

Verbal negation¹

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Abstract. While it is well-known that negation has various behaviours, I focus here on verbal negation, a constituent negation acting on verbs. I show that propositional negation and verbal negation are barely distinguishable at matrix level, but that a real semantic difference is brought out in certain linguistic contexts, including direct perception reports. I link verbal negation with counter-expectation and active inaction, thus generalising previous accounts on negated infinitives in direct perception reports. I then propose a formalisation in a recent event semantics framework. Finally I explore how these ideas relate with previous studies in two languages featuring several negation forms: Korean and Bengali.

Keywords: non-propositional negation, event semantics, negative events, direct perception reports.

1. Introduction

Negation has been argued many times to have various behaviours. There are reasons to think that negation is not just *one* operator (*e.g.* the boolean operator on truth values), but has different facets. Syntactically, in addition to propositional negation, there exist a whole range of constituent negations, acting on nouns, adjectives, adverbs, *etc.* Semantically, there have been never-ending disputes about the meaning of mere propositional negation (Horn, 1989). Pragmatically, negation can focus on implicatures or presuppositions. Horn (1989) calls this *metalinguistic* negation, and Geurts (1998) shows that even this has diverse and irreconcilable forms. Some languages also have expletive negation, a negation marker whose semantic contribution seems essentially inert.

One special feature of negation has been observed with negated infinitives under perception reports, as in:

- (1) a. John saw Mary not smoke.
- b. James saw Anthony not serve Alicia.

These sentences might seem strange out of the blue, but there is corpus evidence that they occur in text and conversation (Miller, 2007; Miller and Lowrey, 2003) and are often associated with a prior expectation for the negated situation to happen. Below I review a few accounts associated with this phenomenon. For now, suffice it to say that most of them treat it as a distinct use of negation.

In this article, I argue that it is actually part of a more general use of negation, that I call verbal negation: given a predicate P , one can reify a new predicate \bar{P} that can in turn be used in positive sentences. This is thus another constituent negation operator, taking scope over predicates and not propositions. Since the verb is seen as the kernel of a sentence, verbal and propositional²

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²In all the article, *propositional negation* refers to a standard negation operator taking scope over the whole proposition and reversing its truth-value.

negation may be considered to be identical. I will present syntactic and semantic evidence that this is not the case.

To be exact, I will argue that at matrix level propositional negation and verbal negation have a very close — if not identical — meaning. However, divergences appear when the negated sentence is embedded in certain linguistic contexts. This is reminiscent of Dretske's work about contrastive statements (Dretske, 1972), where he shows that “if $C(U)$ is a linguistic expression in which U is embedded, and U can be given different contrastive foci (say U_1 and U_2 [which are not distinguished in terms of truth-values]), then it often makes a difference to the meaning of $C(U)$ whether we embed U_1 or U_2 ”. Using this methodology, I will describe several linguistic constructions C , including direct perception reports, in which the difference between $\neg P(x)$ and $\bar{P}(x)$ is brought out — in the case of direct perception reports, the propositional reading of negation is just blocked. This will be section 2 of the article. In the third section, I introduce verbal negation and I show that its meaning has to do with counter-expectation, oppositeness and what I call *active inaction*. Section 4 proposes a formalisation in event semantics; more precisely I will use a variant recently proposed by Bernard and Champollion (2018). Section 5 explores verbal negation cross-linguistically, looking at Korean and Bengali. Finally section 6 is a sketch of an extension to nominal negation.

2. Where propositional negation does not suffice

In this section I enumerate several linguistic constructions in which negation shows an odd behaviour if it is to be analysed as propositional. This will constitute the evidence for verbal negation's existence that I will use in turn to refine verbal negation's semantics.

2.1. Direct perception reports

If negation of infinitives under perception reports like in (1a) is propositional negation, then this sentence should mean something like “John saw that Mary was not smoking” or “John saw Mary do something which was not smoking” or, as some authors have proposed³ “John saw Mary do something incompatible with smoking”. However this is not satisfactory to the extent that (1a) has been argued to carry something more — for instance Mary's refraining from smoking (Miller, 2007) — which is absent in those alternative sentences. A plausible context for uttering (1a) would be one where, although aware that Mary smokes like a chimney, John spent a whole evening in her company without her lighting a single cigarette. Maybe she was nervous and made efforts not to smoke. At any rate this construction seems to always be associated with a strong expectation for the predicate under negation to happen.⁴ There have been attempts to explain which eccentric behaviour of negation here could explain the data.³ As far as I know, the most detailed formalisation is Cooper's, in situation semantics (Cooper, 1997). Cooper analyses (1a) as $s \models \text{see}(j, s') \wedge s' \models \neg \text{smoke}(m)$, where $s \models p$ means that the situation s supports the positive infon p . Then Cooper gives two necessary conditions for the same relation with a negative infon to hold:

1. $s \models \neg \phi \rightarrow \exists(\text{positive})\psi [s \models \psi \wedge \psi \Rightarrow \neg \phi]$
2. $s \models \neg \phi \rightarrow \exists(\text{positive})\psi' [s \models \psi' \wedge \psi' > \phi]$

³See Miller (2007) for a review.

⁴Or a failure, which is in some sense another form of expectation.

where “the symbol $>$ represents some sort of defeasible inference”, meant to model expectation. However Cooper does not explain what he means by defeasible inference, and is pursuing there the view that infons are intrinsically positive or negative, independently of the way they are described — a view that is philosophically controversial. Moreover these two conditions are only necessary conditions and do not state proper truth conditions for $s \models \neg\phi$, and no compositional treatment is provided.

All these problems vanish if we adopt an account, as proposed hereby, where “not smoke” is just a (positive) predicate, admittedly constructed from negation and another predicate.⁵ The counter–expectation flavour becomes thus the verbal negation operator’s task, and the sentence is now a standard direct perception report, just as “John saw Mary smoke”. In other words counter–expectation is now due to using verbal negation, not to the combination of negation with direct perception reports. The difference may seem slight, but it will allow us to generalise this counter–expectation phenomenon to plenty of other linguistic constructions, as described below, without having to distinguish two meanings for them depending on whether they are filled with a positive or a negative predicate.

There actually seems to be subtle variations as to what negation under direct perception report can express. Let me give one more example, which comes from the Internet and is reported by Miller and Lowrey (2003).

