

Telic modality in Russian and beyond*

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1 The puzzle

Modals are usually believed to shift evaluation from the actual world¹ to a set of possible ones. However, it is known that *certain* root modals in *certain* contexts entail their prejacent. For example, (1a) does not entail that Venechka was walking to Kremlin, but (1b) does. The sentence in (1b) cannot be continued by “but he didn’t” *without contradiction*, nor by “and he did” *without redundancy*.

- (1) a. venečka **mog** dojti do kremlya RU²
 Venechka could.IMP walk to Kremlin
Venechka could (imperfective) walk to Kremlin.
- b. venečka **smog** dojti do kremlya
 Venechka could.PFV walk to Kremlin
Venechka could (perfective) walk to Kremlin.
 → [V walked to K].

This phenomenon is called actuality entailments (Bhatt 1999) and is going to be the topic of this paper. The analysis that I am going to propose is based on two generalizations.

The first generalization concerns the kind of modals that give rise to actuality entailments. It has been originally argued by Hacquard (2006) that actuality entailments are conditioned by flavor. In this paper I will show that sentences with actuality entailments always imply (a) that the event described by the prejacent is causally dependent³ on the modal state and (b) that there is an implicit Agent who intends for the prejacent event to happen. These facts can be captured, if we assume that actuality entailing modals are those that have a special flavor. Namely,

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¹In this paper I am only going to consider unembedded cases of actuality entailments. If embedded under another modal, the entailment will be relative to the worlds that the matrix modal is quantifying over.

²Here and below BU stands for Buryat, EN for English, FR for French, MG for Modern Greek, RU for Russian.

the flavor of intentional causation. In what follows I am going to refer to this as *the flavor generalization*.

The second generalization concerns the contexts that trigger actuality entailments. It has been argued by Bhatt (1999) that actuality entailments are conditioned by aspect. In this paper I will confirm the generally assumed observation that actuality entailing modals give rise to their actuality entailments only under perfective aspects. That is, those aspects that introduce a time interval that includes the event time. This will be shown to be true across different languages with various aspectual systems. In what follows I am going to refer to this as *the aspectual generalization*.

The core claim of the paper is that actuality entailing modals form a subcategory of telic verb phrases. Indeed, if we observe a verb phrase that triggers some entailment under perfective aspects, but not under imperfective ones, we usually call this verb phrase telic. In other words, telic verb phrases are descriptively defined as those that have an aspect conditioned entailment (the so-called imperfective paradox property). By this descriptive definition actuality entailing modals are telic (due to the aspectual generalization). What makes them telic? It is their flavor.

There are various paths to telicity. For instance, it has been argued that telic verb phrases have complex event structure, see e.g. Levin, Rappaport-Hovav (1995) or Ramchand (2006). Under various theories of event decomposition, like e.g. Ramchand (2006), a verb phrase *Mary walk to Harvard* encodes a Mary-walking event that causes some Mary-being-at-Harvard event. Or, paraphrasing it differently, a Mary-walking event that results in some Mary-being-at-Harvard event. Its complex event structure makes the verb phrase telic.⁴

In this paper I will argue that the relation between an actuality entailing modal and its prejacent (the special flavor that actuality entailing modals have) is the same as the relation between the Mary-walking event encoded by *Mary walk to Harvard* and some Mary-being-at-Harvard event. The proposed theory will consist of three stipulations.

Firstly, the theory will assume that root modals return a predicate of events.⁵ They describe various states. For instance, the state of someone's physical or mental abilities, the state that the rules or the laws are in, or the state of the circumstances. In what follows I am going to refer to the state that some root modal describes as the modal state.

Secondly, the theory will assume that root accessibility relations are relations between events. That is, root modals quantify over possible events, not worlds.⁶ A root modal that takes the ability relation quantifies over the set of all possible events that include the same individual with the same physical abilities as in the modal state. A root modal that takes the deontic relation quantifies over the set of

³By causal dependency here I mean the same semantic relation that is usually assumed to hold between the process and the result in the semantics of accomplishments: *Mary walked to Harvard* \approx Mary's walking resulted in her being at Harvard.

⁴Roughly speaking, if the causing Mary-walking event took place in the actual world (under a perfective aspect), then the caused Mary-being-at-Harvard event did so too. The same reasoning does not apply, if only a stage of the causing event occurred in the actual world (under an imperfective aspect).

⁵Similar idea for attitudes: Kratzer (2006), Bogal-Allbritten (2016), Moulton (in press).

all possible events that conform to the rules in the modal state. A root modal that takes the circumstantial relation quantifies over the set of all possible events that co-occur with the same circumstances, as in the modal state.

Thirdly, the theory will assume that there is a special causal accessibility relation. Those root modals that take this relation quantify over the set of all possible events that can be caused by the modal state and are intended to happen by an implicit Agent. These modals have an actuality entailment. That is, they are telic. For them the relation between the modal state and the events described by the prejacent is the same as the relation between the Mary-walking event and the Mary-being-at-Harvard event in the denotation of the telic verb phrase *Mary walk to Harvard*.

In what follows I will give the general background in section 2. After that I will discuss the flavor generalization and the aspectual generalization in sections 3 and 4. Finally, I will propose a theory of actuality entailments in section 5. For the flavor generalization I am going to use data from Russian. For the aspectual generalization I am going to use cross-linguistic data from five different languages: Buryat, English, French, Modern Greek and Russian.⁷

2 The background

There are many theories of actuality entailments: Thalberg (1969), Bhatt (1999), Piñón (2003), Hacquard (2006, 2009, 2010), Mari & Martin (2007), Homer (2010), Mari (2015) and others. In this paper I will adopt two basic generalizations and two basic assumptions, which all have been originally put forward by Hacquard (2006). The generalizations are given in (2).

- (2) a. Actuality entailments are conditioned by flavor.
- b. Non-root (i.e. epistemic) modals do not have actuality entailments.

The generalization in (2b) is supported by the epistemic versions of French *pouvoir* ‘can’ and *devoir* ‘must’, which do not have an actuality entailment under perfective (Hacquard 2006:31). The epistemic version of Russian *moč* ‘can’⁸ is incompatible with perfective aspect in the first place, as is shown in (3). The thought that Dmitry might have been guilty, based on the evidence, is expressible by (3a) with the imperfective *moč*, but not by (3b) with the perfective *moč*.

- (3) CONTEXT: A murder has been committed. The speaker wants to convey that given the evidence that we have Dmitry might have been guilty.
 - a. dmitrij **mog** byt’ vinoven RU
Dmitry could.IMP be guilty

⁶Interestingly, Palmer (1986) suggests the terms “event” (root) vs. “propositional” modality.

⁷Both Russian and cross-linguistic data come from individual (sometimes on-line) elicitation with the native speakers.

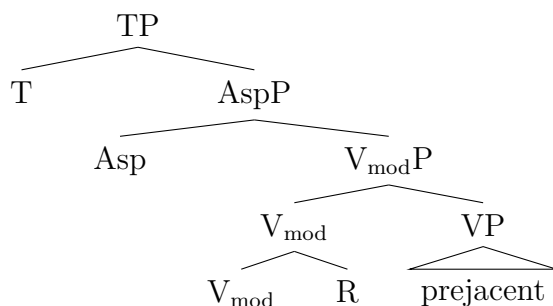
⁸In Russian *moč* is arguably the only modal verb that allows for an epistemic interpretation. There are, however, adverbial and predicative ways of expressing epistemic modality.

- b. #dmitrij **smog** byt' vinoven
 Dmitry could.PFV be guilty
Dmitry could (imperfective / perfective) be guilty.

It seems that cross-linguistically epistemic modals are either incompatible with the perfective morphology, like in Russian or Modern Greek (Sabine Iatridou p.c.). Or they do not give rise to an actuality entailment in this case, like in French, which seems to be a rarer situation. In other words, only root modals may have an actuality entailment.

The two assumptions about root modals that I am going to adopt also come from Hacquard's (2006, 2009, 2010, 2014) work:

- (4) a. Root modals are attached and interpreted below aspect.
 b. Root modals combine with a VP and return a predicate of events:
 $\| V_{\text{mod}}P \|$ is of type $\langle v, t \rangle$.



The assumption in (4b) makes theory internal sense: aspect takes a predicate of events. It also makes intuitive sense: root modals describe states.

Intuitively, the sentence in (5a) describes the state of Jane's abilities, which lasted for a week. The sentence in (5b) describes the state of the university rules, which lasted for a couple of years. The sentence in (5c) describes the state of the traffic, which lasted for an hour.

- (5) a. CONTEXT: Jane was training hard for a whole month.
 For a week she **could** even lift a 200 kilo weight.
 b. CONTEXT: The speaker is talking about the state of the rules of the university while they were in undergrad.
 For a couple of years the students **could** use the library.
 c. CONTEXT: Yesterday's traffic in Moscow was horrible, but there was one hour in the morning, when it was more or less clear and it was possible to arrive at the railway station on time for a train to Petushki.
 For an hour Venechka **could** catch a train to Petushki.

The modifiers *for a week*, *for a couple of years* and *for an hour* in (5) specify the duration of the modal state, not the preajcent.

The intuition behind the modal state is closer to Kratzer's (2006) approach to attitude predicates, rather than to Hacquard's (2006) analysis of root modals. For Hacquard (2006) the event argument of the modal is in the end identified with

the event argument of the prejacent, due to the Principle of Event Identification (Hacquard 2006:57).⁹ For Kratzer (2006) the event argument is independent from the prejacent. It is the event of ‘thinking’ or ‘believing’.

