct analysis for Italian and German, the challenge for the anteriority approach, however, is that one has to block the same combination in English, Spanish and Scandinavian. Klein's solution is to invoke an additional pragmatic constraint in the second group of languages to the effect that the higher and the lower temporal parameters cannot both receive a definite temporal specification. The English present is allegedly temporally specific/definite in contrast to the German or Italian present tense. For English the specificity of the higher present tense is supposed to rule out the presence of an additional lower past-oriented adverbial that relates the event to a definite time.

So for Klein, there is no semantic difference between the English and German perfect. The present perfect puzzle is explained as a pragmatic epiphenomenon of cross-linguistic variation in the denotation of the present. However, this kind of solution does not easily apply to solve the present perfect puzzle in Scandinavian, where the present tense can be used as a non-past and is therefore closer to the German one than to the English strictly punctual present, as argued by Rothstein (2008).

3.2 The result state analysis

The result state analysis makes the intuition from the anteriority approach more concrete: There is indeed something special about the tense time in the perfect construction inasmuch as a *result state*, the state following a prior eventuality, holds at the reference time. This turns the perfect into a stativizer, an operator that converts a telic predicate into a state by closing off the underlying event argument. On this approach, the perfect is still considered an aspect or Aktionsarten operator.

The nature of the result state is much debated in the literature (Portner, 2011). For Parsons (1990), it is merely the trivial, abstract state of the event's having occurred. Nishiyama & Koenig (2010) do not put any semantic constraints at all on the identity of the perfect state, as they leave it to (Gricean) pragmatic reasoning to identify the result state in a specific discourse. Accordingly, they introduce a free property variable X over states, whose value is determined contextually following principles from Gricean pragmatics. See also (Schaden, 2009) on this point. These proposals are not purely temporal and raise interesting questions for the semantics-pragmatics interface.

The most ambitious and explicit result state approach is yet to be worked out in

all its details as it currently exists as an unfinished, yet voluminous manuscript (Kamp et al., 2013). However, the predecessor, the original DRT-analysis of the perfect as it was spelled out in their DRT-book (Kamp & Reyle, 1993), remains highly influential.

Their point of departure for the analysis of the perfect is the decomposition of the event nucleus developed by Moens & Steedman (1988). The perfect takes the culmination point of a telic VP and maps it to a property true of the result state. The tense time, Reichenbach's reference time, is contained in the result state, giving rise to an imperfective inclusion relation. We can analyze a present perfect schematically as in (34), where "$\succ\prec$" stands for the abutting-relation:

(34) a. $[[\text{ PERF of RESULT}_{\text{DRT-style}}\text{ }]] = \lambda P \lambda s \exists e[P(e) \,\&\, Culm(P) \,\&\, e \succ\prec s]$
b. Mary has met the president.
c. [PRES [IPF [RESULT [Mary meet the president]]]]
d. $[n, t, e, s \mid t = n, e :$ culminated meeting of Mary with the president$, e \succ\prec s, t \subseteq s]$ (final DRS)

As Kamp & Reyle (1993, 573) admit, this is an analysis in purely temporal terms. If we identify states with times, the formalization becomes entirely equivalent to an anteriority analysis, as we can see from the reformulations below in predicate logic, cf. (von Stechow, 2000):

(35) a. $\exists t \exists e[t = n \,\&\, e :$ Mary meet the president $\,\&\, e \prec t]$ à la (Reichenbach, 1947)
b. $\exists t \exists s \exists e[t = n \,\&\, e :$ Mary meet the president $\,\&\, t \subseteq s \,\&\, e \succ\prec s]$ = (34-d)
iff $\exists s \exists e[s = n \,\&\, e :$ Mary meet the president $\,\&\, e \prec s]$

The last two statements are equivalent: If the speech time is contained in a larger state abutted by e, then e precedes the speech time, and vice versa. This version of the result state analysis boils down to the anteriority analysis because there is no enforced non-temporal connection between the state s which has to abut e, and the event e itself. That is, *any* state holding after the event will suffice. So, in terms of truth-conditions this analysis doesn't buy us anything compared to the traditional Reichenbachian account. But there is a difference in logical form. The DRT-analysis has a state variable that could potentially be the carrier of adverbial modification by a durative adverbial. However, temporal adverbials cannot easily modify this state in English:

(36) a. Mary has met the president for two hours.
⇒ cannot modify the result state
b. Mary has met the president today.