- (2) Elle, son café, elle le fixe. Mais elle n’y voit rien. Elle s’y cache. Furtivement, elle sonde l’homme assis en face. [...] Il la regarde ne pas le regarder. Tout sourire. Espiègle. ‘She stares at her coffee, but doesn’t see anything in it. She is hiding in it. She surreptitiously probes the man seating in front. [...] He watches her not watch him. All smiles. Impish.’

(2) suggests that she is making a deliberate effort to avoid watching him. This is what I call active inaction: she is actively not watching him. It is in some sense a form of counter–expectation, to the extent that it would be natural — according to social codes or human cognition, *e.g.* — for her to watch him, *i.e.* we expect her to watch him, and she is going against this expectation. We shall discuss the links between these notions in section 3.

2.2. Anaphoric *when*

Another linguistic context where verbal negation can easily be observed is the anaphoric use of *when*. *When* is non–anaphoric when it makes reference to habits or recurrent causal links as in:

- (3) When I listen to the *Winterreise* always my heart is touched and I almost cry.

It is anaphoric when it refers to a single event, as in:

- (4) When Charles arrived, we listened to the *Winterreise*.

I here focus on the anaphoric use of *when* combined with negation. Again, sentences thus formed may sound odd, but I will present some actual examples below. First let me give an account for the semantics of *when* in its anaphoric use.⁶ Compare the following sentences:

⁵This idea is already suggested in Higginbotham (1984).

⁶I do not know if it is possible to unify both anaphoric and non–anaphoric uses in one same linguistic token. Some languages use two different words for both uses: for example German has *als* for the anaphoric *when*, and *wenn* for the non–anaphoric *when*. Since this is not relevant to the current issue about negation, I shall leave this question

- (5) This morning we entered the motorway in Orange towards Italy.
- a. When we reached Avignon, I turned the radio on.
 - b. *When we kept on driving, I turned the radio on.
 - c. ?When we reached London, I turned the radio on.

The reason why (5b) is bad is that since we continuously kept on driving, this is not informative enough about the moment the radio has been turned on. As for (5c), if you know that Orange is in the south of France, you would ask why one would make such a detour, for this sentence entails that we did reach London. Therefore *when* seems to behave exactly as a definite article for time. My account is the following: in a sentence like “When *A*, *B*”, *when* looks for an *A*-event. If there is a unique *A*-event *e* given by the context, then it says that a *B*-event occurred straight after *e*. If there is no such event, or several of them, it fails to select.

Actually definite articles are able to select even if there are several objects in their target set, as long as one of them is prominent. Anaphoric *when* imitates them even in this regard, as showed by:

- (6) ?This morning we entered the motorway in Orange towards Italy. When we turned left, I turned the radio on.

which is infelicitous — since there probably are a lot of left curves on the ride — unless one knows that the motorway from Orange to Italy traces some kind of L shape.

All this being said, let me mention that the traditional account for negation in neo-davidsonian semantics assumes that negation means non-existence. Negation acts as an external operator. Thus if a sentence like “It is raining” has logical form⁷ $\exists e. \text{rain}(e)$, its negation, “It is not raining”, means just non-existence of such an event: $\neg \exists e. \text{rain}(e)$. This explains the contrast:

- (7) a. Last night, when he lost his keys, Pierre called a taxi.
b. *Last night, when he didn’t lose his keys, Pierre called a taxi.

In (7b) indeed, there is simply no event *when* could refer to. Unfortunately, we do not wish to rule out all the occurrences of negation under anaphoric *when*, since the following are actual sentences of English: (8) is from an interview with a football manager, after a game where several expected penalties were not given in the first half, but a penalty was given in the second half, while Sergio Agüero, a famous player of the team, was on the bench; (9) comes from the Corpus of Contemporary American English; (10) was found in the fan fiction novel *Harry Potter and the Methods of Rationality* (thereafter *HPMOR*) by Eliezer Yudkowsky.⁸

- (8) Normally, for the last six, seven months, the penalties were always Sergio’s, but he was on the bench. [However] he was on the pitch when the first penalty was not given.
- (9) When I didn’t show up for pizza, Coach Tom came looking for me.
- (10) If you didn’t predict that something would happen, if it took you completely by surprise, then what you believed about the world when you didn’t see it coming isn’t enough to explain...

out and treat the anaphoric *when* as a word in its own right.

⁷leaving time aside for now

⁸All the Harry Potter examples come from this book.

As we will see in section 4.1, Bernard and Champollion (2018) reify what is traditionally an absence of event as a negative event. This allows us to overcome the problem here — *when* can grab these negative events — but the result is not satisfactory even so. Indeed (8) means something like “Sergio was on the pitch the first time that we expected to get a penalty and didn’t” — we find the notion of counter-expectation again, because the penalty should have been given. If negation here was propositional and only meant absence of event, then (8) would rather mean that Sergio was on the pitch the first minute that there was no penalty, period. The same analysis is available with (9): “When I didn’t show up” means “When I should have shown up and I didn’t” rather than “Whenever I was doing something else than showing up”. One may want to argue that this is not a problem: definite articles like *the* are sometimes confronted with a lot of potential referents and still manage to select one, the most prominent in some sense; similarly *when* could select the most prominent *absence of event* it sees. Although it is questionable, due to (6)’s oddness, I know no knockdown argument against this view. Still, I will make the assumption here that this number of negative events is too much of a burden for *when*, and that some other operator — in this case, verbal negation — has first to sort out the relevant events for it. I therefore pursue the view that a big part of what could be attributed to pragmatics in the phenomena studied here is actually due to a semantic feature of verbal negation’s related to the notion of counter-expectation. We will see how it allows to deal with all the phenomena listed in this section.

2.3. Double negation — Excluded middle

Another topic linked with negation and which has been much written about is the law of excluded middle (Horn (1989), Chapter 2). Let me first make a theoretical point. The law of excluded middle together with the principle of non-contradiction entail the law of double negation — *i.e.* for every proposition A , $A \leftrightarrow \neg\neg A$. Indeed, $A \rightarrow \neg\neg A$ holds because if A is true, $\neg A$ must be false (otherwise there would be a contradiction), which is what $\neg\neg A$ means. Conversely, if $\neg\neg A$ is true, $\neg A$ cannot be true, therefore A is true by the law of excluded middle. Even if one rejects the law of excluded middle, the proof still holds for all the propositions A such that $A \vee \neg A$ is true. Now negation is a cognitively expensive operator (Tian and Breheny, 2018). For propositions A for which the law of double negation holds, A and $\neg\neg A$ have the same meaning, so since the latter is more expensive,⁹ it should be dispreferred. Yet the following examples were produced — all three come from the Corpus of Contemporary American English.