In this paper I am going to assume Kratzer’s (2006) view. In a parallel to attitude predicates, for root modals the event argument is independent from the prejacent. It is the state of someone’s abilities, of rules/laws or of circumstances (like traffic), depending on the modal flavor. The modal flavor is determined by the implicit accessibility relation *R*, following the framework of Kratzer (1977, 1981).

To sum up, root modals are attached and interpreted below aspect. They return a predicate of events. They describe various states. Apart from the prejacent they take an accessibility relation *R*. The accessibility relation determines (a) the kind of state that the modal describes and (b) this state’s semantic relation to the prejacent.

3 The flavor generalization

What root modals give rise to actuality entailments? The flavor generalization consists of three observations, all concerning the special flavor that distinguishes actuality entailing modals.

Firstly, actuality entailing modals describe an unspecified circumstantial modal state. Secondly, actuality entailing modals always imply that the prejacent is causally dependent on this state. Thirdly, actuality entailing modals always imply that there is an implicit Agent who intends for the prejacent to be true.

In this section I will go over these three observations one by one.

3.1 The state of the circumstances

(6) Observation 1.

AE-modals describe an unspecified circumstantial modal state.¹⁰

At first glance it seems that sentences with actuality entailments (henceforth actuality entailing sentences) can be of any root flavor. The sentence in (7a) tells us

⁹For Hacquard root modals become vacuous under perfective aspect. As the result perfective aspect applies directly to the prejacent. This is clearly not the case in Russian. For instance, the prejacent and the modal can be modified each by a different time adverbial:

- (1) za tri nedeli nadya smogla proplyt’ 50 metrov za tri minuty RU
 in three weeks Nadya could.PFV swim 50 meters in three minutes
In three weeks Nadya could (perfective) swim 50 meters in three minutes.

Furthermore, even under a perfective actuality entailing modal the prejacent does not have to be interpreted perfectly:

- (2) petya smog uderživat’ tolpu, kogda vošla koroleva RU
 Petya could.PFV hold.IMP crowd, when entered.PFV the.queen
Petya could (perfective) hold (imperfective) the crowd, when the queen entered (perfective).
 → P was holding the crowd, when the queen entered.

¹⁰Here and below AE stands for actuality entailing.

something about Nadya's physical abilities. The sentence in (7b) tells us something about the state of the law. The sentence in (7c) tells us something about the state of the traffic. All of them have an actuality entailment. None of them can be continued by "but s/he didn't" without contradiction. None of them can be continued by "and s/he did" without redundancy.

- (7) a. blagodarya jejo neobyknovennoj sile RU
 thanks her uncommon strength
Thanks to her uncommon strength,
 nadya **smogla** podnyat' dvuxsotkilogrammovuju giryu
 Nadya could.PFV lift two hundred kg weight
...Nadya could (perfective) lift a 200kg weight.
 → N lifted a 200kg weight.
- b. blagodarya novym zakonam
 thanks new laws
Thanks to the new laws,
 felix **smog** ustroit'sya na rabotu
 Felix could.PFV get.settled on work
...Felix could (perfective) find himself a job.
 → F found a job.
- c. blagodarya otsutstviju probok
 thanks lack of.traffic.jams
Thanks to the lack of traffic jams,
 volodya **smog** sest' na utrennij pojezd
 Volodya could.PFV sit on morning train
...Volodya could (perfective) catch the morning train.
 → V took the train.

There are two ways of approaching these data.

On the one hand, one may assume that actuality entailing modals can be of any root flavor. In other words, actuality entailing modals can take any root accessibility relation, as is generally believed since Hacquard (2006).

On the other hand, one may assume that actuality entailing modals are of an unspecified circumstantial flavor. In other words, actuality entailing modals take a circumstantial accessibility relation that does not specify the modal state. It is a state of the circumstances. Where the circumstances may include someone's physical or mental abilities (7a); rules or laws (7b); or any other circumstances, like traffic (7c). Under this view actuality entailing modals only take one root accessibility relation.

In this paper I am going to pursue the latter option. The reason is that even though actuality entailing modals do not seem to specify the modal state, they do specify this state's relation to the prejacent.

3.2 Causality

(8) Observation 2.

AE-modals imply that the prejacent is causally dependent on the modal state.

Notice that in all the examples above the overt flavor modifier is ‘thanks to’: “thanks to her strength” (7a), “thanks to the new laws” (7b), “thanks to the lack of traffic jams” (7c). This is not accidental. ‘Thanks to’ implies causation. That is, in actuality entailing sentences the prejacent describes a set of events that can¹¹ be caused by the modal state. In other words, the modal state is such that it may cause the prejacent event to happen (and, in the context of perfective aspect, it does).

Take, for instance, the two “deontic” modifiers in (9): ‘according to the rules’ vs. ‘thanks to the rules’. Both sentences in (9) describe some state of the rules. But the relations between these states and the prejacent are different. In (9a) the prejacent event *is compatible with* the state of the rules. In (9b) the prejacent event *can happen because of* the state of the rules. In other words, in (9b) the state of the rules RESULTS IN the prejacent event taking place.

- (9) a. **soglasno pravilam** studenty mogli sdat’ ekzameny v maje RU
 according rules students could.IMP take exams in May
 According to the rules, students could (imperfective) take exams in May.
- b. **blagodarya pravilam** studenty mogli sdat’ ekzameny v maje
 thanks rules students could.IMP take exams in May
 Thanks to the rules, students could (imperfective) take exams in May.

Suppose, for example, that the students in question are non-conformists. They don’t do anything, unless it is against the rules. They also would like to schedule their exams in May. Luckily for them the university rules explicitly forbid that. So the students can go ahead and schedule their exams without violating their political credo, but in violation of the university rules. In this case scenario (9a) is clearly false, but (9b) is perfectly true. Thus, the relations between the modal states and the prejacent in (9) are different: deontic in (9a) (prejacent conforming to the rules) and causal in (9b) (prejacent being the result of the rules).

Only the causal version of the modal (modified by ‘thanks to’) has an actuality entailment under perfective aspect, see (10b). The sentence in (10b) entails that the students took the exams in May. It cannot be continued by “but they didn’t” without contradiction nor by “and they did” without redundancy. The deontic version of the modal (modified by ‘according to’) is not compatible with perfective aspect, see (10a).

- (10) a. (#) **soglasno pravilam** studenty smogli sdat’ ekzameny v maje¹²
 according rules students could.PFV take exams in May
- b. **blagodarya pravilam** studenty smogli sdat’ ekzameny v maje
 thanks rules students could.PFV take exams in May

¹¹Or have to be caused by the modal state, if it is a universal modal.

Thanks to the rules, students could (perfective) take exams in May.
 → The students took the exams in May.

A similar contrast was pointed out by Bhatt (1999:188). It involves two versions of ‘allow’: a deontic ‘allow’, like the one in (11a), and a causal circumstantial ‘allow’, like the one in (11b). In (11a) the prejacent describes an event that is compatible with the set of rules issued by the subject. In (11b) the prejacent describes an event that can happen because of the circumstances described by the subject.

- (11) a. zav-kafedroj **pozvoljal** mne rabotat’ v biblioteke RU
 head-dept allowed.IMP me work in library
The department head allowed (imperfective) me to work in the library.
- b. [obstojatel’stva] / [studak] **pozvoljal(i/Ø)** mne rabotat’ v biblioteke
 circumstances / stud.ID allowed.IMP me work in library
The circumstances / ID allowed (imperfective) me to work in the library.

Both versions of ‘allow’ are compatible with perfective aspect. As expected, the deontic ‘allow’ does not have actuality entailment in this case (12a), but the causal circumstantial one does (12b). The sentence in (12b), but not the one in (12a), entails that I worked in the library. It cannot be continued by “but I didn’t” without contradiction. It cannot be continued by “and I did” without redundancy.

- (12) a. zav-kafedroj **pozvolil** mne rabotat’ v biblioteke RU
 head-dept allowed.PFV me work in library
The department head allowed (perfective) me to work in the library.
- b. obstojatel’stva **pozvolili** mne rabotat’ v biblioteke
 circumstances allowed.PFV me work in library
My ID allowed (perfective) me to work in the library.
 → I worked in the library.

3.3 Intentionality

(13) **Observation 3.**

AE-modals imply that there is an implicit Agent who intends for the prejacent to be true.

All the actuality entailing sentences above imply agentive intentional causation. But the Agent does not have to be present in the syntax. Take, for example, the sentence in (14). It has an actuality entailment. It cannot be continued by “but it didn’t” without contradiction nor by “and it did” without redundancy. There is no Agent in (14). But (14) crucially implies that there was someone who intended to put the people in the boat.

¹²This sentence is only acceptable, if ‘according to the rules’ modifies the prejacent, not the modal. In this case it can be paraphrased along the following lines: the students could and did take the exams in May and the exams proceeded in accordance with the rules.

- (14) lodka **smogla** vmestit' desyaternyx RU
 boat could.PFV place ten
The boat could (perfective) seat ten people.
 → The boat seated ten people.

The intentional component can be easily detected, if we take a preajacent that allows for both intentional and non-intentional interpretation. Take the verb phrase 'Nadya break the old typewriter' in (15). The sentence in (15) is true in a situation where Nadya accidentally dropped an iron bust on the typewriter (unintentional causation). It is also true in a situation where Nadya was determinedly hitting the typewriter with the iron bust for a while, until it broke (intentional causation).

- (15) nadya slomala staruju pečatnuju mašinku RU
 Nadya broke old typing machine
Nadya broke the old typewriter.
 a. ^{ok} describing SIT 1: N accidentally dropped an iron bust on the t-w.
 b. ^{ok} describing SIT 2: N was determinedly hitting the t-w with the iron bust for a while, until the typewriter broke.