In their more recent work, Kamp et al. (2013) are greatly concerned with the problem posed by (36-b). There is a clear requirement that the underlying meeting event must be located within the interval denoted by the positional temporal adverbial. The sentence cannot be true if the meeting did not take place today. But this again means that the temporal adverbial – which restricts the perfect time span – necessarily relates to the event time and does not merely serve to localize the result state. To account for this within the result state analysis Kamp et al. (2013) propose a radical solution which departs from the traditional compositional picture where temporal adverbials restrict a temporal parameter t that mediates between aspects and tenses. In their latest work, a temporal adverbial can localize an event independently of the tense time. The implications of this new architecture for the tense-aspect domain must await future reserach.

3.3 The extended now analysis

The final approach that we will consider analyzes the perfect not in terms of resultativity or as an aspectual relation, but as an extended tense. This idea made a huge impact in the field with McCoard (1978) and his work on English and the subsequent formalization of the theory by Dowty (1979). The XN-interval (extended now) introduced by the perfect is what we have referred to above as the 'perfect time span' (Iatridou et al., 2001). This interval is flexible enough to accommodate different temporal locations of the embedded event. The interval extends backwards into the past from the tense time, and is most commonly taken to include (and not simply abut) the latter as its right boundary.

So the crucial difference from the relative past of the anteriority approach in (31) above, is that the time interval t in (37) below does not properly precede the higher tense t', i.e. the speech time in a present perfect, but includes it.

(37) $XN(t, t') :=$ t' is a final subinterval of t.

The semantic contribution of the perfect is accordingly to introduce this XN-interval[13] (the perfect time span) at which the temporal predicate P[14] is true.

(38) $[\![\text{ PERFECT}_{\text{eXtended Now}}]\!] = \lambda P \lambda t' \exists t[XN(t, t') \,\&\, P(t)]$

The left boundary of XN can be explicitly given by an adverbial or it must otherwise be provided by context as XN is an interval the speaker has in mind and the hearer must be able to infer (Mittwoch, 2008). In English, the complement of the temporal preposition *since* is particularly apt at providing the left boundary of XN, e.g. through a calendar expression (1976) or some appropriate anaphoric device:

(39) a. Since 1976 I have been hospitalized six times.
b. Since then, silence has (always) reigned supreme.

We adopt the following minimal semantics for temporal *since* (von Stechow, 2002; Alexiadou et al., 2003):

(40) $[\![\text{ since}(t)]\!] = \lambda P \lambda t'.P(t') \,\&\, LB(t, t')$,
where $LB(t, t') = 1$ iff t is an initial subinterval of t'.

In the next step of the semantic derivation, t' will be equated to XN. But this implies that the *since*-adverbial must scope immediately below the XN-perfect, as in (41):

(41) a. [PRES [PERF[since 1976 [six times [I be hospitalized]]]]]
b. $\exists t[XN(t, NOW) \,\&\, LB(1976, t) \,\&\, \exists 6t'[t' \subseteq t \,\&\, \text{be hospitalized}(t')]]$

In fact, *since*-adverbials are the perfect level adverbial par excellence. In English (and Mainland Scandinavian (Rothstein, 2008)), *since 1976* must modify a perfect time span (XN) and, accordingly, can only combine with a perfect tense.

(42) *Since 1976 I was/am hospitalized six times.

[13] Only in the case of the present perfect is the terminology 'XN' for the perfect time span strictly speaking appropriate. For the past perfect the corresponding term would be Xthen.

[14] This predicate is the denotation of AspP or a similar temporal-quantificational projection that embeds the VP.

Given that *since 1976* selects a PerfP, one might be inclined to think that the adverbial should be attached to the phrase selected. That, however, would not be compatible with the semantics for *since t* given in (40) and the standard assumption that the perfect operator in (38) is an existential quantifier (Alexiadou et al., 2003).