- (11) — She has long hair. The woman you drew is bald.
— That looks like me. I mean, it doesn’t not look like me. She’s tall, and she has a dog that looks like my dog.
- (12) Zane’s abandoned paperbacks, a few shapeless sweaters we had kept because they fit
— or didn’t not fit — us both.
- (13) I don’t have a big diet plan anymore. I watch what I eat, but I don’t not eat a cheeseburger, because life is no fun living on salads and fruit.

In (13) the use of negation may be due to lower cognitive costs in case of direct echoing. Indeed “I watch what I eat” suggests “I don’t eat a cheeseburger”, which is negated. But actually,

⁹except for direct echoing

the intended meaning of (13) is rather that it is not the case that I will *refrain* from eating a cheeseburger when I have this opportunity (active inaction again); it is not quite equivalent to what a version without negation would mean. The same observation can be made about both other examples. For instance in (11), the speaker corrects herself because “that looks like me” would be stronger than “it doesn’t not look like me”, not equivalent.

All this of course reminds the very famous fact that “I don’t like BlackRock” does not mean the same thing as “It is not the case that I like BlackRock”, but is closer to “I dislike BlackRock”. This goes back to Aristotle’s opposition between contraries and contradictories (Horn (1989), Chapter 1). According to Aristotle, negation may express both, depending on the context and the predicate which is negated. Here we thus find another tendency of negation: the tendency to express something opposite (or contrary) rather than complementary (or contradictory). This was already noticed by Higginbotham (1984) about direct perception reports: “I think that negation in Naked Infinitives is generally interpreted as combining with the **VP** to produce an antonymous predicate not-**VP**”.

The analysis I will develop for these double negation examples is thus that a verbal negation is embedded under a propositional negation. This allows to refer to the contrary’s complement of a predicate, as shown in figure 1; an operation for which there is notoriously no word in virtually all natural languages.

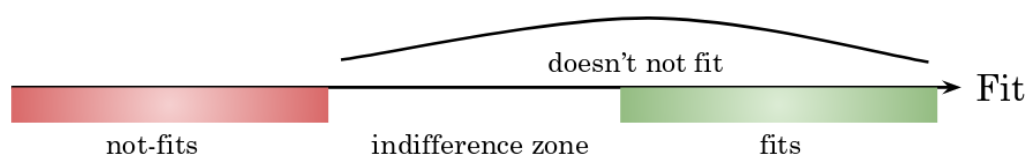


Figure 1: taking the contrary’s complement

Another related violation of the law of excluded middle example is this sentence pronounced by General de Gaulle in a meeting preparing a state visit to USSR, and reported by Alain Peyrefitte in *C’était de Gaulle*:

- (14) Je voudrais voir vers où les Soviétiques sont orientés et ce qu’ils consentiraient à faire, ou du moins, vers où ils sont orientés et ce qu’ils ne consentiront pas à faire.
 ‘I would like to see where the Soviets are leaning and what they would consent to do, or at least, where they are leaning and what they would not consent to do.’

Here if negation was boolean, the second part of the sentence would be redundant, since knowing what the Soviets consent to do would indicate what they do not consent to do, by complementation. What the General means by “ce qu’ils ne consentiront pas à faire” is rather what they would definitely not do, and does not include the topics on which they are neutral, nor the irrelevant topics, *etc.*

2.4. Other clues

There are several other linguistic contexts where negation has a suspicious behaviour. Unfortunately, listing them exhaustively would require space I do not have here. I will then leave them for a future publication, and only briefly mention a few of them here. Worth mentioning are:

1. the interaction between verbal negation and logical connectors and quantifiers. An example of this is discussed below in (22b).
2. prosodic matters, since some of the sentences become acceptable or acquire a new meaning only with certain prosody, such as a stress, or pronouncing *not V* as one word. In writing it can be made visible by adding a hyphen. For instance here are two meaningful examples taken from *Harry Potter and the Methods of Rationality*:

(15) I was old enough to know that not-thinking about something doesn't stop it from happening, so I was really scared.

(16) He was rather startled when he turned back and discovered Hermione sitting down directly beside him at the Ravenclaw table, just as if she hadn't not-done that for more than a week.

In both cases, the same idea could be expressed by replacing “not-*V*” with “refrain from *V*”.

In French, negation is formed with two particles *ne* and *pas* surrounding the verb, or the auxiliary when there is one. In colloquial French, *ne* can be dropped. Moreover, in colloquial French it is possible to add a prefix *re-* to a predicate, to express a reiteration. Here is an example of *re-* applied to a predicate involving negation. It is a spontaneous production of mine. The context is that the car's battery is empty after a long period without running, and nobody is going to drive the car for a long time in the future either.

(17) De toute façon même si je la charge elle va re- pas rouler pendant un
 Anyway even if I it charge it is going to re- not run for one
 mois après.
 month after.
 ‘Anyway, even if I charge it, it is going again to not run for one month.’

The clause can be analysed as [elle va re- [[pas rouler] pendant un mois]]. It carries the idea that it is unusual for the car not to run for such a period. The interaction with time adverbials is interesting too.

3. Related to this, some negative polar questions, asked with the relevant prosody, receive answers as if they were positive:
- (18) — Who *did* not-turn-on the light?
 — Théo did/*Théo didn't/Théo didn't do it.
4. Verbal negation reifies new verbs then used in positive sentences. In particular we can observe it together with positive polarity items.¹⁰ Here are a few examples:

(19) Do you still not understand? (HPMOR)

(20) Tu as déjà pas rendu un devoir à l'heure ?
 You Aux ever_{PPI} Neg hand-on-Past a piece-of-homework in time?

¹⁰As an anonymous reviewer notices, it would be interesting to study the co-occurrence of verbal negation with NPIs. However, the observation should be interpreted carefully, since (propositional) negation is not the only NPI licenser.

‘Did you ever not hand on a piece of homework in time?’