However, if we embed the same verb phrase under an actuality entailing modal, only the intentional interpretation survives, like in (16). The sentence in (16) is only true in the situation where Nadya was hitting the typewriter with a bust. This sentence has an actuality entailment. It cannot be continued by "but she didn't" without contradiction nor by "and she did" without redundancy.

- (16) nadya **smogla** slomat' staruju pečatnuju mašinku RU
 Nadya could.PFV break old typing machine
Nadya could (perfective) break the old typewriter.
 → N broke the typewriter.
 a. [#] describing SIT 1: N accidentally dropped an iron bust on the t-w.
 b. ^{ok} describing SIT 2: N was determinedly hitting the t-w with the iron bust for a while, until the typewriter broke.

The same logic explains the infelicitousness in cases like (17). Here the context implies that nobody intended for the preajacent to happen. Nobody intended for the mother to touch the red chair. Consequently, the sentence is not acceptable.

- (17) CONTEXT: The children are playing a game with chairs. Whoever touches the red chair wins. The mother enters the room to get something from the wardrobe. She accidentally touches the red chair, thus spoiling the game.¹³
[#] mama **smogla** dotronut'sya do krasnogo stula RU
 mother could.PFV touch to red chair
The mother could (perfective) touch the red chair.

The intentionality observation in (13) has been made by Mari (2015). She also points out that actuality entailing modals also imply effort, apart from intentional

¹³This contextual set up is due to Sabine Iatridou.

causation. Mari concludes from it that actuality entailing modals are those that take a teleological accessibility relation.

However, the intentionality component does not seem to be necessary for actuality entailments. It seems to depend on the modal. Some modals have a causal circumstantial flavor with no intentionality and still trigger an actuality entailment:

- (18) Because of all the water John drank at the party he had to go to the bathroom three times during the night.

The sentence in (18) describes the state of circumstances (John's physical state). There is a causation implication: this physical state results in John going to the bathroom. But there are no intentions or effort involved.

However, the sentence in (18) does seem to have an actuality entailment: John did go to the bathroom three times. I will return to these examples in section 5.3.

3.4 Summary

The flavor generalization consists of three parts:

- (19) **The flavor generalization.** Actuality entailing modals
- a. Describe an unspecified circumstantial state.
 - b. Imply that the prejacent is causally dependent on this state.
 - c. Imply that there is an implicit Agent who intends for the prejacent to be true.

All these facts concern the accessibility relation in question. We can capture them, if we assume that actuality entailing modals take an accessibility relation that (a) does not specify the modal state and (b) takes us from this modal state to a set of events caused by it and intended to happen by an implicit Agent. Actuality entailing modals are those that have the flavor of intentional causation.

4 The aspectual generalization

In what aspectual contexts do actuality entailing modals give rise to their actuality entailments? In this section I am going to consider a sample of aspects from five different languages: Russian (Slavic, Indo-European), French (Romance, Indo-European), Modern Greek (Hellenic, Indo-European), English (Germanic, Indo-European) and Buryat (Mongolic). These languages have different aspectual systems. All of them have actuality entailing modals. In all of them actuality entailing modals give rise to their actuality entailments only under perfective aspects. That is, those aspects that introduce a time interval that includes the event time.

4.1 Russian and French

The major aspects in Russian and French include perfective (PFV)¹⁴ and imperfective (IMP). As it has been argued by Klein (1994) perfective introduces the Topic

Time that includes the Event Time. Imperfective introduces the Topic Time that is included in the Event Time.

- (20) a. PFV: Topic Time includes Event Time ET \subseteq TT.
 b. IMP: Topic Time is included in Event Time ET \supseteq TT.

Both Russian and French Imperfective morphology has an episodic and a generic reading. In this paper I am only considering the episodic one.¹⁵ Russian Perfective is probably phonologically null¹⁶ and is only compatible with telic verb phrases (Klein 1995). French PFV/IMP are realized as Passé Composé¹⁷ vs. Imparfait (in the context of the past temporal reference).

French modals *pouvoir* ‘can’ and *devoir* ‘must’ and Russian modal *moč* ‘can’ are actuality entailing, when they have the appropriate flavor (see section 3). In both languages actuality entailing modals have their actuality entailments under perfective, like in (21b) and (22b), but not under imperfective aspect, like in (21a) and (22a). Neither (21b) nor (22b) can be continued by “but he didn’t” without contradiction nor by “and he did” without redundancy.

- (21) a. jean **pouvait** parler à chomsky en personne FR
 Jean could.IMP talk to Chomsky in person
Jean could (imperfective) talk to Chomsky in person.
 b. jean **a pu** parler à chomsky en personne
 Jean could.PFV talk to Chomsky in person
Jean could (perfective) talk to Chomsky in person.
 → [J talked to C].
- (22) a. venečka **mog** dojtı do kremlya RU
 Venechka could.IMP walk to Kremlin
Venechka could (imperfective) walk to Kremlin.
 b. venečka **smog** dojtı do kremlya
 Venechka could.PFV walk to Kremlin
Venechka could (perfective) walk to Kremlin.
 → [V walked to K].

Interestingly, Russian present perfective has future temporal reference, but still triggers an actuality entailment, see (23). The sentence in (23) cannot be continued by “but she will not” without contradiction. It cannot be continued by “and she will” without redundancy.

- (23) nadya **smožet** napisat’ etu knigu RU
 Nadya can.PFV write this book

¹⁴Here and below I am following the notation introduced by Comrie (1976:10): uppercase for language specific aspectual morphemes, lowercase for universal aspectual meanings.

¹⁵In fact, the episodic reading has been argued to be more basic, see e.g. Paducheva (1986).

¹⁶The prefixes have been argued not to correspond to viewpoint aspect, see among others Babko-Malaya (1999), Svenonius (2004), Romanova (2004, 2006) and Tatevosov (2011, 2016b).

¹⁷To avoid the present perfect reading of Passé Composé I am using past temporal adverbials, which have been argued to be incompatible with the present perfect, see e.g. Dahl (1985).

Nadya will be able to write this book.

→ N will write this book.

This shows that actuality entailments are not in principle allergic to the future temporal reference, contra what has been argued by Piñón (2003). In other words, it is aspect that matters, not tense (or temporal reference).

4.2 Modern Greek

The major aspects in Modern Greek include perfective, imperfective and existential perfect (EPFCT). In this paper I am going to follow Iatridou et al.'s (2002) analysis for perfect. According to this view perfect introduces a time interval called the Perfect Time Span. In the case of existential perfect the Perfect Time Span includes the Event Time, which makes it a perfective aspect.

- | | | |
|------|---|---------------------|
| (24) | a. PFV: Topic Time includes Event Time | ET \subseteq TT. |
| | b. IMP: Topic Time is included in Event Time | ET \supseteq TT. |
| | c. EPFCT: Perfect Time Span includes Event Time | ET \subseteq PTS. |

Modern Greek Imperfective is also ambiguous between an episodic and a generic reading. Again, in this paper I am only considering the episodic one. Modern Greek has no universal perfect. Existential perfect is formed by the auxiliary 'have' + the perfective stem of the verb.

Modal Greek modal *boro*: 'can' is actuality entailing, when it has the appropriate flavor (see section 3). Its actuality entailment is absent under imperfective aspect, but present under perfective aspect and existential perfect (perfective aspects).

Imperfective is given in (25a) and does not have an actuality entailment. Perfective is given in (25b) and does have an actuality entailment. The sentence in (25b), but not the one in (25a) entails that Yannis talked to Chomsky.

- | | | |
|------|---|----|
| (25) | a. o Yannis boruse na milisi me ton Chomsky
the Yannis could.IMP NA talk with the Chomsky
<i>Yannis could (imperfective) talk to Chomsky.</i> | MG |
| | b. o Yannis borese na milisi me ton Chomsky
the Yannis could.PFV NA talk with the Chomsky
<i>Yannis could (perfective) talk to Chomsky.</i>
→ Y talked to C . | |

Existential perfect is given in (26) and does have an actuality entailment.

- | | | |
|------|--|----|
| (26) | exo: boresi na bis ston Lefko Iko
have.1SG can.EPFCT NA enter to-the White House
<i>I have been able to enter the White House.</i>
→ The speaker entered the WH. | MG |
|------|--|----|

4.3 English

The major aspects in English include perfective, progressive (PROG) and existential and universal perfects (EPFCT, UPFCT). Progressive is only different from imperfective in that it is less freely compatible with stative verb phrases. Perfects introduce a time interval called the Perfect Time Span. In the case of existential perfect the Perfect Time Span includes the event time (a perfective aspect). In the case of universal perfect the Perfect Time Span is included in the event time, which makes it an imperfective aspect.

- (27) a. PFV: Topic Time includes Event Time $ET \subseteq TT$.
 b. PROG: Topic Time is included in Event Time $ET \supseteq TT$.
 c. EPFCT: Perfect Time Span includes Event Time $ET \subseteq PTS$.
 d. UPFCT: Perfect Time Span is included in Event Time $ET \supseteq PTS$.

English Simple Tenses (\emptyset aspect morphology) have an episodic and a generic reading. In this paper I am only considering the episodic one. The episodic reading of English Simple Tenses is the English Perfective¹⁷. English Progressive is formed by *be* + *V-ing*. English Existential and Universal Perfects are formed by *have* + *V-en* and *have* + *been* + *V-ing* respectively. For stative verb phrases, *including modals* both Perfects look like *have* + *V-en* (Iatridou et al. 2002).

English modals *be able to* and *have to* are actuality entailing, when they have the appropriate flavor (see section 3). Their actuality entailment is present under perfective and existential perfect (perfective aspects). It is absent under the under universal perfect (imperfective aspect).

