

# Chapter 1

## Adverbial modification with causative verbs

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It is not unusual to render the meaning of verbs just by naming a monolithic semantic predicate and indicating its adicity. This approach does not uncover the differences between various verb classes, however. One type of evidence that speaks against such treatment is modification. In the paper, I will show that the various cases of adverbial modification with causative verbs require the decomposition of their lexical meaning. Consequently, the semantic representations must display a higher degree of granularity than **Davidson1967a** suggested for action verbs. Adverbials may be anchored to variables that refer to cause, effect, or state. A dilemma emerges: Semantic integration of an adverbial modifier requires that the relevant variable be bound by a  $\lambda$ -operator (cf. **Higginbotham1985**, Bierwisch 1988, von Stechow 2012). Only the highest ranked referential argument variable can be  $\lambda$ -bound at the point of determining reference. I will offer a solution that is based on the modification template as originally proposed by Zimmermann (1992). The template, however, needs to be refined in order for technical implementation to work and, thus, cover the entire range of cases. The empirical data discussed in the present chapter come from the Slavic languages.

### 1 Introduction

The investigation presented in this contribution is concerned with causative verbs, adverbial modifiers and their “anchors” (i.e. the targets of adverbial predication). As will be seen, the question of how to integrate adverbials in sentence semantics is of crucial importance. There must be more than one way of integration – adverbial modifiers may target different entities, not only events as such.<sup>1</sup>

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<sup>1</sup>Events as targets of adverbial modifiers were originally suggested by **Davidson1967a**.

Looking from another angle, we find that adverbials may be used as a heuristic means to pin down the meaning structure of causative verbs.

An initial observation is that adverbials have the potential to be related to a diversity of aspects of what is communicated: the causing situation – (1a, b), the agent – (??), the caused situation – (??), the duration of the resulting state (??), or the degree, the extent of the resulting state – (??).<sup>2, 3</sup> The mapping from abstract sentence semantics to conceptual structure would have to be taken as intransparent, if the semantic decomposition of the involved causative verbs was not assumed.

- (1) a. [XP V pátek] 25letý útočník zabil  
on Friday.ACC 25-year-old attacker.NOM.SG.M kill.LP.SG.M  
jednoho policistu.  
one.GEN/ACC.SG.M policeman.ACC.SG.M  
‘On Friday a twenty-five-year-old attacker killed a police officer.’ (Cz<sup>4</sup>,  
cf. novinky.cz 2021\_0403)
- b. Nacbank [XP mynuloho týžnja] prodav  
national-bank.NOM.SG.M last.GEN week.GEN sell.LP.SG.M  
rekordnu kil’kist’ valjuty.  
record.ACC amount.ACC convertible-currency.GEN  
‘Last week the National Bank sold a record sum of convertible  
currency.’ (Ukr, pravda.com.ua 2022\_0530)
- c. Toj [XP namerno] go skrši  
he intentionally.ADV it.CL.ACC.SG.M break.aor.3sg  
prozorecot.  
window.sg.m.def  
‘He broke the window intentionally.’ (Mac)

<sup>2</sup>The examples that are used to illustrate the points made in this contribution come from the Slavic languages. For examples that were extracted from web sites, the date when the news report appeared is specified. Where no source is indicated, the examples were constructed and discussed with native speakers.

<sup>3</sup>In the example sentences, the adverbials that are relevant for the discussion are given in square brackets. The label XP is meant to cover different cases of realization, with the syntactic head  $X \in \{P, N, Adv\}$ , cf., e.g., (1a-c). One should, however, bear in mind that there are good reasons to analyze all occurrences of adverbials as PPs. I refrain from discussing the details of such a unified analysis here.

<sup>4</sup>Languages are abbreviated as follows: BCS (Bosnian, Croatian, Serbian) · Bel(arusian) · Bg (Bulgarian) · Croat(ian) · Cz(ech) · LSorb (Lower Sorbian) · Mac(edonian) · OCS (Old Church Slavonic) · Po(lish) · Ru(ssian) · Serb(ian) · Sk (Slovak) · Slvn (Slovenian) · Ukr(ainian) · USorb (Upper Sorbian)

- d. Vratata se zatvori [<sub>XP</sub> s trjasâk].  
 door.SG.F.DEF REFL close.AOR.3SG with bang  
 ‘The door closed with a bang.’ (Bg)
- e. Neugomonnaja vražda nas razdelila [<sub>XP</sub>  
 incessant.NOM.SG.F enmity.NOM.SG.F us.ACC divide.LP.SG.F  
 navsegda]!  
 for-good.ADV  
 ‘Incessant enmity divided us for good!’ (Ru, Lermontov: *Dva brata*)
- f. Siły rosyjskie [<sub>XP</sub> całkowicie] zniszczyły  
 force.NOM.PL Russian.NOM.PL completely destroy.LP.PL  
 Donbas.  
 Donbas.ACC  
 ‘Russian (military) forces completely destroyed the Donbas.’ (Po,  
 tvn24.pl 2022\_0520)

It is important to emphasize that, in the semantic field of causativity, we have to distinguish between lexical causatives and causative constructions (Kulikov2001).<sup>5</sup> The differences between the two types manifest themselves in the number of lexical items involved, the steps and complexity of syntactic structure building, and the way in which the semantic representation of the sentence is created.

The examples in (2)–(5) present verbs that are lexically causative. Since the Slavic languages are morphologically rich, one would expect causative verbs to be recognizable by a morphological marker. However, not every causative verb has an exponent of causativity, e.g. a suffix. Compare the (a) and (b)-examples in (2)–(5). Evidently, derived causative verbs form only a subset of the entire set.

- (2) a. vy/žec’ (PF/IPF, vt) ‘burn’ < \*žēg-ti<sup>6, 7</sup>  
 b. vy/suš-i-t’ (PF/IPF, vt) ‘dry’ < \*sux- ‘dry’ (Ru)
- (3) a. u/kraść (PF/IPF, vt) ‘steal’ < \*krad-ti  
 b. u/top-i-ć (PF/IPF, vt) ‘drown, immerse sb., sth.’ < \*top-<sup>8</sup> (Po)

<sup>5</sup>For lexical causatives, see, e.g., Fabricius-Hansen1991. Causative constructions are dealt with by Song (2011a, b) inter alia.

<sup>6</sup>The convention of historical linguistics to mark reconstructed forms with an asterisk is used where applicable.

<sup>7</sup>-ti is the infinitive marker in Proto-Slavic. The modern Slavic languages show variants of the marker that resulted from language-specific changes. The prefixes (separated by the slash) contribute perfective (grammatical) aspect.

<sup>8</sup>Compare *to-nq-ć* (vi) ‘drown, sink, go under (in water)’ < \*top-nq-ti (Leskien1922)

- (4) a. po/mes-ti (PF/IPF, vt) ‘sweep (out)’ < \*met-ti  
 b. po/čist-i-ti (PF/IPF, vt) ‘clean’ < \*čist- ‘clean’ (Croat)
- (5) a. iz/bos-ti (PF/IPF, vt) ‘gouge out; sting’ < \*bod-ti  
 b. iz/modr-i-ti (PF/IPF, vt) ‘make sb. wise’ < \*mōdr- ‘wise’ (Slvn)

Causative constructions are syntactically complex structures in contrast to causative verbs, which are syntactic atoms.<sup>9</sup> See examples (??).

- (6) a. Cēsar’i sūtvari jī slyšati rěči sijō.  
 emperor.NOM make.AOR.3SG him.ACC hear.INF speech.ACC this.ACC  
 ‘The Emperor had him (Constantine) listen to this matter (lit. speech).’ (OCS, *Vita Constantini*)
- b. Evo ću ih učiniti da dođu i da  
 behold AUX.1SG them.ACC make.INF PRTCL come.PRS.3PL and PRTCL  
 se poklone pred nogama tvojim.  
 REFL bow.PRS.3PL before feet.INS.PL your.INS.PL  
 ‘Behold, I will make them come and bow before thy feet.’ (Serb, Rev. 3:9)
- c. Učinio ju je da u životu ponovo vidi  
 make.LP.SG.M her.ACC AUX.3SG PRTCL in life.LOC anew.ADV see.PRS.3SG  
 smisao.  
 sense.ACC  
 ‘He brought about that she perceived her life as meaningful once again.’ (Croat, cf. jutarnji.hr 2022\_0715)
- d. Turecký prezident nechal  
 Turkish.NOM.SG.M president.NOM.SG.M let.LP.SG.M  
 ruského prezidenta čakať takmer  
 Russian.GEN/ACC.SG.M president.GEN/ACC.SG.M wait.INF almost  
 minútu.  
 minute.ACC  
 ‘The Turkish president let the Russian president wait for almost a minute.’ (Sk, startitup.sk 2022\_0720)
- e. Žiona zmusila go do sprzedania PS5.  
 wife.NOM.SG.F force.LP.SG.F him.ACC into selling.GEN iPS5.GEN  
 ‘His wife forced him to sell the PlayStation 5.’ (Po, itech.wp.pl 2020\_1130)

<sup>9</sup>A lexicalist approach to morphology is adopted here.