Thus, we obtain the wrong result if we switch the relative hierarchy between *PERF* and *since 1976*: A structure like $*PRES \prec$ *since 1976* $\prec PERF$ ... would produce an unavailable reading according to which the left boundary of *PRES* is 1976, and I've been hospitalized six times in an XN reaching into a time before 1976. One has to add a syntactic stipulation that rules out such a structure by requiring that perfect level adverbials must be immediately embedded under PERF. It is precisely this syntactic restriction that makes *since t* a perfect level adverbial, and there seems to be no way of getting rid of this selectional constraint on an XN-analysis of English/Scandinavian (von Stechow, 2002).[15]

From the examples above, we also see that *since*-adverbials are compatible with both E- and U-readings, (39-a) and (39-b), respectively, and that the underlying eventuality stands in a specific relation to XN depending on the quantificational structure and/or aspect. Formally, an imperfective or perfective-like inclusion relation embedded under the perfect determines the U-E distribution. An actual viewpoint aspect is overtly present in languages like Bulgarian and Serbo-Croatian, while in English or Norwegian the aspectual relation comes about through Aktionsarten and/or an adverbial like *always*, which corresponds to the imperfective, or a default invisible adverb *once* (Bäuerle, 1979) which amounts to perfective aspect. Thus, if the VP is embedded under the imperfective, that is the inclusion relation $t \subseteq e$, we get the U-reading, since the eventuality (state) holds at a superinterval of XN (XN $= t$). If the VP is embedded under the perfective $e \subseteq t$, we get the E-reading, which means that there is a subinterval of XN that contains a VP-eventuality. Hence, the U/E-readings are not due to an inherent ambiguity of the perfect operator itself.

By splitting the durational meaning of *since t* from the inner quantification over subintervals of XN, one gets a modular approach (Alexiadou et al., 2003) which can successfully account for the examples above. For instance, the two readings with a stative predictate *reign* in (43) are due to the (possibly covert) quantificational adverbs applying to the tenseless VP.

(43) Since then, silence has (always/once) reigned supreme.

The traditional approach in (Dowty, 1979) is to equate states with times. Imperfective aspect[16] then locates the stative VP (a property of times) at a superinterval of XN to produce the universal reading:

(44) $\exists t \exists t' [XN(t, now) \,\&\, \text{silence reigns}(t') \,\&\, LB(then, t) \,\&\, t \subseteq t']$

The existential reading of (43) can be treated in parallel to (41) above, replacing $\exists 6t'[t' \subseteq t$ ...] by $\exists t'[t' \subseteq t \,\&\, P(t')]$ (there is a subinterval t'... at which P is true). This is the overt or covert adverb of quantification *once* (Bäuerle, 1979) inserted below XN and below the *since*-adverbial. With events (telic VPs) under the perfect we automatically obtain an existential reading, because the location of an event at an interval always

[15] In other languages like German, the corresponding temporal preposition *seit t* does not modify an XN, but rather introduces the XN. Accordingly, *seit t* needs not scope below a perfect and can freely combine with other tenses.

[16] Recall from the previous subsection that a covert imperfective is invoked also in DRT-based analyses of the perfect where the result state s holds at a superinterval of the higher reference time.

amounts to an existential statement. This is most transparently formalized by assuming the presence of a perfective viewpoint aspect, which is covert in Germanic and Romance, but overt in Slavic, as in the Bulgarian and Serbo-Croatian translations below:

(45) En Since the good people disfigured him, he has become cruel and hard.
Ru S tekh por kak dobrye ljudi izurodovali ego, on
from those times that good people disfigured-PAST-PF him, he
stal žestok i čerstv.
became-PAST-PF cruel and hard
(Mikhail Bulgakov, Parasol Corpus)[17]
Fr Depuis que de bonnes gens l'ont défiguré, il
since that of good people him-have-PRES disfigured-PART, he
est devenu dur et cruel.
is-PRES become-PART hard and cruel
It Da quando certa buona gente l'ha mutilato,
since when some good people him-have-PRES disfigured-PART,
è diventato crudele e duro.
is-3SG-PRES become-PART cruel and hard
Bu Otkato dobri khora sa go obezobrazili,
since good people are-3PL-PRES him disfigured-PART-PF,
e stanal žestok i koravosărdečen.
is-3SG-PRES become-PART-PF hard and cruel
SC Otkako su ga dobri ljudi unakazili,
since have-3PL-PRES him good people disfigured-PART-PF,
postao je surov i bezosećajan.
become-PART-PF is-3SG-PRES hard and cruel

(46) a. [PRES [PERF[since ϕ [PF [become cruel]]]]]
b. $\exists t \exists e[XN(t, NOW) \,\&\, LB(\phi, t) \,\&\, e \subseteq t \,\&\, \text{become cruel}(e)]$

Now, we are in the position to address a well-known challenge for any analysis of the perfect: to account for the non-ambiguity of (47-a) and the ambiguity of (47-b), the kind of minimal pairs brought to attention by Dowty (1979).