Perfective is given in (28) and does have an actuality entailment. The sentence in (28) entails that Ernest caught the train.

- (28) Thanks to the perfect traffic Ernest **was able to** catch the night train back.
 \rightarrow E caught the train.

Existential perfect is given in (29a) and does have an actuality entailment. Universal perfect is given in (29b) and does not have an actuality entailment. The sentence in (29a), but not the one in (29b), entails that Stephen went to the store.

- (29) a. Stephen has **been able to** go to the store twice since this morning.
 \rightarrow S went to the store.
 b. Stephen has **been able to** go to the store for two hours already.

Being stative, actuality entailing modals are incompatible with progressive:

- (30) **be being able to* / **be having to*

¹⁷See Dahl (1985), Klein (1994), Kratzer (1998a) among others.

4.4 Buryat¹⁸

The major aspects in Buryat include perfective, imperfective, existential and universal perfects.

- (31)
- | | |
|---|---------------------|
| a. PFV: Topic Time includes Event Time | ET \subseteq TT. |
| b. IMP: Topic Time is included in Event Time | ET \supseteq TT. |
| c. EPFCT: Perfect Time Span includes Event Time | ET \subseteq PTS. |
| d. UPFCT: Perfect Time Span is included in Event Time | ET \supseteq PTS. |

Buryat simple past tense (so called Preterit) *-a:* has a past episodic perfective reading, which I am going to use as the Buryat Perfective. Buryat simple present tense *-na* has a present episodic imperfective reading, which I am going to use as the Buryat Imperfective. Buryat Existential and Universal Perfects are formed by the participles *-han* and *-ha:r* respectively.

Buryat modal *bolo* ‘can’ is actuality entailing, when it has the appropriate flavor (see section 3). Its actuality entailment is present under perfective and existential perfect (perfective aspects). It is absent under imperfective and universal perfect (imperfective aspect).

The present imperfective is given in (32a) and does not have an actuality entailment. The past perfective is given in (32b) and does have an actuality entailment.

- (32)
- CONTEXT: Dugar, who lives in Baraghan, is/was trying to get to Kurumkan.
- a. *dugar avtobus-ta hu:-ža bolo-no* BU
 Dugar bus-DAT sit-CONV can-PRS
Dugar can take the bus (from Baraghan to Kurumkan).
- b. CONTEXT: An answer to the question “Did Dugar get to Kurumkan?”.
*dugar avtobus-ta hu:-ža bol-o:*¹⁹
 Dugar bus-DAT sit-CONV can-PRT
Dugar could (preterit) take the bus (from Baraghan to Kurumkan).
 → D took the bus.

Universal perfect is given in (33a) and does not have an actuality entailment. Existential perfect is given in (33b) and does have an actuality entailment. The sentence in (33b), but not the one in (33a), entails that the hearer ploughed.

- (33)
- CONTEXT: The hearer needs to plough a field. For that they need a tractor.
- a. *traktor-a:r gazar xaxal-ža bolo-ho:r-š*²⁰ BU
 traktor-INSTR earth cut-CONV can-UPFCT-2SG
You have been able to plough with the tractor (for two hours already).

¹⁸Buryat data were collected via fieldwork linguistic in Baraghan (Buryatia, Russia) within the project “Expeditions to Altaic and Uralic Languages” (Moscow State University).

¹⁹In a different context (not in an answer to the given question) this sentence has a reading with no actuality entailment. The data that I have do not make it clear whether in this case the modal is interpreted epistemically or circumstantially. Either it is epistemic, in which case Buryat is like French in allowing perfective morphology to combine with epistemic modals. Or it is circumstantial, in which case Buryat is also like French in allowing for atelic readings of actuality entailing modals under perfective, see section 5.4 for more detail.

- b. traktor-a:r gazar xaxal-ža **bolo-hon-š**
 traktor-INSTR earth cut-CONV can-EPFCT-2SG
You have been able to plough with the tractor (two times already).
 → The hearer ploughed.

4.5 Summary

The sample of aspects discussed supports the aspectual generalization:

(34) **The aspectual generalization.**

Across various aspectual systems of different languages actuality entailments are only present under perfective aspects.

Where perfective aspects are those that introduce a time interval that includes the event time.

Usually, if we observe a verb phrase that triggers some entailment under perfective aspects, but not under imperfective ones, we call this verb phrase telic (the so-called imperfective paradox phenomenon). Actuality entailing modals give rise to an entailment under perfective aspects, but not under imperfective ones. Hence by this descriptive definition they are telic.

We know that there are different paths to telicity. One of them seems to be for a root modal to take a causal accessibility relation.

5 Analysis

5.1 Preliminary assumptions

Before proceeding with the analysis I will make some preliminary assumptions.

Firstly, in what follows I am going to use five semantic types: truth values (D_t), individuals or entities (D_e), time intervals (D_i), events (D_v) and worlds (D_s). Below @ is the actual world, t_u is the utterance time. These are the default values for the first two parameters of interpretation: the world and the time of evaluation w, t . The third parameter is the assignment function g .

Secondly, following Hacquard (2006, 2010, 2014), I am going to assume that events take place or occur in worlds. One event may occur in different worlds.

- (35) a. e in $w := e$ takes place / occurs in w .
 b. Principle of Event Identification (Hacquard 2006:57)
 $\forall w, v: [e \text{ in } w \ \& \ e \text{ in } v \ \& \ P(e) \text{ in } w] \rightarrow [P(e) \text{ in } v]$.

In section 5.2 I will adopt and briefly discuss an event based approach to the aspect conditioned entailments of telic verb phrases. That is, to the fact that telic verb phrases trigger an entailment under perfective aspects, but not under imperfective ones (the so called imperfective paradox). After that, in section 5.3

²⁰The absence of the copula here is crucial. With the copula the speakers seem to prefer the past temporal reference.

I will put forward a theory of actuality entailments. In section 5.4 I will briefly discuss an open issue, concerning non actuality entailing cases in French, pointed out by Mari & Martin (2007).

5.2 Telic VPs have complex event structure

In what follows I am going to assume that telic verb phrases have complex event structure, following the basic ideas in Dowty (1979), Paducheva (1991, 1996), Levin, Rappaport-Hovav (1995), Ramchand (2006), Tatevosov (2011, 2016b) and others. Not all of these theories employ event semantics. But all of them share the idea of decomposing the verbal meaning into smaller pieces, be that events (e.g. Ramchand 2006) or propositions (e.g. Dowty 1979).

Take the verb phrase *Mary walk to Harvard*. Assume that it has the semantics in (36), along the lines of Ramchand (2006). It is a predicate of Mary-walking events that cause some Mary-being-at-Harvard events.

- (36) $\| \text{Mary walk to Harvard} \|^{w,t,g} =$
 $\lambda e_1. \text{walk}(\text{Mary})(e_1) \ \&$
 $\exists e_2: \text{Cause}(e_1)(e_2)(w) \ \& \ \text{be}(\text{at-Harvard})(\text{Mary})(e_2).$

True of Mary-walking events that cause Mary-being-at-Harvard events.

The Cause relation in (36) is the same relation that has been argued to be part of the semantics of verbs like *open* or *break*, see Dowty (1979) and subsequent literature.²¹ Following the general ideas in Lewis (1973) and Dowty (1979), I am going to define this relation contrafactually. $\text{Cause}(e_1)(e_2)(w)$ iff if e_1 didn't happen in w , e_2 wouldn't have happened in w (37a); and if e_1 did happen in w , e_2 would have happened in w (37b).

- (37) $\text{Cause}(e_1)(e_2)(w)$ iff
 a. $\forall v: v$ is a closest²² world to w where e_1 doesn't occur $\rightarrow \neg [e_2 \text{ in } v]$.
 b. $\forall v: v$ is a closest world to w where e_1 does occur $\rightarrow [e_2 \text{ in } v]$.

The causation relation between the process event and the result state in the semantics of accomplishments, like *Mary walk to Harvard*, is probably stronger than mere contrafactually defined causation. It may be best paraphrased by “results in” rather “causes”. In particular, it needs to be at least the relation of immediate causation. If Mary walked to the bus stop and then took the bus to Harvard, it is true that if she didn't walk, she wouldn't have been at Harvard. But one would not describe this situation by saying *Mary walked to Harvard*. In addition to (37), $\text{Cause}(e_1)(e_2)(w)$ at least needs to imply that e_2 takes place immediately after e_1 .

The exact semantic nature of the causal relation as part of the semantics of causative verbs, in particular, implicative verbs like *cause*, *make* or *manage*, has been studied in great detail by Nadathur (2015, 2019).

²¹This may not be the same relation as expressed by the complementizer *because*.

²²The relation ‘closest’ between worlds is reflexive. That is, w is closest to itself.

In what follows I am going to rely on two consequences of the semantics of $\text{Cause}(e_1)(e_2)(w)$. First, it leaves it open whether e_1 happens in w (it might or might not happen). Second, if e_1 does happen in w , e_2 happens in w as well.

Consequently, the semantics in (36) locates neither e_1 nor e_2 in the actual world. It is a predicate of all *possible* Mary-walking events that cause some *possible* Mary-being-at-Harvard events.

In this paper I am not going to discuss the aspectual composition of a verb phrase. That is, I will not explain how the semantics in (36) arises from the semantics of the constituents of the verb phrase *Mary walk to Harvard*. For details see Krifka (1989, 1992, 1998), Ramchand (2006), Tatevosov (2015) and others.

The verb phrase in (36) can be embedded under a perfective or an imperfective aspect. There are two fundamental differences between perfective and imperfective aspects.