- f. Ty sy ju glucnu wucynil.  
 you.NOM AUX.2SG her.ACC happy.ACC.SG.F make.LP.3SG.M  
 ‘You made her happy.’ (LSorb,  
<https://niedersorbisch.de/dnw/woerterbuch/machen>)
- g. Anonimnyj žurnalist podverg operu  
 anonymous.NOM.SG.M journalist.NOM.SG.M subject.LP.SG.M opera.acc  
 Šostakoviča rezkoj kritike.  
 Shostakovich.GEN harsh.DAT criticism.DAT  
 ‘An anonymous journalist subjected Shostakovich’s opera to harsh criticism.’ (Ru)
- h. Padstavili arhanizataraw perapisu pad  
 put.LP.PL organizers.GEN/ACC.PL.M census.gen under  
 rèprèsii.  
 repression.ACC.PL  
 ‘They subjected the organizers of the census to repressions.’ (Bel, cf.  
[bielarus.net](http://bielarus.net) 2020\_0603)

Causativity in natural languages has been a long-standing topic in linguistics. See Bierwisch (2002, 2005), **Comrie1976**, **Dixon2000**, **Farber1976**, **Fodor1970**, **KemmerVerhagen1994**, **Kulikov2001**, Levin & Rappaport Hovav1994, McCawley (1968), Nedjalkov & Sil’nickij (1969a, b), Neeleman & van de Koot2012, **Shibatani1976**, Shibatani (ed.) (1976), Shibatani (ed.) (2002), Song (2011a, b), **Talmy1976**, **Wali1981**, **Wierzbicka1975**, Wolff, **SongDriscoll2002**, Wunderlich (1997) and many more. Work on causative verbs specifically in Slavic includes **Batistić1978**, **Bilandžija2014**, **Bondaruk2021**, **Karlik2002**, and **Padučeva2001**.

The empirical distinction between causative verbs and causative constructions cannot be under doubt. What has been debated, though, are the issues of whether the meaning of causative verbs is monolithic or not and whether causative verbs are lexical items and, hence, represented by a V-head in syntax or emerge by combining a number of heads whose nature is rather semantic than syntactic. For the latter approach see, e.g., **McCawley1971**, von **Stechow1996**, Alexiadou, **AnagnostopoulouSchäfer2006**, **Ramchand2008**, **Schäfer2008**, Alexiadou (2010, 2012), or **Bondaruk2021**, who have made assumptions that are based on ideas developed in the framework of generative semantics of the 1960s and revived by adherents of the theory of distributed morphology, cf. **HalleMarantz1993**, amongst others.

The fact that we find both non-derived and derived causative verbs has implications for claims concerning the representation of their meaning. Some, but

not all, verbs are recognizable as causative verbs through a morphological exponent, e.g. a suffix, see above, examples (2)–(5). Hence, membership in the lexical class of causative verbs does not imply morphological signalling. From this it follows that there must be a causative component in the meaning representation of the respective verbs as such. This leads to the conclusion that the meaning of causative verbs must be given in a decomposed form.

Now the question arises whether a coarse-grained analysis as in (7) should suffice or whether we have to go further and suggest an even more fine-grained analysis.

- (7) [x CAUSE [BECOME [STATE y]]]

To answer this question is a major task of the present chapter. My claim is that an investigation into the issue of adverbial modification is essential for answering the question.

Two general aspects must be taken into account: (i) The verbs encode a relation between a cause and an effect (Bierwisch2005). (ii) Causal relations hold between events (Davidson1967b, Lewis1973), or in more general terms: situations (BarwisePerry1983); see also McCawley1976.

The task is to propose a precise analysis of the semantic structure of causative verbs, that is, to uncover enough structure in order to be able to adequately describe and explain the properties of the verbs and the sentences in which they appear. Prerequisites are a formal framework, explicit assumptions concerning the structure and interpretation of linguistic expressions, and an adequate semantic metalanguage. I will use a lambda-categorial language as developed in the *Two-level semantics framework* (Bierwisch 1982, 1986, 2007; for a general characterization of this framework see LangMaienenborn2011).

Among the semantic ingredients are cause (causing situation), effect (caused situation), transition, source state, and target state. These ingredients imply that causative verbs belong to the so-called change-of-state verbs (Dowty1979, Fabricius-Hansen1999, Rappaport HovavLevin2005).

The lexical systems of the Slavic languages display relations between items that encode states, transitions that result in states, and caused transitions resulting in states, respectively. This might suggest a general way of building up meaning. See Table 1<sup>10</sup> and the paradigms in (8) and (9). What is exemplified here is not the only pattern, however.<sup>11</sup>

<sup>10</sup>Table 1 has been modelled after the one presented by Bierwisch2005 for German.

<sup>11</sup>See Tables 1 and 2 below for another pattern.

Table 1: One pattern of lexical relations

'State' (ADJ)	'Become State' (vi · IPF/PF)	'Cause Become State' (vt)	
slěpŭ	oslī(p)nŏti	oslěpiti	(OCS)
slepoj	slepnut' / oslepnut'	oslepit'	(Ru)
slipyj	slipnuty / oslipnuty	oslipyty	(Ukr)
sljapy	slepnuc' / aslepnuc'	asljapic'	(Bel)
ślepy	ślepnąć / oślepnąć	oślepić	(Po)
slepý	slepnout / oslepnout	oslepit	(Cz)
slijep	slijepjeti / oslijepjeti	oslijepiti	(Croat)
slep	slepeti / oslepeti	oslepeti	(Serb)
sljap	slepeja, -eeš / oslepeja, -eeš	oslepa, -iš	(Bg)
'blind'	'become blind'	'make sb. blind'	

- (8) a. Odežda                      suxa.  
           clothing.NOM.SG.F dry.NOM.SG.F  
           'The clothes are dry.'
- b. Odežda                      vysoxla.<sup>12</sup>  
           clothing.NOM.SG.F dry.LP.SG.F  
           'The clothes have dried.'
- c. Solnce                      vysušilo    odeždu.  
           sun.NOM.SG.N dry.LP.SG.N clothing.ACC.SG.F  
           'The sun has dried the clothes.' (Ru)
- (9) a. Bielizna                      jest                      sucha.<sup>13</sup>  
           laundry.NOM.SG.F be.PRS.3SG dry.NOM.SG.F  
           'The laundry is dry.'
- b. Bielizna                      wyschła.  
           laundry.NOM.SG.F dry.LP.SG.F  
           'The laundry has dried.'
- c. Słońce                      wysuszyło bieliznę.  
           sun.NOM.SG.N dry.LP.SG.N laundry.ACC.SG.F  
           'The sun has dried the laundry.' (Po)

<sup>12</sup>According to Tixonov1985, *sux-* and *sox-* are variants of one and the same root. The variants reflect an old ablaut relation, cf. Vasmer (1955: 704 and 1958: 54).

<sup>13</sup>{-*such-*, -*sch-*, -*susz-*, -*syich-*} are allomorphs of the root.

Although the relations appear systematic, it must be emphasized that corresponding lexical items do not exist in all cases. Also, the lexical relations are not necessarily identical in the various languages, if they exist at all. While, for example, English *open* (adj.) > *to open* (verbum intransitivum) > *to open* (verbum transitivum) may exemplify the adjective > inchoative verb > causative verb derivation (albeit without any overt morphological reflex), in Slavic we see a different path for this lexical field, with the causative verb as the starting point for two processes: (i) The adjective derives from the stem of the passive participle of the transitive causative verb and (ii) the inchoative verb (“decausative”) results from combining the causative verb with the reflexive marker (cf. **Padučeva2003**: 174, **Fehrmann, JunghannsLenertová2014**: 292).<sup>14</sup> Morphological structure and complexity show this clearly. See Tables 1 and 2.

Table 2: Adjective derivation

Causative verb (infinitive)	Passive Participle (stem)	Adjective
otkryt’	otkry-t-	otkry-t-yj (Ru)
otevřít	otevř-en-	otevř-en-ý (Cz)
otvoriti	otvor-en-	otvor-en-i (BCS)
‘to open’ (vt)	‘opened’	‘open’

Table 3: Decausative formation

Causative verb	Inchoative verb
otkryt’	otkryt’-sja (Ru)
otevřít	otevřít se (Cz)
otvoriti	otvoriti se (BCS)
open.INF	open.INF.REFL
‘to open’ (vt)	‘to open’ (vi)

Importantly, we must be aware of the fact that the existence of related or related lexical items speaks neither for nor against the decomposition of the meaning of causative verbs. The semantic representation that results from decomposing a verb’s meaning is abstract (cf. **Bierwisch2011**: 324), it does not depend on

<sup>14</sup>A similar claim was made by **Reinhart2016**: “Unaccusative and one-place [verbs] originate as two-place predicates, and they are derived from their transitive alternate by a reduction operation.”



the existence or non-existence of other lexical items, and it is irrelevant whether the object language has a syntactic construction with identical or similar meaning. The discussion whether or not the English verb *kill* means ‘cause to die’<sup>15</sup> is obsolete – *kill* is a verb with an abstract meaning representation, whereas the object-language expression *cause to die* is a syntactic construction comprising a number of lexical items; their abstract meanings yield, by composition, the abstract meaning of the whole.