3. Introducing verbal negation

In order to draw the semantic features of verbal negation, let us come back to its use under anaphoric *when*, as examined in section 2.2. Here is example (9) repeated with a pronoun change for the sake of simplicity:

(21) When Hugo didn’t show up for pizza, Coach Tom came looking for him.

According to the analysis of *when* developed above, there must be some event to refer to in the *when*-clause. I posit that some specific behaviour of negation here creates such an event, that I call a negative event: an event of Hugo not showing up. A recent event semantics framework, devised by Bernard and Champollion (2018), makes use of negative events as a formal tool for implementing negation compositionally. These negative events are designed to represent *propositional* negation, and thus do not correspond to negative events in the sense that I want to use them here, but as a matter of fact the framework presents nice features to implement *verbal* negation too. I will introduce Bernard and Champollion’s (thereafter B&C) framework (2018) and the way it deals with propositional negation in section 4.1. For now it will suffice to have in mind the informal description I provided at the end of section 2.2, that is to say, that for any predicate P , the lack of a P -event during time interval I gives rise to a negative event: a so-called anti- P -event. Here I explain why it fails to properly analyse (21) and what verbal negation should look like in this framework. In particular I gather data from section 2 to sketch the meaning of verbal negation. A formalisation within B&C’s framework is proposed in the next section.

As explained in section 2.2, there are too many negative events of Hugo not showing up here¹¹ for *when* to select one. Yet somehow *when* is able to select the moment Hugo was most expected to show up, and then passes it to Coach Tom. In the analysis I develop here, I posit the existence of an operator¹² $NEG : V \mapsto \bar{V}$ which, given a verb V , reifies a new verb \bar{V} used in turn in positive sentences. In particular $\neg V(x)$ and $\bar{V}(x)$ are going to be two distinct propositions: while propositional negation \neg takes scope over the whole proposition, verbal negation NEG takes scope only over the verb or predicate. At matrix level, negation is ambiguous between a propositional and a verbal reading, and the semantic difference is hardly perceptible. For instance, a sentence like “Eliot didn’t call Max” means, under a propositional reading, that it is not the case that Eliot called Max, while under a verbal reading it sounds rather like “Eliot did [the action of] not call[ing] Max”.¹³ Although both are very similar and may share the same truth-conditions, it is possible that they are distinguishable — in addition to the counter-expectation flavour I am going to discuss below — in terms of time: the verbal reading refers to a specific time at which there was no calling event, while the propositional reading expresses the absence of such an event at any time. This echoes a phenomenon already observed in Bengali, where Ramchand (2004) argues that two different negation markers reflect exactly this difference in quantification. I will come back to the case of Bengali in section 5.2.

¹¹ At least one for every possible time interval.

¹² The upper cases matter, since NEG will denote the verbal negation operator $V \mapsto \bar{V}$, acting on verbs, while Neg will denote the propositional negation operator $A \mapsto \neg A$, acting on propositions.

¹³ Stressing “did”, marking a brief pause after it and pronouncing “not call” as one word can help this reading.

The difference between propositional and verbal negation is brought out when we embed negation in certain linguistic contexts, such as those presented in section 2, where propositional negation was simply semantically deviant. For instance direct perception reports directly blocks the propositional reading, as we can see through the following comparison:

- (22) a. Serge saw that everybody didn't leave.
b. Serge saw everybody not leave.

While the indirect perception report (22a) has been argued to have two readings (universal quantifier appears higher or lower than negation), it is impossible in (22b) that negation occurs higher. I claim that this is because direct perception reports are incompatible with propositional negation, which was the only one able to express such a reading that not everybody stayed. This incompatibility could be due to the fact that absences of events, even *reified* as negative events, are not, by nature, *directly perceptible*.

Through the constructions examined in section 2, we saw that negation often had an additional semantic flavour compared to propositional negation. I will propose that this is something encoded in the semantics of verbal negation. However, this additional semantic flavour is not always exactly the same. In broad terms, all the examples I have encountered can be sorted into three categories: counter-expectation, active inaction and oppositeness — some examples belong to several categories.

1. Using $\bar{V}(x)$ may indicate that there is an expectation for $V(x)$. This includes examples (8), (9), (17), ...
2. When x is a agent gifted with will, using $\bar{V}(x)$ may indicate x 's refraining from V , or actively not doing V . This is what I call active inaction, because it often involves an effort or concentration in order not to do a natural thing. This include examples (2), (13), (16), ...
3. \bar{V} may be a predicate meaning something opposite to V . This corresponds to Aristotle's distinction between contraries and contradictories. For those predicates that Aristotle calls *mediate*, negation can give rise to two meanings: the contrary and the contradictory. Supposing that the former is in fact verbal negation, while the latter is propositional negation, is consistent with the data above. Examples where negation has an oppositeness flavour include (11) or (12).

I do not know how these categories relate with each other. It may be possible to unify them under a single banner of which they are variants. For instance for an agentive x who has the power to V or not, if $V(x)$ is expected and does not happen, it means that it was a deliberate omission by x ; in other words an active inaction.¹⁴

Since this question is a philosophical issue and this article is rather concerned with existence and mechanisms of verbal negation, I will leave it aside for future research. In the rest of the article, I will make the working hypothesis that there is a single characteristic that covers

¹⁴A possible unifying explanation, suggested to me by Salvador Mascarenhas, may be that verbal negation expresses the negated predicate's degree of intensity being high. A slogan for this idea would be: \bar{V} means "very not V ". Where V is a stative predicate, this translates into *something opposite to V* . On the other hand, when $\neg V$ would give rise to punctual events — *e.g.* under direct perception reports, if one assumes that the verb *see* with infinitival complement forces the creation of a punctual event — \bar{V} expresses that there is something extreme going on with this event; possibly, this was an unexpected event.

all three categories mentioned above,¹⁵ and for the sake of simplicity I will call it counter-expectation.

4. Verbal negation in event semantics

In this section, I first give the main features of B&C's framework (Bernard and Champollion, 2018), and then implement verbal negation in it.

4.1. Negative events and propositional negation

As already mentioned in section 2.2, negation in traditional neo-davidsonian semantics means non-existence. "It is not raining" means just non-existence of a rain event: $\neg \exists e. \text{rain}(e)$. In his Ph.D. dissertation (Bernard, 2019), Bernard argues that this fails to provide a compositional treatment of negation, let alone numerous linguistic phenomena, among which negation under direct perception reports.