Firstly, they differ in their temporal semantics. Perfective aspects introduce a time interval that includes the event time. Imperfective aspects introduce a time interval that is included in the event time, see Klein (1994) and others.

Secondly, they differ in their intensional properties. Perfective aspects entail their complement, while the imperfective ones do not. This is what is usually called the imperfective paradox. Perfective aspects entail that the whole VP-event took place in the actual world. Imperfective aspects entail that only a stage of it did, see Bennett & Partee (1972), Dowty (1979), Bach (1986), Parsons (1990) and others.

In what follows I am going to assume the semantics for perfective and imperfective given in (38). The temporal part of it comes from Klein's (1994) theory and its implementation for event semantics from Kratzer (1998a). The intensional part is due to Landman's (1992) event based approach to the imperfective paradox.

(38) Perfective and imperfective.²³

- a. $\| \text{PFV} \|^{w,t,g} = \lambda VP_{\langle v,t \rangle}. \lambda t. \exists e: e \text{ in } w \ \& \ VP(e) \ \& \ \tau(e) \subseteq t.$
- b. $\| \text{IMP} \|^{w,t,g} = \lambda VP_{\langle v,t \rangle}. \lambda t. \exists e': e' \text{ in } w \ \& \ \exists e, v: \langle e, v \rangle \in \text{CON}(e', w) \ \& \ VP(e) \ \& \ \tau(e) \supseteq t.$
- c. i. $\text{CON}(e', w)$ is a continuation branch of e' in w (Landman 1992:27).
 ii. A continuation branch of an event e' in w is a chain of pairs of an event e and a world v (e occurs in v), where v is the closest to w and e is a reasonable continuation of e' (Landman 1992:26).

(Landman 1992:27), (Klein 1994:101ff), (Kratzer 1998a:17)

What is important here is that (38a) entails that some VP event (e) took place in @. Where the time span of e is included in the time interval introduced by the aspect: $\tau(e) \subseteq t$. Meanwhile (38b) entails that a stage (e')²⁴ of some *possible* VP-event (e) took place in @. Where the time span of the possible VP event e includes the time interval introduced by the aspect: $\tau(e) \supseteq t$.

²³Other aspects, like, for instance, perfects, will differ in the relation between the time interval that they introduce and the reference time, introduced later by tense.

²⁴Stage in the terms of Landman (1992).

For simplicity I am going to assume the anaphoric theory of tense (Partee 1973), (Kratzer 1998a) and only consider the past. Its semantics is given in (39). The past tense is a pronoun of type i , fed into its complement the predicate of time intervals returned by aspect.

(39) $\| \text{PST}_7 \|^{w,t,g}$ is defined iff $g(7) < t$. If defined $\| \text{PST}_7 \|^{w,t,g} = g(7)$.

This sum of assumptions results in the truth conditions in (40). (40a) provides the truth conditions for the past perfective: *Mary walked to Harvard*. (40b) provides the truth conditions for the past imperfective (the progressive in the English case): *Mary was walking to Harvard*.

- (40) Given the actual world ($w = @$) and the utterance time ($t = t_u$),
- a. $\| \text{PST}_7 [\text{PFV} [\text{Mary walk to Harvard}]] \|^{@,t_u,g}$ is defined iff $g(7) < t_u$.
 If defined, it is true iff
 $\exists e_1: e_1 \text{ in } @ \ \& \ \text{walk}(\text{Mary})(e_1) \ \& \$
 $\exists e_2: \text{Cause}(e_1)(e_2)(w) \text{ be(at-Harvard)}(\text{Mary})(e_2) \ \& \$
 $\tau(e_1) \subseteq g(7)$.
 - b. $\| \text{PST}_7 [\text{IMP} [\text{Mary walk to Harvard}]] \|^{@,t_u,g}$ is defined iff $g(7) < t_u$.
 If defined, it is true iff
 $\exists e': e' \text{ in } @ \ \& \ \exists e_1, w: \langle e_1, w \rangle \in \text{CON}(e', @) \ \& \ \text{walk}(\text{Mary})(e_1) \ \& \$
 $\exists e_2: \text{Cause}(e_1)(e_2)(w) \text{ be(at-Harvard)}(\text{Mary})(e_2) \ \& \$
 $\tau(e_1) \supseteq g(7)$.

The perfective in (40a) entails that the time interval that the speaker is talking about $g(7)$ precedes the utterance time t_u : $g(7) < t_u$. It also entails that some Mary-walking event e_1 took place in $@$, where the time span of e_1 is included in the time interval that the speaker is talking about: $\tau(e_1) \subseteq g(7)$. It also entails that there is some *possible* Mary-being-at-Harvard event e_2 , caused by e_1 : $\text{Cause}(e_1)(e_2)(w)$. Due to the semantics of Cause, in all the worlds where e_1 occurs e_2 occurs as well. Since (40a) entails that e_1 took place in $@$, it also entails that e_2 took place in $@$ as well. Consequently, (40a) entails that Mary was at Harvard in the actual world.

The imperfective in (40b) entails that the time interval that the speaker is talking about $g(7)$ precedes the utterance time t_u : $g(7) < t_u$. It also entails that a stage e' of some *possible* Mary-walking event e_1 took place in $@$, where the time span of the possible Mary-walking event e_1 includes the time interval that the speaker is talking about: $\tau(e_1) \supseteq g(7)$. It also entails that there is some *possible* Mary-being-at-Harvard event e_2 , caused by e_1 : $\text{Cause}(e_1)(e_2)(w)$. Since (40b) does not entail that e_1 took place in $@$, it does not entail that e_2 took place in $@$ either. Consequently, (40b) does not entail that Mary was at Harvard in the actual world.

This theory successively derives the so called imperfective paradox, that is, the aspect conditioned entailment of telic verb phrases.

5.3 A theory of actuality entailments

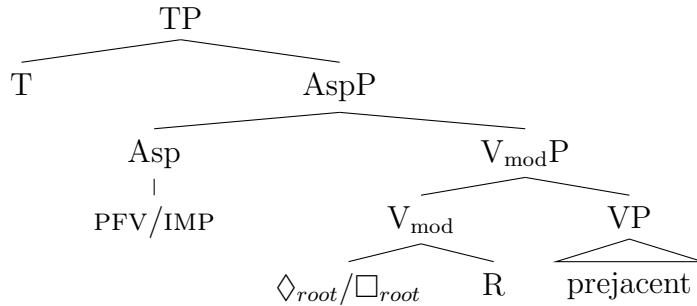
The proposed theory consists of three stipulations.

(41) **Stipulation 1.**

Root modals are attached and interpreted below aspect and return a predicate of events.

The assumed syntax is given in (42). A root modal takes an accessibility relation R , a prejacent and returns a predicate of events. This predicate of events is further fed to aspect and tense.

(42) Assumed syntax:



The $V_{\text{mod}}P$ node in (42) is a predicate of states. It can describe the state of someone's physical or mental abilities, the state that the rules or the laws are in, the state of the circumstances.

(43) **Stipulation 2.**

Root accessibility relations are relations between events.

The lexical entries for an existential and a universal root modal are given in (44). They take a relation between events, a predicate of events and return another predicate of events.

(44) Entries for the modal operators.

- a. $\llbracket \Diamond_{\text{root}} \rrbracket^{w,t,g} = \lambda R_{\langle vvt \rangle}. \lambda P_{\langle vt \rangle}. \lambda e_1. \exists e_2: R(e_1)(e_2) \ \& \ P(e_2).$
- b. $\llbracket \Box_{\text{root}} \rrbracket^{w,t,g} = \lambda R_{\langle vvt \rangle}. \lambda P_{\langle vt \rangle}. \lambda e_1. \forall e_2: R(e_1)(e_2) \rightarrow P(e_2).$ ²⁵

The accessibility relation R determines the kind of event that the modal describes (e_1) and this event's relation to the prejacent (e_2). A sample of accessibility relations is given in (45). For instance, an accessibility relation may take us from the state of someone's abilities to the set of events including the same individual with the same abilities (45a). The accessibility relation is supplied by the context.

- (45) a. $\text{Abil}(e_1)(e_2)$ iff e_1 is the state of some x 's physical abilities
and e_2 includes the same x with the same physical abilities.
- b. $\text{Deon}(e_1)(e_2)$ iff e_1 is the state of some set of laws/rules being in place
and e_2 conforms to those rules.
- c. $\text{Circ}(e_1)(e_2)$ iff e_1 is the state of some relevant circumstances
and e_2 co-occurs with the same circumstances.

²⁵The universal modal, like any other universal operator, comes with a non-empty domain presupposition $(\exists e_2: R(e_1)(e_2) \ \& \ P(e_2))$.

Nothing in the lexical entries in (44) locates either e_1 or e_2 in @. No relation among those introduced in (45) will do so either. Root modals quantify over the *possible* accessible events, which do not necessarily occur in the actual world.

Following Kratzer (1981), each modal is specified in the lexicon as to what accessibility relations it may or may not take. For example, German *dürfen* ‘can’ only takes the relation in (45b). Meanwhile, Russian *moč* ‘can’ (and German *können* ‘can’) may take any of the relations in (45).

Given an accessibility relation and a verb phrase, root modals return predicate of events. For example, given the deontic accessibility relation in (45b) and a verb phrase, an existential root modal will return the predicate of events in (46).

$$(46) \quad || \Diamond_{root}(\text{Deon})(VP) ||^{w,t,g} = \lambda e_1. \exists e_2: \text{Deon}(e_1)(e_2) \ \& \ || VP ||^{w,t,g}(e_2).$$

Where $\text{Deon}(e_1)(e_2)$ iff e_1 is the state of some set of laws/rules being in place and e_2 conforms to those rules.