Among the issues that need to be addressed in order to solve the question of how to represent the meaning of causative verbs are the following: (i) What is the conceptual and semantic structure of the causing situation? (ii) Is the “causer” always an agent? (iii) What is the conceptual and semantic structure of the caused situation? (iv) What is the formal correlate of the causal relation?

Interestingly, adverbials will contribute to the solution, since, as I claim, the decomposition of the lexical meaning of causative verbs is necessary for covering all types of adverbial modification occurring with them. What is needed is, in fact, a fine-grained semantic representation which reflects the partial situations involved and comprises a sufficient number of variables referring to those situations.

In what follows, an approach will be developed that, as I will argue, comes up to the goal of finding an adequate analysis for causative verbs and adverbial modifiers.

In section 2, I will present and discuss proposals as to how the meaning of causative verbs is to be represented. §?? will be devoted to adverbials – their syntax and semantics (3.1) as well as the issues of adverbials and states (3.2), adverbials and caused situations (3.3), and, adverbials and causing situations (3.4). Problems will come to light that concern the impossibility of semantically integrating adverbials in certain cases, unless refinements of the apparatus are introduced the necessity of which follows from empirical observations and considerations of their impact. In section 4, I will introduce my proposal, namely refinements of Zimmermann’s (1992) modification template and what the newly proposed templates effect in the course of semantic composition. By the extended and refined apparatus, I will argue, it is possible to cover not only the case of adverbial modification of the causing situation, but also the cases that, in the course of the discussion in section 3, have turned out to pose problems for the semantic integration of adverbials modifying the target state and the caused situation,

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<sup>15</sup>The discussion had been ongoing since the 1960s, see, e.g., Fodor1970, Wierzbicka1975, McCawley (1968), Shibatani (1975, 1976), Shibatani (ed.) (1976), Saksena1982, FanselowStaudacher1991, and Kulikov2001.

respectively. §?? summarizes the discussion, lists the specific versions of the modification template, and shows in what form these versions can be generalized.

## 2 Representation of verb meaning

In the linguistic literature, the meaning of causative verbs is often rendered as a relation as simple as that in (10).

(10)  $P(x, y)$

Accordingly, verbs like English *open* or *kill* and their equivalents in other languages would be represented as in (??) and (??), respectively. Consequently, these representations would have to be taken as the basis for the computation of the meaning of sentences as in (11b, c) and (12b, c).

(11) a. OPEN ( $x, y$ )

b. Som list wó(t)cynił.  
AUX.1SG letter.ACC open.LP.SG.M  
'I opened the letter.' (LSorb,  
<https://niedersorbisch.de/dnw/woerterbuch/oeffnen>)

c. Sym wokno woćinił.  
AUX.1SG window.ACC open.LP.SG.M  
'I opened the window.' (USorb, Breu2011: 161, fn 14)

(12) a. KILL ( $x, y$ )

b. Kain swójogo bratša wusmjerši.  
Cain.NOM.SG.M his brother.GEN/ACC kill.PST.3SG  
'Cain killed his brother.' (LSorb, cf. New Testament, 1 John 3,12)

c. Kain swojeho bratra zabi.  
Cain.NOM.SG.M his brother.GEN/ACC kill.PST.3SG  
'Cain killed his brother.' (USorb, cf. New Testament, 1 John 3,12)

(13) a. BUTTER ( $x, y$ )

b. Jones buttered the toast. (cf. Davidson1980 [1967a]: 107)

(14) HIT<sub>HARRY</sub>, MARY (cf. Fillmore1968: 374)

(15) a. (for which person  $x$ ,  $x$  hit Bill)

b. Who hit Bill? (cf. Chomsky 1981: 324)

- (16) a. break (x (y))  
b. The girl broke the window. (cf. **Grimshaw1990**: 24)

The above representations (and other similar ones) of the meaning of causative verbs are not adequate.<sup>16</sup> This is for the following three reasons: (i) It is coarse-grained and does not render the event structure. (ii) The way conceptual interpretation could be derived from it is non-transparent and, thus, unclear. (iii) Different anchors of adverbial modification do not have formal counterparts – they do not occur in the analysis and would have to be inferred. The notation is not complex enough: it names the verbal predicate and indicates its adicity (number of arguments). If this is all that is stated in a representation, claims that lexical meaning should not be decomposed at all (e.g., **Putnam1975**) would be strengthened.

There is a further deficiency: any difference between actions, on the one hand, and natural occurrences and states, on the other, could not be detected; consider (??) and (18), respectively.

- (17) Sunce            je            dostiglo            zenit.  
sun.NOM.SG.N AUX.3SG reach.LP.SG.N zenith.ACC  
‘The sun reached the zenith.’ (BCS)
- (18) Petâr obiĉa            Marija.  
Petâr love.PRS.3SG Marija  
‘Petâr loves Marija.’ (Bg)

Classifications of verbs would be the result of pure intuition; it would, de facto, have to suffice to simply declare a verbal lexeme as a member of a lexical class. Structural grammar, however, has to invoke features, e.g. functors, as the basis for class formation (cf. **Steube1988**, chapter 6).

**Bierwisch2005** points out systematic relations between different types of predication. Proceeding from this we may assume a schema<sup>17</sup> as the following.

- (19) [CAUSE [TRANSITION [STATE]]]

<sup>16</sup>I concede that those semantic notations are, of course, legitimate in case issues are investigated for whose treatment more fine-grained analyses are not required. However, if lexical semantics proper is the object of investigation, then coarse-grained representations of verb meaning clearly are simplifications.

<sup>17</sup>I should like to emphasize that this is a semantic schema. It represents structured lexical semantics but not a hierarchy of abstract syntactic heads (for a syntactic approach, see, for example, **Ramchand2008**). As I will argue below, Slavic verbs are syntactic atoms and, therefore, inserted under the lexical V-head in syntax.

Based on this scheme we get the following representations for *kill* and *open*, respectively.

- (20)  $[[x \text{ does something}] \text{ CAUSE } [\text{BECOME } \neg[y \text{ is alive}]]]$   
(cf. Dowty1979: 91)
- (21)  $\lambda y \lambda x \lambda s [[[ \text{ACT } x ] [ \text{CAUSE } [\text{BECOME } [\text{OPEN } y]]]]] s]$   
(Bierwisch2002)

The assumption of semantic predicates like ACT (Bierwisch2002, Bierwisch2005), DO-something (Dowty1979, Levin & Rappaport Hovav1995), or *do* as a realization of a “higher predicate of intentionality” with the action verb proper more deeply embedded (Ross1972) provokes the following question: Is it always the case that an action occurs as the cause?

Many causative verbs co-occur not only with agents but also with non-volitional causers. Compare:

- (22) a. Mladý                      chlapec                      zabil                      dievča.  
young.NOM.SG.M guy.NOM.SG.M kill.LP.SG.M girl.ACC.SG.N  
‘A young man killed a girl.’ (Sk,  
<https://www.kkbagala.sk/texty/bitky-na-papieri-su-bez-krvi/>  
accessed 2022\_0829)
- b. Plyn                      zabil                      dievča.  
gas.NOM.SG.M kill.LP.SG.M girl.ACC.SG.N  
‘Gas killed a girl.’ (Sk, cf. cas.sk 2009\_0112)

That is why Fehrmann, Junghanns & Lenertová2014 proposed abstracting over the semantic predicate in order to avoid the exclusion of non-actions. They treat the predicate variable *P* as a semantic parameter.<sup>18</sup>

- (23)  $\lambda y \lambda x \lambda s [[[P \ x] [ \text{CAUSE } [\text{BECOME } [\text{OPEN } y]]]]] s]$   
(Fehrmann, JunghannsLenertová2014: 304)

As stated above, adverbial modification with causative verbs may relate to different situations – the causing situation vs. the caused situation, leaving states for the moment aside.

The local and temporal adverbial in (24) and (25), respectively, predicate over the causing situation. Thus, they are represented as predicates of *s* in the formal notation. See below, section 3.4.

<sup>18</sup>At the level of Conceptual Structure the parameter is specified by way of an interpretation that is based on the context.

- (24) [XP Pid Izjumom] ukrajins'ki vojiny zbyly  
near Izyum.INS Ukrainian.NOM.PL soldier.NOM.PL  
rosijs'kyj vertolit.  
shoot-down.LP.PL Russian.ACC helicopter.ACC  
'Near Izyum Ukrainian soldiers shot down a Russian helicopter.' (Ukr,  
pravda.com.ua 2022\_0613)
- (25) Miroslav Polcar svou přítelkyni zavraždil [XP v březnu].  
Miroslav Polcar his girlfriend.ACC murder.LP.SG.M in March.LOC  
'Miroslav Polcar murdered his girlfriend in March.' (Cz, cf. blesk.cz  
2014\_1022)

The example in (26) presents a complex verb that is the result of attaching the reflexive marker to the transitive verb *začynic* 'close'. In the course of this process, the argument structure of the verb is affected, which is the basis for the decausative interpretation of the sentence.<sup>19</sup> The modal adverbial *cixa* 'quietly' that occurs in (26) characterizes the caused situation, i.e. the transition to the target state.