(47) a. For hundreds of years his family has lived in the village.
b. His family has lived in the village for hundreds of years.
(and still does / but not anymore)

In an ingenious analysis, Dowty partly solved the puzzle of why a preposed *for*-adverbial forces a continuous interpretation. However, one can simplify Dowty's rather complicated proposal by introducing aspect. This is what we will do here. We assume that the temporal preposition *for* applied to a duration phrase has the following meaning:

(48) $[\![\text{ for hundreds of years }]\!] = \lambda P \lambda t.\textit{hundreds of years}(t) \,\&\, \forall t'[t' \subseteq t \rightarrow P(t')]$

The durative *for*-adverbial says that the modified property must hold of every subinterval of the evaluation time. Unlike *since*-adverbials, the *for*-adverbial can only combine with homogeneous predicates and therefore has universal quantification baked into its semantics. In the XN-theory, the structural ambiguity of durational adverbials can be

[17]Since there is no perfect in modern Russian, the verbs in both the matrix and temporal clause simply carry perfective aspect and past morphology in the Russian original.

analyzed by letting the adverbial measure either a state within the XN (eventuality-level) or the entire XN (perfect-level), but in both cases – pace (Dowty, 1979) – the *for*-adverbial is located below the perfect on the account outlined here.

In the U-reading in (47-a)/(49-b), there is an imperfective relation $t'' \subseteq t'$. The *for*-adverbial attached high up modifies XN above this aspectual relation, but still under the perfect. In the E-reading – one possible interpretation of (47-b), cf. (50-b) below – a perfective-like invisible quantificational adverb intervenes between the VP and PerfP, and the *for*-adverbial is located below the quantificational adverb.

The two readings attested in (47-a)/(47-b) can therefore be accounted for without lexical ambiguity of neither *for* nor the perfect, but by scopal interaction (Alexiadou et al., 2003), along the following lines:

(49) a. [PRES [PERF[for hundred years [IPF [live in the village]]]]]
b. $\exists t[XN(t, NOW) \,\&\, 100\ \text{y.}(t) \,\&\, \forall t''[t'' \subseteq t \rightarrow \exists t'[\text{live in v.}(t') \,\&\, t'' \subseteq t']]]$
universal reading in (47-a)/(47-b)

(50) a. [PRES [PERF[ONCE [for hundred years [live in the village]]]]]
b. $\exists t[XN(t, NOW) \,\&\, \exists t'[t' \subseteq t \,\&\, 100\ \text{y.}(t') \,\&\, \forall t''[t'' \subseteq t' \rightarrow \text{live in v.}(t'')]]]$
existential reading in (47-b)

Compared to the result state theory, the XN-analysis is more successful in its treatment of the improper past adverbial *today*, cf. (15), repeated below:

(51) Universal reading
En ... the nation's owls have been behaving very unusually today.
SC ... su se naše nacionalne sove danas ponašale
... are-3PL-PRES SELF our national owls today behaved-PART-IMP
vrlo neobično.
very unusually

The corpus translations also provides a couple of E-readings in the very same context:

(52) Existential reading
Ge ... haben sich unsere Eulen heute sehr ungewöhnlich
... have-PRES SELF our owls today very strange
verhalten.
behave-PART
Bu ... dnes sovite v stranata sa projavili
... today owls-the in country-the are-3PL-PRES showed-PART-PF
mnogo stranno povedenie.
very strange behaviour

The adverbial modifies XN and must scope above aspect and below the perfect, which existentially closes off XN. For the U-reading we have as always an imperfective aspectual relation below *today*, forcing the owl's unusual behavior to continue to hold at the utterance time. For both English (*-ing*) and Serbo-Croatian, this aspect is overtly marked.

In order to account for the E-reading, where the owls misbehave only for some time during today preceding the utterance time, we insert a covert adverb of quantification in German corresponding to the overt perfective aspect in Bulgarian.