The predicate in (46) is true for any state of some laws/rules for which there is an event e_2 in the extension of the prejacent that conforms to those laws/rules. For example, the sentence in (47) describes the state of the rules that allowed for students to use the library (the rules that described an event of students using the library as legal), which lasted for a couple of years.

(47) For a couple of years the students could use the library.

The relations listed in (45) represent only a sample of all possible accessibility relations. For example, in the sentence *The dean allowed me to use the library* the English verb *allow* takes a different accessibility relation which can be described along the following lines:

$$(48) \quad \text{Deon}_{\text{Speech}}(e_1)(e_2) \text{ iff } e_1 \text{ is the event of some individual uttering a rule or a regulation and } e_2 \text{ is an event that conforms to that rule or regulation.}$$

Another possible accessibility relation is for bouletic future oriented modality:

$$(49) \quad \text{Boul}(e_1)(e_2) \text{ iff } e_1 \text{ is the state of some individual } x \text{ having a desire and } e_2 \text{ is the event realizing this desire, where } \tau(e_1) < \tau(e_2).$$

One possible accessibility relation is a causal circumstantial one. The modals that take it are actuality entailing:

(50) **Stipulation 3.**

Iff a root modal takes causal accessibility relation, it is actuality entailing.

The causal accessibility relation is given in (51). It builds in the three observations that constituted the flavor generalization in section 3. It holds of two events e_1 and e_2 , if e_1 is the state of circumstances (including the traffic, someone’s abilities or rules/laws depending on the context), e_1 causes e_2 and there is an Agent who intends for e_2 to happen.

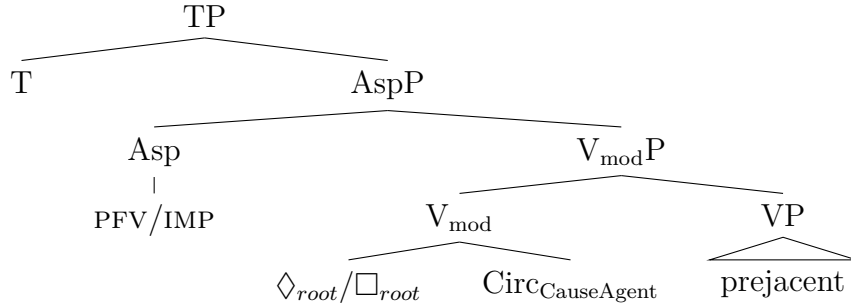
$$(51) \quad \text{Circ}_{\text{CauseAgent}}(e_1)(e_2)(w) \text{ iff}$$

- a. e_1 is the state of some relevant circumstances;

- b. and $\text{Cause}(e_1)(e_2)(w)$;
- c. and $\exists x$: x intends for e_2 to happen.

Actuality entailing modals are those root modals that take $\text{Circ}_{\text{CauseAgent}}$ in (51). Their syntactic position and lexical semantics is exactly the same as for other root modals:

(52) An actuality entailing modal:



This sum of assumptions results in the truth conditions in (53). (53a) provides the truth conditions for an existential actuality entailing modal under perfective aspect. (53b) provides the truth conditions for an existential actuality entailing modal under imperfective aspect.

- (53) Given the actual world ($w = @$) and the utterance time ($t = t_u$),
- a. $\| \text{PST}_7 [\text{PFV} [\diamond_{\text{root}}(\text{Circ}_{\text{CauseAgent}}) \text{VP}]] \|^{@, t_u, g}$ is defined iff $g(7) < t_u$.
 If defined, it is true iff
 $\exists e_1$: e_1 in $@$ &
 $\exists e_2$: $\text{Circ}_{\text{CauseAgent}}(e_1)(e_2)(w)$ & $\| \text{VP} \|^{@, t_u, g}(e_2) = 1$ &
 $\tau(e_1) \subseteq g(7)$.
 - b. $\| \text{PST}_7 [\text{IMP} [\diamond_{\text{root}}(\text{Circ}_{\text{CauseAgent}}) \text{VP}]] \|^{@, t_u, g}$ is defined iff $g(7) < t_u$.
 If defined, it is true iff
 $\exists e'$: e' in $@$ & $\exists e_1, w$: $\langle e_1, w \rangle \in \text{CON}(e', @)$ &
 $\exists e_2$: $\text{Circ}_{\text{CauseAgent}}(e_1)(e_2)(w)$ & $\| \text{VP} \|^{@, t_u, g}(e_2) = 1$ &
 $\tau(e_1) \supseteq g(7)$.

The perfective in (53a) entails that the time interval that the speaker is talking about $g(7)$ precedes the utterance time t_u : $g(7) < t_u$. It also entails that some state of circumstances e_1 took place in $@$, where the time span of e_1 is included in the time interval that the speaker is talking about: $\tau(e_1) \subseteq g(7)$. It also entails that there is some *possible* event e_2 , caused by e_1 , intended to happen by an implicit Agent and for which the preajcent is true. Due to the semantics of Cause, in all the worlds where e_1 occurs e_2 occurs as well. Since (53a) entails that e_1 took place in $@$, it also entails that e_2 took place in $@$ as well. Consequently, (53a) has an actuality entailment.

The imperfective in (53b) entails that the time interval that the speaker is talking about $g(7)$ precedes the utterance time t_u : $g(7) < t_u$. It also entails that a stage e' of some *possible* state of circumstances e_1 took place in @, where the time span of the possible state of circumstances e_1 includes the time interval that the speaker is talking about: $\tau(e_1) \supseteq g(7)$. It also entails that there is some *possible* event e_2 , caused by e_1 , intended to happen by an implicit Agent and for which the prejacent is true. Since (53a) does not entail that e_1 took place in @, it does not entail that e_2 took place in @ either. Consequently, (53b) has no actuality entailment.

This theory is most similar to Bhatt's (1999) original analysis in that actuality entailing modals "underlyingly" entail their prejacent. But there are some differences. The present theory does not postulate any ambiguity (cf. Bhatt's two *abil*'s) and gives a homogeneous semantics for the root modals with actuality entailments and for the ones without. Furthermore, it directly builds in the relation between actuality entailments and the modal flavor. A root modal is actuality entailing if it takes the accessibility relation $\text{Circ}_{\text{CauseAgent}}$ from (51).

The present analysis crucially relies on the causation relation. In fact, the agentive component is predicted not to be essential. Imagine an accessibility relation like (51), but without the final clause in (51c). Call it $\text{Circ}_{\text{Cause}}$. This relation would not imply intentional causation. But a modal that could take it is still predicted to trigger an actuality entailment under perfective aspect.

There might be some reasons to believe that such an accessibility relation exists and that some modals can take it. These modals seem to also trigger an actuality entailment. Take the following sentence:

- (54) Thanks to the two gallons of tea served at the dinner John had to go to the bathroom three times during the night.

It arguably has an actuality entailment (John went to the bathroom three times). The modal state is John's physiological state. The prejacent describes an event that is caused by this state (John going to the bathroom). But there are no *intentions* involved.

This is predicted under the present analysis. Even if the causal accessibility relation does not involve the agentive part, the modal will still be actuality entailing due to the semantics of Cause.

The question is which modals can take only the agentive version ($\text{Circ}_{\text{CauseAgent}}$) and which ones may take the non-agentive one ($\text{Circ}_{\text{Cause}}$). This question is going to be left open in this paper. It seems that existential root modals, like Russian *moč* or English *be able to* or *can* tend to take $\text{Circ}_{\text{CauseAgent}}$, but do not $\text{Circ}_{\text{Cause}}$. Meanwhile universal root modals, like English *have to* can sometimes take $\text{Circ}_{\text{Cause}}$, like in the bathroom example in (54).

5.4 An open issue

Mari & Martin (2007) argue that French *pouvoir* 'can' and *devoir* 'must' may not have an actuality entailment under perfective, if modified by certain adverbials.

In other words, French *pouvoir* and *devoir* have a non actuality entailing (that is, atelic) reading under the French Passé Composé. This additional atelic reading

can be highlighted by certain adverbials.

For example a for-adverbial, like in (55). In (55a) the Passé Composé of *pouvoir* is modified by an in-adverbial and has an actuality entailment. In (55b) the Passé Composé of *pouvoir* is modified by a for-adverbial and does not have an actuality entailment.

- (55) a. jean **a pu** parler á Chomsky en deux heures FR
 Jean could.PFV talk to Chomsky in two hours
Jean could (perfective) talk to Chomsky in two hours.
 → [J talked to C].
- b. jean **a pu** parler á Chomsky pendant deux heures
 Jean could.PFV talk to Chomsky for two hours
Jean could (perfective) talk to Chomsky for two hours.

This is not true for Russian actuality entailing modals, nor for e.g. Modern Greek ones. In (56a) the perfective of Russian *moč* ‘can’ is modified by an in-adverbial and has an actuality entailment. In (56b) the perfective of Russian *moč* ‘can’ is modified by a for-adverbial and is ungrammatical.

- (56) a. za tri mesyaca nadya **smogla** proplyt’ 50 metrov RU
 in three month Nadya could.PFV swim 50 meters
In three months Nadya could (perfective) swim 50 meters.
 → [N swam 50 meters].
- b. * tri mesyaca nadya **smogla** proplyt’ 50 metrov
 three month Nadya could.PFV swim 50 meters
 Intended: *For three months Nadya could (perfective) swim 50 meters.*

Interestingly, some other telic verb phrases in French allow for an additional atelic interpretation with Passé Composé. Again, this is not true for Russian (but possibly true for some Modern Greek telic verbs).

Take the verb phrase ‘Jean write a letter’. In (57a) its Passé Composé is modified by an in-adverbial and has a culmination entailment (the letter was finished). In (57b) its Passé Composé is modified by a for-adverbial and has no culmination entailment (the letter was not finished).