- (26) Dzvery<sup>20</sup> [XP cixa] začynilisja.  
door.NOM.PL.F quietly.ADV close.LP.PL.REFL  
'The door quietly closed.' (Bel)

In order to cover the various cases, the semantic representation in (23) has to be improved. The variable *s'* is introduced. It stands for the caused situation. The two situation variables – *s* and *s'* – are related by the CAUSE operator.<sup>21</sup>

- (27)  $\lambda y \lambda x \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [\text{OPEN } y]]]]]$   
(Fehrmann, JunghannsLenertová2014: 305)<sup>22</sup>

<sup>19</sup>The term "decausative" goes back to Padučeva2003 who considers the reflexively marked verb as the result of a derivation process. Fehrmann, JunghannsLenertová2014 support Padučeva's view that the causative component of the underlying transitive verb persists. See below, section 3.3 for further discussion.

<sup>20</sup>The equivalent of 'door' is a *plurale tantum* in the Slavic languages presented here, with the exception of modern Bg, see (?). However in older stages of Bg, the word was a *plurale tantum* too.

<sup>21</sup>Davidson1967b, Dowty1979, and Bierwisch (2002, 2005) assume a CAUSE operator relating events (situations).

<sup>22</sup>": represents the asymmetric logical conjunction, cf. Heidolph1992. The INST functor maps from the situation class to an instance of the class, cf. Bierwisch (1990: 176).

The assumption of the variable *s'* provides the basis for explaining adverbials as predicates of the caused situation. We are now able to cover both cases of adverbial predication that have been discussed so far.

Have we already reached the final, optimal, representation of the meaning of causative verbs? Consider examples such as the following:

- (28) Stanciju metro “Park Pobedy” zakryli [XP na dva  
station.ACC subway.INDECL Park Pobedy close.LP.PL for two.ACC  
dnja].  
days.GEN.SG  
‘They closed the subway station “Park Pobedy” for two days.’ (Ru,  
spbdnevnik.ru 2021\_0103)
- (29) Dálnici D5 na sedmém kilometru ve směru na  
motorway.ACC D5 at seventh.LOC kilometer.LOC in direction.LOC to  
Prahu v neděli večer [XP na zhruba dvě hodiny]  
Prague.ACC on Sunday.ACC evening for about two.ACC hours.ACC.PL  
uzavřela nehoda osobního auta a  
close.LP.SG.F accident.NOM.SG.F passenger.GEN car.GEN and  
motorky.  
motorbike.GEN  
‘An accident between a passenger car and a motorbike led to the closure  
of the D5 motorway for about two hours at kilometer seven in the  
direction to Prague.’ (Cz, lidovky.cz 2021\_0627)

In these examples, the adverbial relates to the resulting state (target state). It turns out that a variable referring to this state must be introduced. This variable is given as *z* in the following representation.

- (30)  $\lambda y \lambda x \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST BECOME } [z \approx [Q \ y]]]]]$ <sup>23</sup>

Now we have arrived at a fine-grained meaning representation for causative verbs, with the three variables *s*, *s'* and *z* as potential anchors for adverbial modification.<sup>24</sup> In a way, the analysis suggested here zooms in on the meaning struc-

<sup>23</sup>The variable *z* stands for an abstract state argument. “ $\approx$ ” is a junctor that relates *z* to an expression that characterizes it. See Maienborn (2003, 2005, 2007), Geist2006, and Pitsch (2014).

<sup>24</sup>Three variables are also suggested by Koontz Garboden2009 – *v* (causing eventuality), *e* (caused change-of-state event), and *s* (resulting state).

ture.<sup>25</sup>

We turn next (in section 3 below) to general aspects of adverbials and the non-trivial problem of how to properly integrate adverbials in the compositional semantics.

### 3 Adverbials

### 3.1 Syntax and semantics

In principle, there are two types of adverbials: (i) free adverbials (adjuncts) and (ii) necessary adverbials (complements).<sup>26</sup>

In the most common case, adverbials are expressions which can freely occur in sentences. They are phrases (XPs) adjoining to phrases in sentence structure.

- (31) PPO<sup>27</sup> [[<sub>XP</sub> unoči] [[ zbyla 2 litaky  
air-defense.NOM.SG.F in.night shoot-down.LP.SG.F two planes.ACC  
RF] [<sub>XP</sub> nad Dnipropetrovščynoju]]].  
Russian.Federation.GEN above Dnipro.region.INS  
'During the night, the (Ukrainian) air defense shot down two airplanes of  
the Russian Federation that were flying over the district of Dnipro.' (Ukr,  
pravda.com.ua 2022\_0317)
- (32) Ozbroyenyj čolovik [[<sub>XP</sub> u supermarketi v  
armed.NOM.SG.M man.NOM.SG.M in supermarket.LOC in  
amerykans'komu misti Buffalo] [rozstriljav ščonajmenše 10  
American.LOC city.LOC Buffalo shoot.LP.SG.M at-least ten  
ljudej]].  
people.GEN.PL  
'An armed man shot at least ten people in a supermarket in the American  
city of Buffalo.' (Ukr, pravda.com.ua 2022\_0515)

<sup>25</sup>The global reference of a causative verb to an event is not undermined: "A verb refers to one and only one [...] event, irrespective of the complex structure of causatives and inchoatives involving causation, cause, effect, transition, source [state], and target state." (Bierwisch2005)

<sup>26</sup> Apart from these, sentences can contain parenthetic adverbials. They have a special status and are thus not considered in this paper.

<sup>27</sup> PPO stands for *Protypovitrijana oborona* 'air defense'.

- (33) [[<sub>XP</sub> Na drodze krajowej nr 83, pod Turkiem], [wiatr  
on road.LOC state.LOC No. 83 near Turek.INS wind.NOM.SG.M  
przewrócił na bok naczepę ciężarówki, w której  
overturn.LP.SG.M on side.ACC trailer.ACC truck.GEN in which.LOC  
były puste puszki na piwo]].  
be.LP.PL empty.NOM.PL.F can.NOM.PL.F for beer.ACC  
'On state road N<sup>o</sup>. 83, the trailer of a truck laden with empty beer cans  
was overturned by the wind.' (Po, tvn24.pl 2017\_0303)
- (34) [[<sub>XP</sub> Na gaj paradi u Jerusalmu] [pripadnik radikalne  
on gay parade.LOC in Jerusalem.LOC follower.NOM.SG.M radical.GEN  
jevrejske organizacije Haredi [[<sub>XP</sub> nožem] [je  
Jewish.GEN organization.GEN Haredi knife.INS AUX.3SG  
ranio šestoro ljudi]]]].  
injure.LP.SG.M six people.GEN.PL  
'On the gay parade in Jerusalem a follower of Haredi, a radical Jewish  
organization, wounded six people with a knife.' (Serb, rts.rs 2015\_0730)

In the special case, adverbials are necessitated by the semantics of the verb and, therefore, realized as complements in syntax (see, e.g., **Steube1988**: ch. 6.2, **Werkmann2003**: 52-53). Local, directional, and temporal expressions are instances of such adverbials.<sup>28</sup>

- (35) Piotr [mieszka \*([<sub>XP</sub> w Warszawie])].  
Piotr.NOM live.PRS.3SG in Warsaw.LOC  
'Piotr lives in Warsaw.' (Po)
- (36) Marija [otiva \*([<sub>XP</sub> v grada])].  
Marija go.PRS.3SG to town.DEF  
'Marija goes to town.' (Bg)
- (37) Rebënok [rodilsja \*([<sub>XP</sub> v prošlom godu])].  
child.NOM.SG.M be-born.LP.SG.M.REFL in last.LOC year.LOC  
'The child was born last year.' (Ru)

Semantically, adverbials serve as modifiers<sup>29</sup> of situations, see example (38), or states, see section 3.2.

<sup>28</sup>By convention, an asterisk preceding round brackets means that the object-language expression must not be omitted.

<sup>29</sup>**Bartsch1972**, inter alia, distinguishes between VP-modifying and S(entence)-modifying adverbials. In the Slavic languages, the difference is not brought to light by different syntactic behaviour of the adverbials.



- (38) a. Policijata zatvori ulicata [<sub>XP</sub> zaradi bomba].  
 police.SG.F.DEF close.AOR.3SG street.DEF because.of bomb  
 ‘The police closed the street due to a bomb alert.’ (Bg)  
 b. R<sub>caus</sub> (s, [∃y [[BOMB y] : [QUANT y = 1]]])

Adverbial modifiers of nominal expressions restrict the denotation as in example (39).