A particular feature of B&C's framework is that it makes use of a special predicate on events, called *actual*. They introduce it so: "Intuitively, actual events are events that are the case, while non-actual events are conceivable events that are not the case." (Bernard and Champollion, 2018) It allows among others to refer to events that do not happen, as in "Sabine is tired because she didn't sleep". The point is that in this sentence, there is an anti-sleeping-event whose Sabine is the agent, and which caused her tiredness.¹⁶

For each predicate P , they define anti- P events as events which preclude every event in P . The type $Neg(P)$ of anti- P -events is defined by the following axiom (Bernard, 2019):

Axiom 1 $\exists e \in Neg(P). \text{actual}(e) \wedge \tau(e) = I \Leftrightarrow \neg(\exists e' \in P. \text{actual}(e') \wedge \tau(e') \subseteq I$

where τ is the time-span function which takes an event to the interval of time at which it happened, and I is any time interval. It means that there is an actual anti- P -event during I if, and only if, there is no actual P -event occurring during this time.

A few words about B&C's formalism are necessary for what follows. They use a typed λ -calculus framework. It seems at first glance more complex than standard neo-davidsonian frameworks, but is designed especially to work compositionally with propositional negation.¹⁷

I will use their notation: variables e, e' , and so on, are events of type v , the type of events; f is a variable of type $\langle v, t \rangle$, meant to represent, among others, thematic roles (for instance $\lambda e. \mathbf{ag}(e) = \text{Cassandra}$ is the predicate true of events whose agent is Cassandra); a verb V is of type $\langle \langle v, t \rangle, \langle v, t \rangle \rangle$, abbreviated as \mathbf{vp} ; and a sentence S is of type $\langle \mathbf{vp}, \mathbf{vp} \rangle$. To cite the example given in Bernard and Champollion (2018), the predicate *eat* is to be represented by the λ -term

$$\llbracket \mathbf{eat} \rrbracket = \lambda f. \lambda e. \text{eat}(e) \wedge f(e)$$

If one wants to say that Cassandra eats, one combines it with the f assigning agentive role to Cassandra, and gets

$$\llbracket \mathbf{Cassandra\ eats} \rrbracket = \lambda e. \text{eat}(e) \wedge \mathbf{ag}(e) = \text{Cassandra}$$

¹⁵Even if such a characteristic turns out to have no ontological sense at all, formally nothing prevents one from considering it as the disjunction of several unrelated components.

¹⁶Notice that *event* is a generic term that embraces here states and other abstract objects, just as Bernard (2019) explains.

¹⁷Why standard neo-davidsonian frameworks are problematic, and why their formalism overcomes these problems, is explained in their article.

The problem now is that there is no more space for additional information — *e.g.* what she eats — so the authors introduce a silent type-raising operator that will keep new thematic roles available. At the end of a derivation, this silent operator needs to be closed, and it is done by a trivial function $\lambda e. \top$, where \top is the True value.¹⁸ At the top of the derivation there is still a λe channel open, so one puts an existential closure on events.

4.2. Implementing verbal negation

Since the absence of (actual) P -events still entails the existence of (actual) anti- P -events, **Axiom 1** leads to a classical behaviour of negation, which is not what we want. As established in section 3 verbal negation $\overline{P}(x)$ means something more than mere absence of P -events, and we want only the reverse implication to be valid. A natural thing to try then is to write $NEG(P)$ as $Neg(P)$ plus something more.¹⁹ In this section, I present two possible formalisations of mine based on this idea. Again, the analysis will rest on the *when* construction.

Recall the account from above: In “*When A, B*”, the operator *when* looks for an A -event. If there is a unique A -event e given by the context, then it says that a B -event occurred straight after $\tau(e)$. If there is no such event, or several of them, it fails to select. This can be done by the following λ -term:

$$[\textbf{When}] = \lambda S. \lambda V. \lambda f. \lambda e. \exists e'. \text{actual}(e') \wedge S(\lambda e''. \top)(e') \wedge V(\lambda e''. \tau(e'') = \tau(e') \wedge f(e''))(e)$$

This term takes a sentence S (the A -clause), and a verb V (the one in the B -clause) and returns a predicate on events e that says that: there was an actual S -event e' , and e has to be a V -event that occurred at the same time as e' .²⁰ The variable f leaves the possibility open to add more thematic roles at higher levels,²¹ and a closure operator will fill it at the top of the derivation. As a first example, having “Hugo showed up” (*sic.*) represented as the following term:

$$[\textbf{Hugo showed up}] = \lambda f. \lambda e. \text{show_up}(e) \wedge \text{ag}(e) = \text{Hugo} \wedge f(e)$$

leads to the following derivation:

$$\begin{aligned} [\textbf{When Hugo showed up}] &= \lambda V. \lambda f. \lambda e. \exists e'. \text{actual}(e') \\ &\wedge \text{show_up}(e') \wedge \text{ag}(e') = \text{Hugo} \wedge V(\lambda e''. \tau(e'') = \tau(e') \wedge f(e''))(e) \end{aligned}$$

$$\begin{aligned} [\textbf{When Hugo showed up, Coach Tom came looking for him}] \\ &= \lambda f. \lambda e. \exists e'. \text{actual}(e') \wedge \text{show_up}(e') \wedge \text{ag}(e') = \text{Hugo} \wedge \\ &\text{come_look_for}(e) \wedge \text{ag}(e) = \text{CT} \wedge \text{theme}(e) = \text{Hugo} \wedge \tau(e) = \tau(e') \wedge f(e) \end{aligned}$$

which, after closure, gives the expected meaning: there is an actual event e' of Hugo showing up, and at the same time there is an actual event e of Coach Tom coming to look for Hugo.

Now if we try to model “When Hugo didn’t show up” with propositional negation, it will fail:

¹⁸You may just ignore this part, as well as the function f argument, I have kept them only to remain consistent with B&C’s system.

¹⁹Recall that NEG is the verbal negation operator, while Neg is the propositional negation operator.

²⁰Things are complex, and the condition should also include cases where e occurred a very short time after e' ; since it is not the matter here, I will settle for this simplified condition $\tau(e) = \tau(e')$.