- (57) a. jean **a écrit** une lettre en deux heures FR
 Jean wrote.PFV a letter in two hours
Jean wrote (and finished) a letter in two hours.
- b. jean **a écrit** une lettre pendant deux heures
 Jean wrote.PFV a letter for two hours
Jean wrote a letter for two hours (but didn’t finish it).

In fact, in various other languages there seems to be a class of telic verbs that have an additional atelic interpretation under perfective aspect, pointed out by e.g. Tatevosov (2016a). Tatevosov calls them “weakly telic”. Not all languages have this class of verbs. Although to have it seems to be typologically common (Tatevosov

2016a:182-183). Furthermore, the lexical members of this class *vary* from language to language.

For example, both Karachay-Balkar (Turkic) and Mari (Uralic) have each a relatively big class of telic verbs that allow for an additional atelic interpretation under perfective aspect. Thus, the verb ‘drink’ in both Karachay-Balkar (*ic*) and Mari (*jüaš*) has both a telic and an atelic interpretation under perfective aspect (Tatevosov 2016a:183).

However, the lexical members of this class are not the same in both languages. The telic verb ‘put.on’ in Mary (*čijaš*) *does* have an additional atelic interpretation under perfective aspect, but in Karachay-Balkar (*kij*) it *does not* (Tatevosov 2016a:175,183).

Obviously, one needs a theory that would explain why ‘put.on’ in Mari does have an additional atelic interpretation under perfective aspect, but ‘put.on’ in Karachay-Balkar does not. The same theory should explain why ‘drink’ in both languages have a telic and an atelic interpretation under perfective aspect. The same theory should also explain why French ‘write’ does have an atelic interpretation under perfective aspect, but Russian ‘write’ does not.

Crucially, the same theory would explain why French actuality entailing modals have an atelic interpretation under perfective aspect, while Russian or Modern Greek ones do not.

A potential explanation should come from two sources. Firstly, the semantics of the perfective morphemes in question (Karachay-Balkar Perfective vs. Mari Perfective in the context of ‘put.on’; Russian Perfective vs. French Perfective in the context of ‘drink’ and actuality entailing modals). Secondly, the lexical set up of the verbs in question (Karachay-Balkar ‘drink’ vs. Karachay-Balkar ‘put.on’ in the context of Karachay-Balkar Perfective).

6 Conclusion

In this paper I have proposed a theory of actuality entailments built on two generalizations.

The first generalization concerns the kind of root modals that give rise to actuality entailments. These modals have a specific flavor (accessibility relation). For them the prejacent should describe an event caused by the modal state and intended to happen by an implicit Agent.

The second generalization concerns the contexts that trigger actuality entailments. Across various languages with different aspectual systems actuality entailing modals give rise to their actuality entailments only under perfective aspects. This makes them descriptively telic.

The proposed analysis consists of three stipulations. Firstly, root modals return a predicate of events and describe various modal states. Secondly, root accessibility relations are relations between events (root modals quantify over possible events). Thirdly, one of these relations involves intentional causation. Root modals that take this relation quantify over the set of events that are caused by the modal state and are intended to happen by an implicit Agent. These modals are actuality entailing,

that is, telic. For them the relation between the modal state and the prejacent is the same as the relation between the Mary-walking event and the Mary-being-at-Harvard event in the denotation of the telic verb phrase *Mary walk to Harvard*.

This theory does not derive actuality entailments from the scope of the modal with respect to tense or aspect, which makes it different from Piñón (2003), Hacquard (2006), Borgonovo & Cummins (2007) and Homer (2010). Root modals do not become trivialized or vacuous in the context of a perfective aspect, unlike in Hacquard (2006) or Borgonovo & Cummins (2007). Nor do they require an actuality coercion operator in this context, unlike in Homer (2010).

This theory is similar to Bhatt (1999) and Mari (2015) in that it ties actuality entailments to the semantics of the modal, thus deriving the flavor generalization, that is, the fact that actuality entailing sentences have particular implications (causation). Like Mari (2015), the theory derives actuality entailments from the type of the modal's accessibility relation. Unlike in Mari's (2015) analysis, the relation needs to be causal, but not necessarily agentive or intentional.

Glosses

Gloss	Interpretation	Gloss	Interpretation
1, 2, 3	person	NA	Balkan subordination marker
CONV	converb	PFV	perfective
DAT	dative case	PROG	progressive
EPFCT, UPFCT	existential, universal perfect	PRS	present tense
IMP	imperfective	PRT	preterit
INSTR	instrumental case	SG, PL	singular, plural number

TT – Topic Time; PTS – Perfect Time Span; ET – Event Time.

References

- Altshuler, D. (2010a) A Birelational Analysis of the Russian Imperfective; In: *Sinn und Bedeutung 14*; Vienna; 1-18
- Altshuler, D. (2010b) Temporal Interpretation in Narrative Discourse and Event Reference; Rutgers Ph.D. Thesis, New Brunswick
- Altshuler, D. (2014) A Typology of Partitive Aspectual Operators; In: *NLLT 32*; 735-775
- Babko-Malaya, O. (1999) Zero Morphology: A Study of Aspect, Argument Structure, and Case; PhD dissertation; Rutgers University
- Bach, E. (1986) The Algebra of Events; In: *Linguistics and Philosophy*, Vol. 9
- Bar-el, L., Davis, H. and Matthewson, L. (2005) On Non-Culminating Accomplishments; In: *Proceedings of the North Eastern Linguistics Society 35*; Amherst, MA: GLSA
- Barwise J., Perry P. (1983) Situations and Attitudes; Cambridge, MA: MIT Press
- Bennett, M., Partee, B. (1972) Towards the logic of tense and aspect in English; IULC, Bloomington
- Bhatt, R. (1999) Covert Modality in Non-Finite Contexts; University of Pennsylvania Ph.D. Thesis
- Bogal-Allbritten, E. (2016) Building Meaning in Navajo; UMass dissertation
- Borgonovo, C., Cummins, S. (2007) Tensed Modals; In: *Coreference, modality, and focus: Studies on the syntax-semantics interface* (Linguistik Aktuell 111); ed. by Eguren, L., Soriano, O.; John Benjamins; 1-18

- Carlson, G. (1980) Reference to Kinds in English; Garland Publishing, Inc; New York and London
- Cipria, A., Roberts, C. (2001) Spanish *imperfecto* and *pretérito*: Truth Conditions and Aktionsart Effects in a Situation Semantics; In: *Natural Language Semantics*, Volume 8, Issue 4; 297-347
- Comrie, B. (1976) Aspect; Cambridge: Cambridge University Press
- Condoravdi, C. (2002) Temporal interpretation of modals: modals for the present and the past; In: *The Construction of Meaning*, ed. by Beaver, D., Kaufmann, S., Clark, B. and Martinez, L.C.; Stanford: CSLI Publications; 59-88
- Dahl, Ö. (1985) Tense and Aspect Systems; Basil Blackwell Ltd, Oxford
- Davidson, D. (1967) Truth and Meaning; In: *Synthese*, Vol. 17, No. 3
- Dowty, D. (1979) Word Meaning and Montague Grammar: The Semantics of Verbs and Times; Dordrecht: Reidel
- Filip, H. (2005) The Telicity Parameter Revisited; In: *Semantics and Linguistics Theory XIV*; Itaca: CLC Publications
- Grønn, A. (2003) The Semantics and Pragmatics of the Russian Factual Imperfective; University of Oslo Ph.D. Thesis
- Gyarmathy, Z., Altshuler, D. (2016) Non-culmination by Abduction; <https://www.researchgate.net/publication/328543257>
- Hacquard, V. (2006) Aspects of Modality; MIT Ph.D. Thesis
- Hacquard, V. (2009) On the Interaction of Aspect and Modal Auxiliaries; In: *Linguistics and Philosophy*, June, 32
- Hacquard, V. (2010) On the Event Relativity of Modal Auxiliaries; In: *Natural Language Semantics*, Volume 18, issue 1
- Hacquard, V. (2014) Actuality Entailments; In: *A Companion to Semantics*; ed. by Matthewson, L., Meier, C., Rullman, H. and Zimmermann, T.E.; Oxford: Wiley
- Heim, I. (1994) Comments on Abusch's Theory of Tense; In: *Ellipsis, Tense and Questions*, ed. by Kamp, H.; Dytan 2 Deliverable; 143-170
- Heim, I., Kratzer, A. (1998) Semantics in Generative Grammar; Oxford: Blackwell
- Heim, I., von Stechow, K. (2016) Intensional Semantics; lecture notes
- Homer, V. (2010) Actuality Entailments and Aspectual Coercion; ms.
- Iatridou, S., Aganostopoulou, E., Izvorski, R. (2002) Some Observations about the Form and Meaning of the Perfect; In: *Ken Hale: A Life in Language*, Cambridge, ed. by Kenstowicz, M.; MIT Press
- Kaufmann, S., Condoravdi, C., Harizanov, V. (2006) Formal approaches to modality; In: *The Expression of Modality*, ed. by Frawley, W.; Berlin, New York: Mouton de Gruyter
- Kenny, A. (1963) Action, Emotion and Will; New York: Humanities Press
- Khoo, J. (2015) On Indicative and Subjunctive Conditionals; MIT, Philosophers Imprint, Vol. 15, No 32 www.philosophersimprint.org/015032/
- Klein, W. (1994) Time in Language; London: Routledge
- Klein, W. (1995) A time-relational analysis of Russian aspect; In: *Language*, 71/4, 669-695
- Klein, W. (2009) How time is encoded; In: *The expression of time*, ed. by Klein, W., and Li, P.; Berlin: Mouton de Gruyter; 39-82
- Koenig, J.-P., Muansuwan, N. (2000) How to End Without Finishing: Thai Semi-Perfective markings; In: *Journal of Semantics* 17; 147-184
- Kratzer, A. (1977) What can and must Can and Must Mean? In: *Linguistics and Philosophy*, January, Volume 1, issue 3
- Kratzer, A. (1981) The Notional Category of Modality; In: *Words, Worlds, and Contexts: New Approaches in Word Semantics*, ed. by Eikmeyer, H. and Rieser, H.
- Kratzer, A. (1991) Modality; In: *Semantik: Ein internationales Handbuch zeitgenössischer Forschung*, ed. by von Stechow, A. and Wunderlich, D.; Berlin: De Gruyter, 639-650
- Kratzer, A. (1998a) More Structural Analogies Between Pronouns and Tenses; In: *SALT 8*, MIT
- Kratzer, A. (1998b) Scope or Pseudo-Scope Are There Wide-Scope Indefinites?; In: *Events and Grammar*, ed. by Rothstein, S.; Dordrecht: Kluwer Academic Publishers; 163-196
- Kratzer, A. (2006) Decomposing Attitude Verbs; In: *Semantics Archive*, 24; November 2009 <<http://semanticsarchive.net/Archive/DcwY2JkM/attitudeverbs2006.pdf>>
- Kratzer, A. (2007) Situations in Natural Language Semantics; In: *Stanford Encyclopedia of Philosophy*