- (39) a. glasovi [<sub>XP</sub> iza zida]  
 voice.NOM.PL behind wall.GEN.SG  
 ‘voices behind the wall’ (Croat)  
 b. [[VOICE x :  
 [QUANT x ≥ 2]] : [x BEHIND THE WALL]]

Specific questions arise concerning the syntactic positions of adverbials. What positions do adverbials occupy in the underlying structure and in what positions do they occur at the surface? These questions are not trivial for languages with so-called free constituent order.

There has been a long-lasting discussion concerning the criteria and factors for adverbial placement, cf. **Maienborn1996**, **Alexiadou1997**, **Frey2003**, **FreyPittner1999**, **Steinitz (1969)**, **Cinque (1999, 2004)**, inter alia. Many linguists adhere to the view of a rigid, semantically determined hierarchy of adverbials. No convincing evidence for this can be found in the Slavic languages. In these languages, there are almost no restrictions and adverbials of different types show up in many positions. The positions that we see at the surface reflect requirements of information structure rather than fixed syntactic placement. Relative scope can be an additional factor (cf. **Junghanns2002** and 2006, **Szucsich2002**, **Werkmann2003**, and **Biskup2011**).

In Slavic languages, free adverbials are merged as adjuncts to VP but can occur in higher positions at the surface (cf. **Junghanns2002** and **Werkmann2003**, amongst others). A relatively low base-generated position can be shown even for so-called sentential adverbials (**Junghanns2006**). Compare the following examples:

- (40) a. ... abych mu<sub>i</sub> [<sub>DP</sub> ten zvláštní a  
 in\_order\_to.COND.1SG him.DAT this.ACC special.ACC and  
 pravdivý námet]<sub>j</sub> [[<sub>SA</sub> skutečně] [daroval \_\_\_\_<sub>i</sub>  
 true.ACC story.ACC really.ADV give-as-present.LP.SG.M

—<sub>j</sub> ]].

‘... so that I really would give him this special and true story.’ (Cz, Junghanns2006: 117)

- b. Vždyt’ já<sub>i</sub> ho<sub>j</sub> [[<sub>XP</sub> jednou] [[<sub>SA</sub> opravdu] [[<sub>XP</sub> after-all I.NOM him.ACC one\_day really completely úplně] [ —<sub>i</sub> opustím —<sub>j</sub> ]]]].  
leave.PRS.1SG

‘After all, one day I really will leave him for good.’ (Cz, Junghanns2006: 117)

either use “3SG.DAT” in glosses, or him, but not “him.DAT”

How do adverbials get integrated in the course of semantic composition?

The operation effecting the integration of adjunct adverbials has been given different names – theta identification (Higginbotham1985), unification of theta roles (Bierwisch 1988), or predicate modification (von Stechow 2012). The approach chosen by Zimmermann (1992) is specific in that it involves a modification template. The differently named operations all yield the same result: logical conjunction of predicates.

In the following example we see in (b) the result of amalgamating the meaning of the VP (modificandum) and the meaning of the adverbial (modifier), irrelevant details omitted.

- (41) a. Blesk [<sub>XP</sub> v Tatrách] zabil  
lightning.NOM.SG.M in Tatra-mountains.LOC.PL kill.LP.SG.M  
otca rodiny.  
father.GEN/ACC family.GEN  
‘In the Tatra mountains, a bolt of lightning killed the father of a family.’ (Sk, noviny.sk 2016\_0727)  
b. λs [[s INST [P ...]]] : [[s CAUSE ...] : [[LOC s] ⊂ [LOC TATRA]]]]

presumably, lightning is lexically specified for masculine, so this does not have to be added in the gloss

Necessary adverbials are semantically integrated in a different way. Since they have the status of an argument of the verb, they replace a predicate variable Q in the verb’s meaning representation via functional application. Technically this is achieved by lambda conversion. As a result we get conjoined predicates.

- (42)  $\lambda Q \dots \lambda s [s \text{ INST } [\dots] : [Q \ s]]$

The interaction of syntax and semantics sketched here is transparent and non-redundant. In other approaches (e.g., Schäfer2008), syntax encodes event structure, proceeding from state via change of state to causation. In my opinion, this puts a semantic overload on syntax, however. One reason to reject such an approach is the integrity of the verbal lexeme in Slavic.<sup>30, 31</sup>

### 3.2 Adverbials and states

Adverbials can predicate over states. This is a rather restricted case. Durative adverbials are one type that can be used in this function. They indicate the time period for which the resulting state is claimed to last or has lasted.

- (43) Stanciju metro “Park Pobedy” zakryli [<sub>XP</sub> na dva  
station.ACC subway.INDECL “Park Pobedy” close.LP.PL for two.ACC  
dnja].  
days.GEN.SG  
‘They closed the subway station “Park Pobedy” for two days.’ (Ru,  
spbdnevnik.ru 2021\_0103)
- (44) Dálnici D5 [<sub>XP</sub> na zhruba dvě hodiny] uzavřela  
motorway.ACC D5 for about two.ACC hours.ACC.PL close.LP.SG.F  
nehoda osobního auta a motorky.  
accident.NOM.SG.F passenger.GEN car.GEN and motorbike.GEN  
‘An accident between a passenger car and a motorbike led to the closure  
of the D5 motorway for about two hours.’ (Cz, lidovky.cz 2021\_0627)
- (45) Obor zavrel jaskyňu [<sub>XP</sub> na večné časy].  
giant.NOM.SG.M close.LP.SG.M cave.ACC for eternal.ACC.PL time.ACC.PL  
‘The giant closed the cave for good.’ (Sk)
- (46) Zavřu ti hubu [<sub>XP</sub> navždy]!  
close.PRS.1SG you.DAT mouth.ACC for-good  
‘I will close your mouth for good!’ (Cz)

<sup>30</sup>For a detailed argumentation against lexical decomposition in syntax see JägerBlutner1999.

<sup>31</sup>It might be claimed that syntactic decomposition would yield positions syntactically determining specific semantic differences. However, there is no evidence for adverbials in the assumed abstract positions. Since explicit semantic representations provide the basis for the respective interpretations, an over-articulated syntax is superfluous and should be ruled out by economy requirements.

The classification of a given adverbial as durative is not always obvious. The interpretation of an irreversible and, hence, lasting state has to be brought out by inferences based on world knowledge. Compare:

- (47) Religija ego slabuju nervnuju sistemu ubila [XP  
 religion.NOM.SG.F his weak.ACC nerve.ACC system.ACC kill.LP.SG.F  
 okončatel'no] svoimi protivorečijami.  
 ultimately.ADV its contradiction.INS.PL  
 'Religion with its contradictions once and for all wrecked his weak  
 nerves.' (Ru, "Veseluxa" na 11 tysjač znakov 2015\_0314)

A problem arises for the semantic integration of the adverbials that target resulting states. Although the version of the semantic representation of causative verbs adopted here posits a variable *z* which, since it refers to the resulting state, is the target of the adverbial, the semantic operation effecting the required step in the meaning composition cannot apply because *z* is not bound by a lambda operator (48) and, therefore, in some sense inert.

- (48)  $\lambda y \lambda x \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST BECOME } [z \approx [Q \ y]]]]]$

A solution to this problem will be proposed in section 4.

A special case is constituted by adverbial expressions of the kind shown in the following examples.

- (49) Zbrojni syly Ukrainy [XP povnistju] znyščyly  
 armed.NOM.PL forces.NOM.PL Ukraine.GEN completely destroy.LP.PL  
 zalyšky rosijs'koji texniky na ostrovi Zmijinyj.  
 remain.ACC.PL Russian.GEN equipment.GEN on island.LOC snake (PN,

not inflected)

'The Ukrainian armed forces completely destroyed the equipment left behind by the Russians on the Snake Island.' (Ukr, Fokus, 2022\_0702)

- (50) Rosijany pered Dnem nezaležnosti Ukrainy [XP  
 Russian.NOM.PL before day.INS independence.GEN Ukraine.GEN  
 sutťjevo] zbil'syly kil'kist' raketonosijiv u  
 substantially.ADV increase.LP.PL number.ACC missile-carrier.GEN.PL on  
 Čornomu mori.  
 Black.LOC Sea.LOC

'Before Ukraine's independence day, the Russians substantially increased

the number of aeroplanes carrying missiles in the Black Sea region.’ (Ukr, pravda.com.ua 2022\_0821)

- (51) Rosyjscy najeźdźcy [<sub>XP</sub> doszczętnie] zniszczyli  
 Russian.NOM.PL invader.NOM.PL completely.ADV destroy.LP.PL  
 miasto Rubiżne.  
 city.ACC Rubizhne  
 ‘The Russian invaders completely destroyed the city of Rubizhne.’ (Po, cf. ukrinform.pl, 2022\_0520)

These adverbials name the degree (grade, extent, scale) as to which the implicit predicate that corresponds to the resulting state holds.

Although not obvious at first sight, the adverbial in (52) belongs in this group too.