²¹see section 4.1

since Hugo never showed up, every time interval I has its own event of Hugo not showing up. This results, according to **Axiom 1** in uncountably many events of Hugo not showing up, and *when* is thus overwhelmed with those and cannot select. I already explained in section 2.2 why this may not be a problem, as it is not for definite articles like *the*, but I explain here how verbal negation can nevertheless greatly reduce the complexity.

Here is a λ -term for the verbal negation operator:

$$[\text{not}_{NEG}] = \lambda V. \lambda f. \lambda e. e \in NEG(\lambda e'. V(f)(e'))$$

Then:

$$\begin{aligned} [\text{When Hugo didn't}_{NEG} \text{ show up}] &= \lambda V. \lambda f. \lambda e. \exists e'. \text{actual}(e') \\ &\wedge e' \in NEG(\lambda e''. \text{show_up}(e'')) \wedge \text{ag}(e') = \text{Hugo}) \wedge V(\lambda e''. \tau(e'') = \tau(e') \wedge f(e''))(e) \end{aligned}$$

We now want to give a definition of NEG precise enough that there is only one (prominent) event of Hugo not showing up. We saw that what restricted the number of negative events described by verbal negation was its counter-expectation feature. A natural thing to try then is to posit a predicate *expected* on events. Just as there are actual events and non-actual events, there are expected events and events that are not expected, and this is what *expected* reflects. Of course both predicates are different: some expected events turn out to not happen, while some actual events were not expected. Then we can say that there is a \bar{P} -event when there is no actual P -event but there was an expected P -event:

$$\begin{aligned} \text{Axiom 2} \quad &(\exists e \in NEG(P). \text{actual}(e) \wedge \tau(e) = I) \Leftrightarrow \\ &\neg(\exists e' \in P. \text{actual}(e') \wedge \tau(e') \subseteq I) \wedge (\exists e' \in P. \text{expected}(e') \wedge \tau(e') = I) \end{aligned}$$

This indeed gives the desired predictions for *when*. For example, if the pizza party was announced at 8, participants expect Hugo — knowing for instance social codes and Hugo's punctuality habits — to come by, say, 8.15. Thus there is an expected event of Hugo showing up e' whose time-span is $[8; 8.15]$. Notice that there is no expected event of Hugo showing up with a shorter time-span, for before 8.15 it was still “normal” that he has not arrived yet. Once it is 8.15 participants can conclude that in addition to the expected event of Hugo showing up, there was no actual event of Hugo showing up during this time-span, thus the axiom above tells that *there was* an actual event of Hugo not_{NEG} showing up, which just ended. At this point only, Coach Tom came looking for him.²²

This makes good predictions for several other constructions we saw in section 2, but it becomes unclear when it comes to double negation. I mentioned that double negation was to be analysed as a verbal negation embedded in a propositional negation.²³ Then “I don't_{NEG} not_{NEG} eat a cheeseburger” means that there is no not_{NEG} eating cheeseburger event, which is equivalent to:

$$\neg \neg (\exists e' \in P. \text{actual}(e') \wedge \tau(e') \subseteq I) \vee \neg (\exists e' \in P. \text{expected}(e') \wedge \tau(e') = I)$$

where P here stands for eating a cheeseburger. Since \neg is propositional negation, it is involutive and the formula above can be translated as “I eat a cheeseburger, or it is not the case that I am

²²The careful reader has noticed that according to the *when*- λ -term above, Coach Tom looking for Hugo should occur within $[8; 8.15]$ too, and not right after. But the more careful reader will have noticed that footnote 20 acknowledges that this was an imprecise definition of *when* regarding time-spans.

²³more on this point in section 5.

expected to eat one” (where expected is to be taken here in the broad sense described in section 3). For me it is unclear that this is the correct meaning for such a sentence, for then a situation where I actually do not eat the cheeseburger, but was not expected to — for instance because I notoriously hate cheeseburgers — makes the sentence true. If this is the case, then a discourse like this should be coherent:

- (23) I have to do my best to stick with my diet plan, but I don’t *not eat* cheeseburgers, for I don’t like them anyway.

I have no idea whether this discourse sounds weird or can make sense in some contexts, and I believe that at this point experiments should be led to determine whether these double negations agree with the predictions made by **Axiom 2**. If I am to make a guess, I think that there may be huge variations across sentences, contexts and participants.

Another potential, more conceptual problem with this axiom, is that there is no actual link between \bar{P} -events and their corresponding expected P -events. The axiom merely says that there exists an expected P -event, but does not allow to *grab* it.²⁴ But explaining what this expected event consists in is maybe not the role of formal negation, and could be explained by more general pragmatic mechanisms.

A second formalisation, more in line with the arguments developed at the end of section 3, is to posit a (yet unanalysed) property F of events, meant to express unexpectedness, deliberateness and other related concepts mentioned there. Then the *NEG* operator is simply defined by:

$$\textbf{Axiom 3} \quad e \in \text{NEG}(P) \Leftrightarrow e \in \text{Neg}(P) \wedge F(e)$$

Coming back to Hugo, if F is defined so that among all the events of Hugo not_{Neg} showing up only one has the F property (in the situation developed above, it was the one taking place between 8 o’clock and 8.15), then *when* has got something to select. Moreover, let us check that it derives the correct meaning for double negation. Imagine that François is sick with influenza and the doctor prescribed him to take a nap every afternoon between 2 and 5. Today, he was seen awake at 3. But someone comes to his defence: “François didn’t *not* sleep from 2pm to 5pm!”. Negations in this sentence should be analysed as “François didn’t_{Neg} [[not_{NEG} sleep] from 2pm to 5pm]!”. Formally, with $I = [2pm; 5pm]$:

$$\exists e. e \in \text{Neg}(\lambda e'. e' \in \text{NEG}(\lambda e''. \text{sleep}(e'') \wedge \text{ag}(e'') = \text{François}) \wedge \tau(e') = I) \wedge \text{actual}(e)$$

which is equivalent, according to **Axiom 3**, to:

$$\neg \exists e. e \in \text{Neg}(\lambda e'. \text{sleep}(e') \wedge \text{ag}(e') = \text{François}) \wedge F(e) \wedge \text{actual}(e) \wedge \tau(e) = I$$