Here are the relevant truth-conditions, spelled out with event(ualities) and viewpoint

aspect:

(53) a. $\exists t \exists e[XN(t, now)\,\&\,\text{owls' behavior}(e)\,\&\,t \subseteq today\,\&\,t \subseteq e]$ (U-reading)
b. $\exists t \exists e[XN(t, now)\,\&\,\text{owls' behavior}(e)\,\&\,t \subseteq today\,\&\,e \subseteq t]$ (E-reading)

Let's now see how the XN-theory can tackle the present perfect puzzle.

Unlike *today*, a truly past oriented adverbial like *yesterday* – with the by now familiar intersective meaning given above in (23) – can modify neither the utterance time nor the XN-interval, the interval stretching backwards from the speech time, for semantic reasons.

A blatant contradiction – on any account – arises if *yesterday* scopes above the perfect and modifies the present, as in (54-b). The structure in (54-c) also produces a contradiction as an interval whose right boundary is the speech time cannot be included in yesterday.

(54) a. *You have heard it yesterday. (cf. (18))
b. [PRES *yesterday* [PERF [PF [VP]]]
contradiction: $now \subseteq yesterday$!
c. [PERS [PERF *yesterday* [PF [VP]]]]
$\exists t[XN(t, now)\,\&\,t \subseteq yesterday\,\&\,\exists e[e \subseteq t\,\&\,\text{you hear}(e)]]$
contradiction: $XN(t, now)\,\&\,t \subseteq yesterday \rightarrow now \subseteq yesterday$!

The XN-analysis can also nicely capture the contrast in acceptability between definite/deictic and indefinite/quantificational temporal adverbials, which in the minimal pair below clearly do not refer to the same Monday:

(55) a. *She has been to school on Monday.
b. She has been to school on a Monday.

The present perfect in English can combine with *on a Monday*, which quantifies over subintervals of the local evaluation time, that is subintervals of XN, thus avoiding the possible contradictions mentioned above. Here is the relevant distinction:

(56) a. $[\![\text{ on Monday }]\!]_c = \lambda P \lambda t.t \subseteq Monday_c\,\&\,P(t)$ (same format as *yesterday*)
b. $[\![\text{ on a Monday }]\!] = \lambda P \lambda t.\exists t'[monday(t')\,\&\,t' \subseteq t\,\&\,P(t')]$

An adequate truth-condition for (55-b) again requires something like a covert perfective aspect:

(57) $\exists t[XN(t, now)\,\&\,\exists t'[monday(t')\,\&\,t' \subseteq t\,\&\,\exists e[\text{go to school}(e)\,\&\,e \subseteq t']]]$

So far so good, now to the problems, which indeed exist on this proposal as well. The XN-analysis seems to have succeeded in blocking (54-a) above, but there is yet another option to consider. Why shouldn't *yesterday* be able to scope below aspect and modify the VP-eventuality?

(58) [PRES [PERF [PF *yesterday* [you hear]]]]

If the VP denoted a property of times, we could not rule out the structure in (58). The run time of an event can obviously be included in *yesterday*, and the condition $\tau(e) \subseteq yesterday$ makes perfect sense. Pancheva & von Stechow (2004) argue that we face a type clash in (58) since events are not the same as their run times (by convention, the result of applying the function τ). However, the strategy of invoking a type clash

in explaining the present perfect puzzle is not easy to uphold given that stative VPs in the perfect are also ruled out with positional definite adverbials:[18]

(59) *My family has lived in the village last year.

Furthermore, advocates of an XN-analysis would have to explain why *gestern/ieri* in German or Italian effortlessly combines with a present perfect as we saw in section 2.5, and, second, why positional adverbials in English are perfectly fine in other perfects, such as the past perfect:

(60) Yes, she had been to school on Monday. (= (19))

Example (60) most naturally invites an interpretation of *on Monday* modifying the eventuality time (or in Reichebach's notation for the past perfect: E $\prec$ R $\prec$ S & E *on Monday*). The event time is definite, what is referred to as a 'retrospective pluperfect' in (Fabricius-Hansen, 1986). Furthermore, it turns out that the analysis of XN above does not easily extend to an Xthen outside the present perfect. XN is treated as an existential tense ($\exists t[XN(t, now)...]$), but in the past perfect different combinations of referential/anaphoric/definite vs. quantificational/existential/indefinite tenses are conceivable (Grønn & von Stechow, 2016).