- (52) Muž nožem [<sub>XP</sub> smrtelně] zranil  
 man.NOM.SG.M knife.INS deathly.ADV wound.LP.SG.M  
 knihovnici.  
 female-librarian.ACC  
 ‘A female librarian was stabbed with a knife to death by a man.’ (Cz, zpravy.aktualne.cz 2015\_0525)

Modification by degree expressions is a topic of its own and will be left aside here.

use “F”  
instead of  
“female”

### 3.3 Adverbials and caused situations

Adverbial modification of the caused situation can be very clearly seen in de-causatives.<sup>32</sup>

- (53) a. *Transitive structure*  
 Petr [<sub>XP</sub> v tomto okamžiku] otevřel dveře.  
 Petr.NOM.SG.M in this.LOC moment.LOC open.LP.SG.M door.ACC.PL.F  
 ‘In this moment, Petr opened the door.’ (Cz)  
 b. *Decausative*  
 Dveře se [<sub>XP</sub> v tomto okamžiku] otevřely.  
 door.NOM.PL.F REFL in this.LOC moment.LOC open.LP.PL  
 ‘In this moment, the door opened.’ (Cz)

<sup>32</sup>Slavic decausatives represent a type of interpretation of linguistic structures containing a verb that is derived from a causative verb and occurs with a reflexive marker. The marker signals a change in the argument structure of the original verb (Fehrmann, JunghannsLenertová2014).

In the case of (??), what caused the transition to the door being open remains implicit. The adverbial contributes the temporal specification of the transition and, therefore, modifies the caused situation.

One can make the same point with modal adverbials.

- (54) a. Vrata su se [XP tiho] zatvorila.  
 door.NOM.PL.N AUX.3PL REFL quietly.ADV close.LP.PL.N  
 ‘The door quietly closed.’ (BCS)
- b. Drzwi otworzyły się [XP ze skrzypieniem].  
 door.NOM.PL open.LP.PL REFL with creak.INS.SG  
 ‘The door opened with a creak.’ (Po)
- c. Dzvery [XP bjazhučna] začynilisja.  
 door.NOM.PL.F soundlessly.ADV close.LP.PL.REFL  
 ‘The door closed without any noise.’ (Bel)

It is not the causing situation that happens ‘quietly’, ‘with-a-creak’, or ‘soundlessly’. Rather, the transition to the state gets characterized in this way.

The Semantic Form (SF) of causative verbs in (55) has an anchor for those adverbials, namely the variable *s*’.

- (55)  $\lambda y \lambda x \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST BECOME } [z \approx [Q \ y]]]]]$

Similarly as in the case of adverbial modification of states (see the preceding sub-section), the relevant variable is not lambda-bound. Due to this, the necessary step in the process of semantic composition is technically impossible. This problem is addressed in section 4.

The possibility of adverbial modification of the caused situation as in the examples given above does not constitute a special, exceptional case. We find adverbial modification also with inchoatives. These have a less complex semantic structure as compared with causative verbs. However, the situations interpreted for the inchoatives in a way resemble the caused situations in the more complex structures.

- (56) a. [XP Cora wjacor] jo wumrěl Michail Gorbatschow.  
 yesterday evening AUX.3SG die.LP.SG.M Mikhail Gorbachev  
 ‘Mikhail Gorbachev died yesterday evening.’ (LSorb,  
 rbb-online.de/radio 2022\_0831)

- b. Britanskata kralica Elizabet II počina [<sub>XP</sub> v zamâka  
British.SG.F.DEF queen.SG.F Elizabeth II die.AOR.3SG in castle.DEF  
Balmoral].  
Balmoral  
'The British Queen Elisabeth II died in Balmoral castle.' (Bg,  
24chasa.bg 2022\_0908)
- c. Kraljica je [<sub>XP</sub> danes] [<sub>XP</sub> mirno] umrla [<sub>XP</sub> na  
queen.NOM.SG.F AUX.3SG today peacefully die.LP.SG.F in  
Balmoralu].  
Balmoral.LOC  
'The Queen today died peacefully in Balmoral.' (Slvn, zurnal24.si  
2022\_0908)
- d. [<sub>XP</sub> Wčera] je kralowna Elisabeth II. [<sub>XP</sub> w  
yesterday AUX.3SG queen.NOM.SG.F Elizabeth II in  
Šotiskej] zemrêla.  
Scotland.LOC die.LP.SG.F  
'Yesterday afternoon Queen Elizabeth II died in Scotland.' (USorb,  
serbske-nowiny.de 2022\_0909)

### 3.4 Adverbials and causing situations

The semantic integration of adverbials modifying causing situations does not pose any problem at all. The variable *s* provides the anchor for the adverbial's meaning contribution. This variable is technically accessible, since it is lambda-bound, cf. (57).

$$(57) \lambda y \lambda x \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST BECOME } [z \approx [Q \ y]]]]]$$

The relevant variables of the modificandum and the modifier get identified via application of the modification rule schema, see below. As a consequence, the adverbial is predicated over the causing situation. This can be illustrated as follows:

- (58) [<sub>XP</sub> V nedêli večer] policie uzavřela dálnici  
on Sunday.ACC evening police.NOM.SG.F close.LP.SG.F motorway.ACC  
D5.  
D5  
'On Sunday evening, the police closed the D5 motorway.' (Cz, adapted  
from lidovky.cz 2021\_0627)

- (59) a. *Semantic value of the VP*  
 $\lambda s \text{ } [[s \text{ INST } [P \text{ } [THE \text{ POLICE}]]]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME \text{ } [z \approx [NOT \text{ ACCESSIBLE } [MOTORWAY \text{ D5 } ]]]]]]]]$
- b. *Meaning representation for the temporal adverbial*  
 $\lambda x \text{ } [TIME \text{ } x \subset SUNDAY \text{ EVENING}]$
- c. *Modification template*<sup>33</sup>  
 $\lambda Q_2 \lambda Q_1 \lambda s \text{ } [[Q_1 \text{ } s] : [Q_2 \text{ } s \text{ } ]]$
- d. *Application of the template to the modifier*  
 $\lambda Q_2 \lambda Q_1 \lambda s \text{ } [[Q_1 \text{ } s] : [Q_2 \text{ } s]] (\lambda x \text{ } [TIME \text{ } x \subset SUNDAY \text{ EVENING}])$   
 $\equiv \lambda Q_1 \lambda s \text{ } [[Q_1 \text{ } s] : [\lambda x \text{ } [TIME \text{ } x \subset SUNDAY \text{ EVENING}] \text{ } s]]$   
 $\equiv \lambda Q_1 \lambda s \text{ } [[Q_1 \text{ } s] : [TIME \text{ } s \subset SUNDAY \text{ EVENING}]]]$
- e. *Application of the preceding result to the modificandum*  
 $\lambda Q_1 \lambda s \text{ } [[Q_1 \text{ } s] : [TIME \text{ } s \subset SUNDAY \text{ EVENING}]] (\lambda s \text{ } [[s \text{ INST } [P \text{ } [THE \text{ POLICE}]]]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME \text{ } [z \approx [NOT \text{ ACCESSIBLE } [MOTORWAY \text{ D5 } ]]]]]]]])$   
 $\equiv \lambda s \text{ } [[\lambda s \text{ } [[s \text{ INST } [P \text{ } [THE \text{ POLICE}]]]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME \text{ } [z \approx [NOT \text{ ACCESSIBLE } [MOTORWAY \text{ D5 } ]]]]]]] \text{ } s] : [TIME \text{ } s \subset SUNDAY \text{ EVENING}]]]$   
 $\equiv \lambda s \text{ } [[[[s \text{ INST } [P \text{ } [THE \text{ POLICE}]]]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME \text{ } [z \approx [NOT \text{ ACCESSIBLE } [MOTORWAY \text{ D5 } ]]]]]]]] : [TIME \text{ } s \subset SUNDAY \text{ EVENING}]]]$

Adverbials of one special type are restricted to modification of the causing situation, namely Agent-oriented adverbials (AOA). An illustrating example is given below.

- (60) Petr                      [XP záměrně]                      zlomil                      tužku.  
Petr.NOM.SG.M                      intentionally.ADV break.LP.SG.M pencil.ACC  
‘Petr intentionally broke the pencil.’ (Cz, **Karlík2002**: 413)

The meaning for the Slavic equivalents of ‘intentionally’ may tentatively be represented as follows:

- (61)  $\lambda s \text{ } [\exists w \text{ } [PURPOSE \text{ } (w, s)]] : [\exists! x \text{ } [AGENT \text{ } (x, s)]] : [HAVE \text{ } (x, w)]]]$

This meaning contribution gets integrated in the usual way by means of the template (see above). This gives us:

<sup>33</sup>Compare Zimmermann (1992: 256). For more details on this, see section 4.