This means that there is no anti-sleeping-event by François between 2 and 5 which is actual and has the F property. In other words, either there is no actual anti-sleeping-event lasting from 2 to 5 — *i.e.* he slept at least a bit during this interval — or there is one, but it does

²⁴One way to avoid this may be to modify **Axiom 2** into

$$e \in \text{NEG}(P) \Leftrightarrow e \in P \wedge \text{expected}(e) \wedge \forall e'. P(e') \rightarrow \neg \text{actual}(e')$$

Now the link is direct since the \bar{P} -event *is* the P -event. But then no \bar{P} -event can technically be actual, which may lead to difficulties I cannot assess, leaving aside the fact that now $\text{NEG}(P)$ -events *are* P -events — a very troubling idea.

not have the *F*-property. Thus, as expected, the sentence is true if he slept at least at some point between 2 and 5, or if he was not expected to (the convalescence period is over) — if *F* takes an expectation flavour — or if he did not sleep, but tried to and was prevented to by the phone ringing non-stop — if *F* takes a deliberateness flavour — or if he did not properly sleep but was somnolent — if *F* takes an oppositeness flavour. Having all these truth-conditions in competition of course does not mean that one of them is not to be preferred over the others.

Axiom 3 thus allows us to derive the expected meaning for the uses of verbal negation presented in section 2. These derivations are compositional, since they compositionally use B&C's compositional framework (Bernard and Champollion, 2018). Note also that as a direct consequence of this definition, verbal negation entails propositional negation, which is a desirable property for the system in view of section 3.

5. Verbal negation in other languages

If propositional negation and verbal negation are truly two different operators,²⁵ then some languages should exhibit a difference visible to the naked eye. In this section I examine the cases of Korean and Bengali.

5.1. Korean²⁶

Korean has two forms of negation: long form and short form. Syntactically short negation behaves as a constituent negation acting on the verb, while long negation acts on the whole proposition. Examples of long and short negation are shown in (24) and (25) respectively.

- (24) Inho-nun hakkyo-ey ka-ci ani ha-yess-ta.
 Inho school-to go Neg ha-Past-Decl
 'Inho did not go to school.'

- (25) Inho-nun hakkyo-ey an ka-ss-ta.
 Inho school-to Neg go-Past-Decl.
 'Inho did not go to school.'

Short negation uses the preverbal negation particle *an*, while long negation combines *ani* with the conjugated light verb *ha*. There is also a *mos* form of negation that I will leave aside here. Lee (1993) devotes a chapter to the semantic differences between these negations.

There are several ways in which short form and long form can reflect the verbal-propositional opposition. First, short negation takes lower scope than long negation, which suggests that it can behave as a constituent negation on the verb. Second, on the basis of data on imperatives in Korean, which are compatible with long ²⁷ but not with short negation, Han and Lee (2007) argue that the latter, but not the former, is related with negative events or negative states.²⁸ Third, some authors have associated short negation with "strong volition not to do the denoted action" (McClanahan, according to Lee (2017)), which is reminiscent of active inaction.

An enlightening test here is to watch how these negations combine with each other. Han and Lee (2007) attest that cases of double negation are possible, when a long-form negation takes

²⁵ though lexicalised the same in English and other European languages.

²⁶ Most of the facts and examples about Korean come from Han and Lee (2007) or from personal communications from Chungmin Lee and Yun Yeo Jun.

²⁷ with a different lexicalisation

²⁸ The notion of negative event is here to be understood in a more restricted sense than B&C's.

scope over a short-form negation, as in (26):

- (26) Inho–nun maykcwu–lul an masi–ci ani ha–yess-ta.
 Inho beer Neg drink Neg do–Past–Decl
 ‘Inho didn’t not drink beer.’

The authors suggest that this is equivalent to the positive form “Inho drank beer”. But native speakers I have asked about this — including one of these two authors — judge that there is a slight difference between (26) and the positive sentence; namely (26) would mean that Inho drank only a little amount of beer, or that he drank it reluctantly. They compared it with a sentence like “Inho doesn’t not like beer”, where the effect of double negation is to take the contrary’s complement, as described at the end of section 2.3. This seems in line with an interpretation of short negation as verbal negation, since it involves notions of volition and oppositeness. Moreover, while combining two short forms together is impossible, my informants declared that combining two long forms is acceptable, and gives rise to a neutral meaning in terms of volition ((26) with two long forms would rather have the same meaning as “Inho’s drinking beer happened”), which is again what two propositional negations would produce, though I have no explanation why this construction is acceptable in Korean while it is not in French or English.

5.2. Bengali

Another language worth studying is Bengali. As explained in Ramchand (2004), Bengali possesses two distinct sentential negation markers which occur in different morphosyntactic contexts. These markers are known as *na* and *ni*. Ramchand starts from the observation that *na* hardly appears together with perfect aspect, and explains this in terms of quantification: she follows an analysis where a declarative sentence states that at some referent time, some event happened. According to her, while *ni* just negates the existence of this referent time at which the event happened, *na* acts below the time quantifier and negates the existence of the event *at this particular time*. Here is an example directly taken from Ramchand (2004):²⁹

- (27) Ram am–Ta khelo na.
 Ram mango eat–PAST–3RD *na*
 ‘Ram didn’t eat the mango’
 $\exists t : [t < t^*]. \neg \exists e : [t_f(e) = t]. \text{eating}(e) \wedge \mathbf{ag}(e) = \text{Ram} \wedge \mathbf{th}(e) = \text{the mango}$
- (28) Ram am–Ta khay ni.
 Ram mango eat–3RD *ni*
 ‘Ram didn’t eat the mango (at all)’
 $\neg \exists t : [t < t^*]. \exists e : [t_f(e) = t]. \text{eating}(e) \wedge \mathbf{ag}(e) = \text{Ram} \wedge \mathbf{th}(e) = \text{the mango}$

This explanation accounts for the syntactic deviance of *na* in the sentences raised by the author. However, as she herself mentions, the interpretation of some of these sentences can actually be forced in some linguistic contexts, which then leads to meanings strangely close to what we observe in English with verbal negation. In the rest of this paragraph I will underline some converging facts, which led me to the (speculative) hypothesis that *na* may implement verbal

²⁹I have taken the liberty to adapt logical notations to those used in the present article. t^* stands for the speech time, and $t_f(e)$ is the ending time of e . (27) and (28) do form a minimal pair; the different forms of the verb are due to an aspectual issue interfering with the negation.

negation in Bengali, while *ni* implements propositional negation. All the examples cited here are directly taken from Ramchand (2004). Let me begin with the following contrast:

- (29) tin ghonTa dhore ami kichu boli ni
 for three hours I anything say-1ST *ni*
 ‘For three hours I didn’t say a thing.’
- (30) ?tin ghonTa dhore ami kichu bollam na
 for three hours I anything say-1ST *na*
 ‘For three hours I didn’t say a thing.’