For instance, the larger context of (60) shows that the 'higher tense' is here a referential/anaphoric/definite past, which is indeed typically the case in the past perfect:

(61) (This morning [...], I went upstairs and sat down on her bed. [S]he answered my questions quite readily.) Yes, she had been to school on Monday.

In this particular example the 'lower tense', the perfect time span, is also arguably definite, a configuration which ultimately would require a dynamic framework for temporal semantics, as argued in (Grønn & von Stechow, 2016).

Thus, the mixed behavior of (definite) temporal adverbials under the perfect apparently presents a major obstacle to a uniform, purely semantic analysis of the perfect cross-linguistically, and perhaps even within a single language. The existential XN-analysis seems to be restricted to the English/Scandinavian-style present perfect and does not easily apply to other languages or perfect constructions.

4 Conclusion

To a certain extent, intuitively, the three readings we started with correlate with the three theories we have discussed. The resultative reading motivates the result state analysis, the experiential-existential reading goes well with a relative past of the anteriority theory, while the universal perfect motivates an extended now analysis. However, semanticists working on the perfect will probably not be happy with this correlation, since it implies that the individual theories fail to give a uniform and comprehensive semantics for the perfect.

In the light of our discussion above, one could perhaps propose a compromise meaning for the perfect between a relative past and extended now along the following lines (Musan, 2002), (Pancheva & von Stechow, 2004):

[18] In the discussion above we have often assumed that states are basically the same as times, following (Dowty, 1979) and others.

(62) $[\![\text{PERFECT}_{\text{uniform}}]\!] = \lambda P \lambda t \exists t'[t' \leq t \,\&\, P(t')]$
($t' \leq t$ iff there is no $t'' \subset t'$ s.t. $t'' > t$)

This is a weak version of XN, where the perfect introduces an interval, no part of which may follow the higher reference time. The interval need not include the utterance time in a present perfect, hence it can potentially be reduced to a relative past (e.g. in German/French). A relative past is also what would be needed for the past perfect in English/Scandinavian. But even (62) cannot be the end of the story since it doesn't explain the present perfect puzzle (and it is not clear whether it can account for the result state readings).

There is something special about the present perfect. Maybe one reluctantly has to accept multiple ambiguities across and within languages, reserving XN only for the present perfect in English/Scandinavian/Spanish, as we did in (Grønn & von Stechow, 2016). Or, as is commonly assumed in the literature, one has to add a pragmatic component to the analysis. In the words of (Portner, 2011), "it is also possible that some aspects of the perfect's meaning are not derived compositionally, but rather associated with the construction as a whole".

Portner (2003) himself combines a temporal (semantic) extended now theory with a modal (pragmatic) component, saying that the perfect comes with a pragmatic presupposition of current relevance. Schaden (2009) and Nishiyama & Koenig (2010), on the other hand, add a Gricean story to the result state analysis.

Both Pancheva & von Stechow (2004) and Schaden (2009) put heavy emphasis on competition between forms in explaining the present perfect puzzle. Perhaps the present perfect is the only perfect construction that enters into direct competition with the simple past. Schaden notes that in English, Swedish and Spanish, the simple past is unmarked and the perfect is marked, while in German, French and Italian, it is the other way round. The unmarked form is used by default with reference to events in the past, and this will normally block a marked present perfect from co-occurring with a past time adverbial. We refer to Portner (2011) for a critical discussion of this approach.

For Pancheva & von Stechow (2004), the crucial point is the denotation of the present, which they claim to be different in English and German. Due to a more restricted denotation of the present in English, the present perfect is allegedly strengthened to a strong XN-reading which includes the utterance time as the right boundary of XN. The same pragmatic strengthening of the present perfect does not take place in German (or French, Italian etc.), where XN is allowed to merely abut the utterance time, as pointed out in (Rathert, 2004). However, it is not quite clear how the competition story from (Pancheva & von Stechow, 2004) extends to Scandinavian, which like English exhibits a prohibition against positional past adverbials in the present perfect, but has a more German-like present tense (Rothstein, 2008). On a more general note, von Stechow (2002) says that the perfect in German/French is unmarked in the sense of being common, and that unmarked morphology always carries several meanings.

This said, it is clear that many factors involved in the semantics and pragmatics of the perfect are still only partly understood, notably the precise interaction of compositional temporal semantics – our main focus here – with the pragmatic competition perspective.

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