- (62)  $\lambda s \ [ [ [ [s \text{ INST } [P \text{ [PETER]]}] ] : [ [s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [z \approx [\text{NOT INTACT } [\text{THE PENCIL}]]]]]] ] : [ \exists w \text{ [PURPOSE } (w, s)] : [ \exists !x \text{ [AGENT } (x, s)] : [\text{HAVE } (x, w)]] ] ] ] ]$

In section 2 (22a, b), we saw that causative verbs can be used with both agents and non-agents in some cases. Where there is a co-occurrence of a causative verb and a non-agent, an AOA is excluded:

- (63) a. Marko je [<sub>XP</sub> namjerno] otvorio  
 Marko.NOM.SG.M AUX.3SG intentionally.ADV open.LP.SG.M  
 vrata.  
 door.ACC.PL.N  
 'Marko intentionally opened the door.'
- b. Vjetar je (\*[<sub>XP</sub> namjerno]) otvorio  
 wind.NOM.SG.M AUX.3SG intentionally.ADV open.LP.SG.M  
 vrata.  
 door.ACC.PL.N  
 'The wind opened the door.' (*namjerno* 'intentionally' is excluded)  
 (Croat)

Only in the case of volitional causation does the use of an AOA yield a well-formed expression. Exclusion of an AOA, thus, is a diagnostic for non-agents (non-volitional causation). Compare the following examples with volitional (64a, 65a) and non-volitional (64b, c and 65b, c) causation

- (64) a. Ukrajin'ski zaxysnyky vidbyly dev''jat'  
 Ukrainian.NOM.PL defender.NOM.PL repel.LP.PL nine.ACC  
 sprob nastupu okupantiv.  
 attempt.GEN.PL.F attack.GEN occupying-force.GEN.PL.M  
 'The Ukrainian defenders repelled nine attempted attacks by the  
 (Russian) occupying forces.'
- b. Dzerkalo vidbylo jiji oblyččja.  
 mirror.NOM.SG.N reflect.LP.SG.N her face.ACC  
 'The mirror reflected her face.'
- c. Viter vidbyv korabel' vid pryčalu.  
 wind.NOM.SG.M tear-away.LP.SG.M ship.ACC from pier.GEN  
 'The wind tore the ship away from the pier.' (Ukr)

- (65) a. Ukrajins'ki            zaxysnyky            [<sub>XP</sub> uspišno]            vidbyly  
 Ukrainian.NOM.PL defender.NOM.PL            successfully.ADV repel.LP.PL  
 dev''jat' sprob            nastupu            okupantiv.  
 nine.ACC attempt.GEN.PL.F attack.GEN occupying-force.GEN.PL.M  
 'The Ukrainian defenders successfully repelled nine attempted attacks  
 by the (Russian) occupying forces.' (pravda.com.ua 2022\_0905)
- b. Dzerkalo            (\*[<sub>XP</sub> uspišno])            vidbylo            jiji oblyččja.  
 mirror.NOM.SG.N            successfully.ADV reflect.LP.SG.N her face.ACC  
 'The mirror reflected her face.' *uspišno* 'successfully' is excluded)
- c. Viter            (\*[<sub>XP</sub> uspišno])            vidbyv            korabel'  
 wind.NOM.SG.M            successfully.ADV tear-away.LP.SG.M ship.ACC  
 vid pryčalu.  
 from pier.GEN  
 'The wind tore the ship away from the pier. (*uspišno* 'successfully' is  
 excluded) (Ukr)

## 4 Proposal

The expression in (66) represents – omitting irrelevant details – the result of semantically combining the SF of a VP (modificandum) with the SF of an adverbial (modifier).

- (66)  $\lambda s$             [[s            INST ... ] : [... s ... ]]  
                              modificandum modifier

The lambda operator binds the situation variable *s*. The lambda-bound *s* is the only active argument slot left. Thus, the variable *s* may serve as an anchor for an adverbial.

Davidson1967a used adverbial modification as an argument for the introduction into the theory of the event variable, enriching the set of arguments of verbal predicates.<sup>34</sup> However as we can conclude from our preceding discussion, adverbials anchored to the causing situation variable represent only one of the various cases of adverbial modification. This case does not pose any problem at all (see above, section 3.4). But we still have to find a solution for the other two cases – modification of *s'* and *z*, respectively.

<sup>34</sup>Instead of the term “event variable”, the more general term “situation variable” is used in the present paper.

The solution offered here involves the use of the semantic-template tool in a way similar to that originally suggested by Zimmermann (1992) in her paper on modifiers. We need, however, a more flexible templatic structure in order to be able to cover all cases of adverbial modification. Below, in the course of discussing the problematic cases refined versions of Zimmermann’s original template will be proposed.

Templates are “silent” linguistic elements in that they contribute meaning but lack phonetic form, cf. Zimmermann (1992: 275, fn 4). Using templates has the effect of adapting linguistic expressions to the contexts in which they have to fulfil certain functions and cannot do so on their own.<sup>35</sup>

Zimmermann’s original proposal is given in (67):<sup>36</sup>

(67) *Modification template*

$\lambda Q_2 \lambda Q_1 \lambda x [[Q_1 x] : [Q_2 x]]$

where  $Q_1, Q_2 \in S/N$  and “:”  $\in (\alpha/\alpha)/\beta$  (Zimmermann 1992: 256)

Unfortunately, the template in this form is insufficient for our purposes. We have to refine it in order to be able to technically implement the modification of  $s'$  and  $z$ , respectively.

As a first step, the SF of causative verbs needs improvement. For the purpose of covering all types of adverbial modification, the SF must, besides binding  $s$ , provide options for lambda-binding of  $z$  and  $s'$ . This is taken care of in (68):

(68)  $\lambda y \lambda x (\lambda z) (\lambda s') \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME [z \approx [Q \ y]]]]]]]$

Proceeding from the versatile SF proposed here, we will discuss each case in need of a solution in turn.

#### 4.1 Case 1 Modification of $z$

(69) Policie                      uzavřela              dálnici                      D5 [<sub>XP</sub> na dvě  
police.NOM.SG.F close.LP.SG.F motorway.ACC D5              for two.ACC

<sup>35</sup>Apart from modification, Zimmermann introduced templates for deriving case meanings (Zimmermann2003), the interaction of tense and mood (Zimmermann 2016), and the integration of subordinate clauses (Zimmermann 2018).

<sup>36</sup>Here, Zimmermann used S(entence) and N(ame) as semantic types in the way proposed by Ajdukiewicz1935. The notation can be easily adapted to a system using logical types like  $t$  and  $e$  (cf., e.g., von von Stechow 2012).

hodiny].

hours.ACC.PL

‘The police closed the D5 motorway for two hours.’ (Cz, adapted from lidovsky.cz 2021\_0627)

- (70) a. *Semantic value of the VP*  $(\lambda z) \lambda s [[s \text{ INST } [P \text{ [THE POLICE]]}] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME [z \approx [\text{NOT ACCESSIBLE [MOTORWAY D5]]]]]]]]$  The round brackets mark the argument slot as optional. It will be activated only in case of need. The case arises when an adverbial is meant to predicate over  $z$ .
- b. *Meaning representation for the temporal adverbial*  
 $\lambda x [\text{TIME INTERVAL } x = \text{TWO HOURS}]$
- c. *Modification template* (1st refined version of Zimmermann’s (1992: 256) original template)  
 $\lambda Q_2 \lambda Q_1 \lambda s [[[Q_1 z] s] : [Q_2 z]]$   
 $Q_1 \in S/N/N, Q_2 \in S/N$
- d. *Application of the template to the modifier*  
 $\lambda Q_2 \lambda Q_1 \lambda s [[[Q_1 z] s] : [Q_2 z]] (\lambda x [\text{TIME INTERVAL } x = \text{TWO HOURS}])$   
 $\equiv \lambda Q_1 \lambda s [[[Q_1 z] s] : [\lambda x [\text{TIME INTERVAL } x = \text{TWO HOURS}] z]]$   
 $\equiv \lambda Q_1 \lambda s [[[Q_1 z] s] : [\text{TIME INTERVAL } z = \text{TWO HOURS}]]$
- e. *Application of the preceding result to the modificandum*  
 $\lambda Q_1 \lambda s [[[Q_1 z] s] : [\text{TIME INTERVAL } z = \text{TWO HOURS}]] (\lambda z \lambda s [[s \text{ INST } [P \text{ [THE POLICE]]}] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME [z \approx [\text{NOT ACCESSIBLE [MOTORWAY D5]]]]]]]])$   
 $\equiv \lambda s [[[\lambda z \lambda s [[s \text{ INST } [P \text{ [THE POLICE]]}] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME [z \approx [\text{NOT ACCESSIBLE [MOTORWAY D5]]]]]]]] z] s] : [\text{TIME INTERVAL } z = \text{TWO HOURS}]]$   
 $\equiv \lambda s [[[\lambda s [[s \text{ INST } [P \text{ [THE POLICE]]}] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME [z \approx [\text{NOT ACCESSIBLE [MOTORWAY D5]]]]]]]] s] : [\text{TIME INTERVAL } z = \text{TWO HOURS}]]$   
 $\equiv \lambda s [[[s \text{ INST } [P \text{ [THE POLICE]]}] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME [z \approx [\text{NOT ACCESSIBLE [MOTORWAY D5]]]]]]]] : [\text{TIME INTERVAL } z = \text{TWO HOURS}]]$