The quantification distinction between *ni* and *na* does predict that (29) is the correct form to express this content, while (30) “merely says that at a particular time within that interval, there was no single event of the speaking type”. However, Ramchand concedes that (30) can be interpreted another way: “The only possible reading for this sentence is to have constituent negation of the verb, where the negation is interpreted as describing a positive event of continuously exerting ones will to ‘not speaking’ deliberately for a full three hours”. This is what a verbal negation approach would predict. In the same section, she gives a similar example involving counter-expectation.

Another interesting contrast is the following, which does not need further comments with regard to the discussion in section 2.2 above.

- (31) jokhon Mary amTa khel-o [na/*ni], tokhon John khub rege gælo
 When Mary the mango eat-PAST-3RD [*na/ni*], then John very angry got
 ‘When Mary didn’t eat the mango, (then) John got very angry’

In addition, Ramchand signals that “only *na* can be used with non-finite clauses” — which confirms the constituent negation role of *na*, and seems to be in line with my account on direct perception reports. However, all these similarities have been noticed *a posteriori*. In order to establish a proper link between the propositional-verbal opposition and negations in Bengali, additional investigation is needed.

6. Toward nominal negation

Negation of noun phrases has been described as an example of generalised quantifiers. However, as far as I can tell, negation of nouns themselves, as in (32), has been little studied.

- (32) Harry didn’t smile. It might have been the most difficult nonsmile of his life.

In this sentence *nonsmile* is used as a common noun, modified by a superlative adjective. But what is the semantic role of this *non-* prefix? It does not seem to be a complement operator among all entities. A dog is hardly a nonsmile. Rather, what the author wants to express here is that Harry had a hard time repressing a smile; in other words, he made a deliberate effort to not smile. This takes us back to verbal negation, since refraining from doing an action was one of its features. We find another feature of verbal negation semantics, counter-expectation, in (33) below. To understand this, one has to know that Harry is here using the pensieve, which is a magical device in Harry Potter’s magical universe. In HPMOR, when you use this device, you can review someone else’s memory from his own point of view. Here Harry is experiencing one memory of Dumbledore’s, which means that he lives the situation as a subjective camera.

- (33) Dumbledore's voice broke, the world tilted as the outlooking head fell down into the ancient hands, and awful sounds came from not-Harry's throat as he began to sob like a child.

In this memory Dumbledore sobbed, so Harry is experiencing this as if himself was sobbing, though through Dumbledore's body, whence the negation "not-Harry". Replacing "not-Harry" with "Harry" or with "Dumbledore" in this sentence removes the disconcerting feeling we experience in (33), even if both substitutions give true sentences, in some sense. This suggests that this disconcerting feeling, that reflects the surprising fact that Harry is not in his own body, may be triggered by the use of nominal negation. This would be accounted for by a counter-expectation meaning of nominal negation.

Another interesting example comes from a song by Georges Brassens: *La non-demande en mariage* (the marriage non-proposal). In this song he tells the woman he loves that he does not want to marry her or live with her, but rather remain her "eternal betrothed". He is thus making a proposal of not marrying (which is more than not making a proposal of marrying). It is in some sense something opposite to a marriage proposal, and this reading is encouraged by the negation in the title.

These three examples illustrate how nominal negation might trigger the same features as verbal negation. Of course all three are literary examples that sound a bit like jokes or puns, as our brain has to do some conscious job to understand them properly, but we are nevertheless able to understand them, which means that there is something for linguistics to explain.

Though I did not investigate this further so far, I believe that this constitutes an easy extension for verbal negation. A natural way to make the connection clear may be nominalisation: in English one can easily form a noun from a verb by adding the *-ing* suffix to it, as in (34b).

- (34) a. When did he wash the car?
 b. When did the washing of the car take place?
 c. When did he not wash the car?
 d. *When did the not washing of the car take place?
 e. ?When did the nonwashing of the car take place?

With verbal negation (34a) becomes (34c) and immediately carries a counter-expectation flavour. We can now nominalise the predicate *not wash* and get (34d), which sounds quite awful. Speakers I have interrogated seem to prefer (34e), although they still find it weird.³⁰ This does not argue for verbal negation being a new verb forming operator, since then one should be able to nominalise the verb *not-wash*, and it should mean barely the same thing as negating the nominalised verb *washing*. Nevertheless *nonwashing* in (34e) does carry this expectation of washing the car, exactly as a verbal negation would.

7. Conclusion

In this paper, I have argued for the need for *verbal* negation, distinct from the familiar propositional negation. Verbal negation has been proposed as a solution to diverse negation puzzles: negated infinitives under perception reports, negation under anaphoric *when* and cases of dou-

³⁰Here is a context that may help: John works in a bank. His job is to wash the customers' cars while they are meeting the boss. But he is lazy and sometimes he gets the job done by a friend of his while he himself does something else and enjoys his free time. Today for example he went to the cinema but he didn't enjoy the film: "It was the most boring nonwashing of my life!".

ble negation.

I have shown that besides exhibiting the syntactic properties of a constituent negation acting on verbs, verbal negation differentiates itself from propositional negation by clear semantic features, often related to counter-expectation.

At matrix level, negation is ambiguous between a propositional and a verbal reading. However some linguistic contexts can disambiguate it. In particular, I have shown how distinguishing between propositional and verbal negation can reflect the distinction, going back to Aristotle, between contradictories and contraries. I have illustrated how the propositional-verbal distinction may actually be lexicalised in languages featuring several forms of negation like Korean and Bengali. Finally, I have implemented verbal negation within a compositional event semantics framework involving so-called negative events. The system has the desirable property that verbal negation entails propositional negation.

Future work could involve examining how the diverse semantic features presented by verbal negation (counter-expectation, active inaction, oppositeness) relate to each other, and strengthening the tie in with nominal negation as sketched in section 6.

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