- Kratzer, A. (2011) What can can mean; SALT 21; Rutgers University; slides
- Kratzer, A. (2013) Modality for the 21st century; University of Geneva; slides
- Krifka, M. (1989) Nominal Reference, Temporal Constitution and Quantification in Event Semantics; In: *Semantics and Contextual Expression*; ed. by Bartsch, R., van Benthem, J., von Stechow, P.; Dordrecht: Foris Publication; 75-115
- Krifka, M. (1992) Thematic Relations as Links Between Nominal Reference and Temporal Construction; In: *Lexical Matters*, ed. by Sag, I., Szabolsci, A.; CSLI
- Krifka, M. (1998) The Origins of Telicity; In: *Events and Grammar*, ed. by Rothstein, S.; Dordrecht; Kluwer Academic Publishers
- Kripke, S. (1963) Semantical Analysis of Modal Logic; In: *Normal modal propositional calculi; Zeitschrift für Mathematische Logik und Grundlagen der Mathematik* 9; 67-96
- Landman, F. (1992) The Progressive; In: *Natural Language Semantics* 1:1; 132
- Lemmon, E. (1966) Algebraic Semantics for Modal Logics I; In: *The Journal of Symbolic Logic*, Vol. 31, No. 1, pp. 46-65
- Levin, B., Rappaport Hovav, M. (1995) Unaccusativity: At the Syntax-Lexical Semantics Interface; Linguistic Inquiry Monograph, 26, MIT Press; Cambridge, MA
- Lewis, David K. (1986) On the plurality of worlds; Cambridge, Mass.; Blackwell
- Link, G. (1998) Algebraic Semantics in Language and Philosophy; Stanford (CA); CSLI Publications
- Mari, A. (2015) Actuality entailments: when the modality is in the presupposition; In: *Lecture Notes in Computer Science*
- Mari, A., Martin, F. (2007) Tense, Abilities, and Actuality Entailment; In: *Proceedings of the Amsterdam Colloquium*
- Maslov, J. (1948/1984) Vid i leksicheskoye znachenije glagola v sovremennom russkom literaturnom jazike (Aspect and the lexical meaning of verb in Modern Russian); In: *Izvestiya Akademii Nauk SSSR*; Reprinted In: *Ocherki po aspektologii* (1984) Leningrad: LSU; 71-90
- Maslov, J. (1973) Universalnye semanticheskiye komponenty v sodержanii grammaticheskoy kategorii sovershennogo/nesovershennogo vida (Universal semantic components in the grammatical category of perfective/imperfective); In: *Sov. Slavjanovedeniye* 4; 73-83
- Matthewson, L. (2015) On the (Non-)Future Orientation of Modals; In: *Proceedings of Sinn und Bedeutung* 16, vol. 2, Cambridge, MA: MIT Working Papers in Linguistics; 431-446
- Moulton, K. (in press) CPs: Copies and Compositionality; In: *Linguistic Inquiry*
- Nadathur, P. (2015) Implicative Verbs and their Presuppositions; ms; Stanford; https://web.stanford.edu/~pnadath/pdfs/implicatives_final.pdf
- Nadathur, P. (2018) Causal Dependence in Ability and Actuality; handout; 11th California Universities Semantics and Pragmatics Workshop; <https://web.stanford.edu/~pnadath/pdfs/Nadathur-CUSP11.pdf>
- Paducheva, E. (1986) Semantika vida i tochka otscheta (The semantics of aspect and the reference point); In: *Izvestiya AS USSR; Series for literature and language* 5; 413-424
- Paducheva, E. (1991) Taksonomicheskije kategorii i tematicheskije klassi predikatov (Taxonomic categories and thematic classes of predicates); In: *Nauchno-tekhnicheskaja informacija*, 2, No 5; 21-31
- Paducheva, E. (1996) Semanticheskije issledovaniya (Semantic Inquiries); Moscow: Jazyki slavyanskoj kultury
- Paducheva, E., Zaliznyak, Anna (1989) Predikati propozicionalnoj ustanovki v modalnom kontekste (Propositional predicates in the modal context); In: *Logicheskij Analiz Jazika (Logical analysis of language)*; Moscow
- Palmer, F. (1986) Mood and Modality; Cambridge: Cambridge University Press; 2nd edition: Cambridge: Cambridge University Press, 2001
- Parsons, T. (1990) Events in the Semantics of English; MIT Press; Cambridge, MA
- Partee, B. (1973) Some structural analogies between tenses and pronouns; In: *Journal of Philosophy* 70, 601-609
- Piñón, C. (2003) Being able to; In: *WCCFL* 22, ed. by Garding, G. and Tsujimura, M.; Somerville, MA: Cascadia Press; 384-397
- Portner, P. (1998) The Progressive in Modal Semantics; In: *Language* 74:4; 760-787
- Portner, P. (2009) Modality; Oxford University Press
- Prior, A. (1967) Past, Present and Future; Clarendon Press

- Ramchand, G. (2006) Verb Meaning and the Lexicon: A First Phase Syntax, University of Tromsø, CASTL
- Reichenbach, H. (1947) The Tenses of Verbs; In: *Elements of Symbolic Logic* 51; New York: The Macmillan Company; 287-298
- Romanova, E. (2004) Superlexical vs. lexical prefixes; Nordlyd 32-2p; Special issue on Slavic prefixes: 255-278
- Romanova, E. (2006) Constructing Perfectivity in Russian; PhD. dissertation; University of Tromsø
- Smith, C. (1992) Parameter of Aspect; Reidel, Dordrecht
- Svenonius, P. (2004) Slavic prefixes inside and outside VP; Nordlyd 32-2; Special issue on Slavic prefixes: 323-361
- Tatevosov, S. (2011) Severing Perfectivity from the Verb; In: *Scando-Slavica*; 57-2
- Tatevosov, S. (2014) Perfectivity in Russian: A Modal Analysis; In: *NELS* 44, Vol 2; 197-210
- Tatevosov, S. (2015) Akcionalnost v Leksike i Grammatike. Glagol i Struktura Sobitija (Aktionsart in Lexicon and Grammar. Verb and Event Structure); Jazyki Slavyanskoy Kulturi; Moscow
- Tatevosov, S. (2016a) Glagolnye Klassy i Tipologija Akcionalnosti (Verb Classes and Typology of Aktionsart); Jazyki Slavyanskoy Kulturi; Moscow
- Tatevosov, S. (2016b) Severing Imperfectivity from the Verb, In: *FDSL* 12
- Thalberg, I. (1969) Austin on Abilities; In *Symposium on J.L. Austin*, ed. by Fann, K., T.; Humanities Press Inc., New York; 182-205
- Thomason, R. (1984) Combinations of tense and modality; In: *Handbook of Philosophical Logic: Extensions of Classical Logic, vol. II*, ed. by Gabbay, D., M. and Guenther, F., Dordrecht: Reidel; 136-165
- Vallejo, D. R. (2017) Actuality Effects as Conversational Implicatures; In: *Journal of pragmatics*, Vol. 112; 44-67
- Varasdi, K. (2014) Making Progressives: Necessary Conditions are Sufficient; In: *Journal of Semantics* 31; 179-207
- Vendler, Z. (1957) Verbs and Times; In: *Philosophical Review* 66:143-160; reprinted in *Linguistics and Philosophy*; Ithaca: Cornell University Press; 97-121
- Verkuyl, H. (1972) On the Compositional Nature of the Aspects; Dordrecht: Reidel
- Werner, T. (2006) Future and Non-future Modal Sentences; In: *Natural Language Semantics*, 14; 235-255
- Zucchi, A. (1993) The Language of Propositions and Events: Issues in the Syntax and Semantics of Nominalization; Ph.D. Thesis; UMass; Dordrecht: Kluwer
- Zucchi, A. (1999) Incomplete Events, Intensionality, and Imperfective Aspect; In: *Natural Language Semantics* 7:2, 179-215
- Zucchi, A. (2015) Events and Situations; In: *Annual Review of Linguistics* 1; 85-106
- von Wright (1968) An Essay in Deontic Logic and the General Theory of Action; In: *Acta Philosophica Fennica*, Ristampato: Dowty (1979)