## 4.2 Case 2 Decausative: Modification of s'

- (71) Vratata se zatvori [XP tixo].  
 door.SG.F.DEF REFL close.AOR.3SG quietly.ADV  
 'The door closed quietly.' (Bg)
- (72) a. *Meaning representation for the causative verb*  
 $\lambda y \lambda x (\lambda s') \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [z \approx [\text{NOT OPEN } y]]]]]]]$
- b. *Argument-blocking reflexive marker*  
 $\lambda P \lambda x [P \ u \ x]$  (FJL2010: 220 and 226; FJL2014: 302)
- c. *Blocking of the internal argument*  
 $\lambda P \lambda x [P \ u \ x] (\lambda y \lambda x (\lambda s') \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [z \approx [\text{NOT OPEN } y]]]]]]]$   
 $\equiv \lambda x [\lambda y \lambda x (\lambda s') \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [z \approx [\text{NOT OPEN } y]]]]]]] u \ x]$   
 $\equiv \lambda x [\lambda x (\lambda s') \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [z \approx [\text{NOT OPEN } u]]]]]]] x]$   
 $\equiv \lambda x (\lambda s') \lambda s [[s \text{ INST } [P \ x]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [z \approx [\text{NOT OPEN } u]]]]]]]$
- d. *Semantic value of the VP, including the meaning of the subject ( $\lambda s'$ )  $\lambda s$*   
 $[[s \text{ INST } [P \ [\text{THE DOOR}]]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [z \approx [\text{NOT OPEN } u]]]]]]^{37}$
- e. *Meaning representation for the modal adverbial*  
 $\lambda s^* [\text{QUIET } s^*]$
- f. *Modification template (2nd refined version of Zimmermann's (1992: 256) original template)*  
 $\lambda Q_2 \lambda Q_1 \lambda s [[[[Q_1 \ s'] \ s] : [Q_2 \ s']]]$   
 $Q_1 \in S/N/N, Q_2 \in S/N$
- g. *Application of the template to the modifier*  
 $\lambda Q_2 \lambda Q_1 \lambda s [[[[Q_1 \ s'] \ s] : [Q_2 \ s']]] (\lambda s^* [\text{QUIET } s^*])$   
 $\equiv \lambda Q_1 \lambda s [[[[Q_1 \ s'] \ s] : [\lambda s^* [\text{QUIET } s^*] \ s']]]$   
 $\equiv \lambda Q_1 \lambda s [[[[Q_1 \ s'] \ s] : [\text{QUIET } s']]]$
- h. *Application of the preceding result to the modificandum*  
 $\lambda Q_1 \lambda s [[[[Q_1 \ s'] \ s] : [\text{QUIET } s']]] (\lambda s' \lambda s [[s \text{ INST } [P \ [\text{THE DOOR}]]] : [[s \text{ CAUSE } s'] : [s' \text{ INST } [\text{BECOME } [z \approx [\text{NOT OPEN } u]]]]]]]$

<sup>37</sup> Vratata 'the door' is the syntactic subject of the sentence. At the level of CS, the variable  $u$  will be interpreted as having the same referent as the subject.

$$\begin{aligned}
 &\equiv \lambda s \ [[[ \lambda s' \lambda s \ [ [s \text{ INST } [P \text{ [THE DOOR]]] ] : [ [s \text{ CAUSE } s'] : [s' \text{ INST} \\
 &\quad [BECOME [z \approx [\text{NOT OPEN } u]]]]]] s'] s] : [\text{QUIET } s']] \\
 &\equiv \lambda s \ [[[ \lambda s \ [ [s \text{ INST } [P \text{ [THE DOOR]]] ] : [ [s \text{ CAUSE } s'] : [s' \text{ INST} \\
 &\quad [BECOME [z \approx [\text{NOT OPEN } u]]]]]] s] : [\text{QUIET } s']] \\
 &\equiv \lambda s \ [[[ [s \text{ INST } [P \text{ [THE DOOR]]] ] : [ [s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME \\
 &\quad [z \approx [\text{NOT OPEN } u]]]]]]] : [\text{QUIET } s']]
 \end{aligned}$$

The adverbial, which is predicated over  $s'$ , has been integrated in a transparent, formally correct way. At the level of Semantic Form,  $s'$  remains unbound and, hence, is a semantic parameter. Later at the level of Conceptual Structure, it will be existentially quantified by default.

The lambda operator that binds the variable  $s$  will, in the course of further semantic amalgamation, be replaced by an existential quantifier. For details regarding this operation see Zimmermann (2009: 486, 2016: 290).

By assuming various versions of the modification template and the optional activation of argument slots through the binding of the respective variables by a lambda-operator, it has become possible to provide solutions for the problematic cases of adverbial modification.

## 5 Summary

Adverbials that appear as modifiers in sentences induced by causative verbs are not always linked to the causing situation. By closer inspection, it became clear that the caused situation and the resulting state may also be semantic anchors for adverbials, given the right contexts. Two issues arose: (i) We were in need of determining the appropriate semantic representation for causative verbs, that is, uncovering enough structure to account for the empirical facts. (ii) Technical means had to be found for the integration of adverbials predicating over (a) caused situations and (b) resulting states in the course of semantic composition.

In order to solve issue (i), I have defended the view that the meaning of causative verbs has to be decomposed, yielding a more fine-grained structure than the simple  $P(x, y, e)$  analysis. Ultimately, the meaning representation must display three variables:  $s$ ,  $s'$  and  $z$ , referring, respectively, to the causing situation, the caused situation and the target state.

### (73) *Generalized meaning representation of causative verbs*

$$\lambda y \lambda x (\lambda z) (\lambda s') \lambda s \ [[[s \text{ INST } [P \text{ } x]]] : [ [s \text{ CAUSE } s'] : [s' \text{ INST } [BECOME [z \approx [Q \text{ } y]]]]]]$$

This representation is sufficiently detailed, in that it displays all the potential anchors for adverbial modifiers.

Zimmermann's (1992) approach to modification was based on the assumption of a semantic template, which, among other things, accounted for the case of adverbials predicated over the event as a whole. The discussion in the present paper showed that we have to go further than this. It became clear that it must be possible to activate the arguments  $s'$  and  $z$  and, thus, make them accessible for steps in the process of semantic composition. My proposal consists in the lambda-binding of the respective variables, cf. the representation in (73). Since the argument slots need not be opened in all cases, lambda-binding is optional, which is indicated by the use of round brackets. We are thus not forced to assume default deactivation in case the respective argument is not needed as an anchor, which is desirable for reasons of economy.

As I have argued, the solution for issue (ii) can be reached by refining Zimmermann's original template. We have ended up with three specific versions of the modification template. These are the following:

- (74) a. *Version for  $s$*   
 $\lambda Q_2 \lambda Q_1 \lambda s [[Q_1 s] : [Q_2 s]]$   
 $Q_1, Q_2 \in S/N$   
 See Zimmermann (1992: 256).  
 b. *Version for  $s'$*   
 $\lambda Q_2 \lambda Q_1 \lambda s [[[Q_1 s'] s] : [Q_2 s']]$   
 $Q_1 \in S/N/N, Q_2 \in S/N$   
 c. *Version for  $z$*   
 $\lambda Q_2 \lambda Q_1 \lambda s [[[Q_1 z] s] : [Q_2 z]]$   
 $Q_1 \in S/N/N, Q_2 \in S/N$

We can generalize over the specific versions. This gives us the modification template in its final form:

- (75) *Generalized modification template*  
 $\lambda Q_2 \lambda Q_1 \lambda s [{}_{\alpha} (I)_{\alpha} [Q_1 {}_{\alpha}(w)]_{\alpha} s] : [Q_2 {}_{\alpha}(w)_{\alpha} {}_{-\alpha}(s)_{-\alpha}]$   
 $Q_1 \in S/N_{\alpha}(/N)_{\alpha}, Q_2 \in S/N, w = s' \vee z$

If  $\alpha$ -marked brackets apply,  $-\alpha$ -marked brackets do not apply, and vice versa.

## Abbreviations

1	first person	LP	<i>l</i> -participle
3	third person	M	masculine
ACC	accusative case	N	neuter
ADJ	adjective	NOM	nominative case
ADV	adverb	PF	perfective aspect
AOA	agent-oriented	PL	plural number
	adverbial	PN	proper name
AOR	aorist	PRS	present tense
AUX	auxiliary	PRTCL	particle
CL	clitic	PST	past tense
COND	conditional mood	REFL	reflexive marker
DAT	dative case	s	causing situation variable
DEF	definite	s'	caused situation variable
F	feminine	SA	sentential adverbial
GEN	genitive case	SF	Semantic Form
INDECL	indeclinable	SG	singular number
INF	infinitive	vi	verbum intransitivum
INS	instrumental case	vt	verbum transitivum
IPF	imperfective aspect	z	target state variable
LOC	locative case		

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