

On tropes, states, and the combinatorics of the copula *werden* in German¹

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Abstract. This paper provides an ontology-based approach to the combinatorics of copula verbs. First, we argue that *werden* ‘become’ in German can be combined with trope ascriptions (e. g., *groß* ‘tall’), but not with state ascriptions (e. g., *im Garten* ‘in the garden’, *tot* ‘dead’). The approach is spelled out in terms of a (mis)match between the typing presuppositions of *werden* and the proffered ontological type of its predicative argument. Second, we relate our results to the combinatorics of stative copulas, focusing on the *ser/estar* alternation in Spanish. It is shown that the sensitivity of the alternation to a comparison between vs. within individuals can be recast in ontological terms. This captures striking combinatorial analogies between *ser* and *werden* and sheds new light on the ontological foundation of comparison classes.

Keywords: copula verbs, states, tropes, *ser/estar* alternation, comparison classes, selectional restrictions.

1. Introduction

This paper is concerned with the combinatorics of copula verbs. Specifically, we aim to account for the intriguing selectional constraints of the copula *werden* ‘become’ in German; see the examples in (1) and (2), which are based on observations in Steinitz (1999) and Härtl (2005).

- (1) Mia wurde {groß / müde / schwanger}.
Mia became {tall / tired / pregnant}
- (2) a. #Mia wurde {im Garten / dort}.
Mia became {in the garden / there}
- b. #Mia wurde {tot / nackt}.
Mia became {dead / naked}

Roughly, *werden* expresses a change of the subject referent from not being *P* to being *P*. In (1), for instance, Mia undergoes a change from not being tall to being tall, from not being tired to being tired, etc. The puzzle is that there is no obvious reason why *werden* cannot be used analogously in examples such as (2): Mia could undergo a change from not being in the garden to being in the garden, from not being dead to being dead, etc. Notably, there is also no trivial categorial explanation for the contrast. Both (1) and (2b) are based on APs; furthermore, the examples in (3) show that *werden* does not come with a principled ban on PPs either.

- (3) Mia wurde zur Vegetarierin.
Mia became to a vegetarian
‘Mia became a vegetarian.’

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The first crucial question, then, is the following: to what kind of conceptual distinction is *werden* sensitive, and how should the relevant distinction be integrated into semantic composition?

A follow-up question pertains to the combinatorics of copula verbs and the ascription of properties to subject referents more generally. The stative copula *sein* ‘be’ in German is unselective, as shown by (4). However, there are remarkable similarities between *werden* and *ser* ‘be_{ser}’ in Spanish. Following, for instance, Gumiel-Molina et al. (2015), *ser* is fine with relative adjectives such as *alto* ‘tall’ and relational adjectives such as *vegetariano* ‘vegetarian’, as in (5), and at odds with what they call perfective adjectives such as *muerto* ‘dead’ and *desnudo* ‘naked’; locatives are also odd. In these cases, *estar* ‘be_{estar}’ must be used, as shown in (6).

- (4) Mia ist {groß / müde / im Garten / tot}.
Mia is {tall / tired / in the garden / dead}
- (5) Ben es {alto / vegetariano}.
Ben is_{ser} {tall / vegetarian}
- (6) Ben {#es / está} {muerto / desnudo / en el jardín}.
Ben {is_{ser} / is_{estar}} {dead / naked / in the garden}

The follow-up question, then, is the following: how do stative copulas fit into the picture, and, more specifically, is there a principled link between *werden* and the *ser/estar* alternation?

In order to address the questions raised, we will proceed as follows: in Section 2, we will argue that *werden* selects ascriptions of particularized properties, so-called tropes, and thus excludes state ascriptions. Correspondingly, we will give conceptual reasons for treating *groß* ‘tall’, *müde* ‘tired’, etc. as trope ascriptions and locatives, *tot* ‘dead’, etc. as state ascriptions. Our hypothesis will corroborate the more general claim that natural language combinatorics is sensitive to the ontological distinction between tropes and states; see Moltmann (2007, 2009, 2013); Bücking (2012, 2019); Maienborn (2019) for further evidence.² In Section 3, we will spell out a lexical semantics account according to which combinatorial restrictions are rooted in type conflicts between the presupposed type of a functor and the proffered type of its argument. Section 4 will address implications for the analysis of stative copulas. We will focus on the *ser/estar* alternation in Spanish and its treatment by Gumiel-Molina et al. (2015) in terms of comparison classes. In a nutshell, we will suggest that trope ascriptions are conceptually akin to a comparison *between* individuals, which is crucial for *ser* according to Gumiel-Molina et al. (2015), while state ascriptions are conceptually akin to a comparison *within* individuals, which is crucial for *estar* according to Gumiel-Molina et al. (2015). This will shed new light on the ontological foundation of comparison classes and provide a principled link between *werden*’s combinatorics and the *ser/estar* alternation. Section 5 offers a conclusion.³

²Moltmann (2013: 303-305) suggests that *become* in English introduces transitions between tropes. However, she does not dwell on the consequences of this hypothesis for selectional restrictions and the semantic composition.

³For reasons of space, we will not discuss Härtl (2005). Härtl argues that *werden*’s combinatorial properties are rooted in its incompatibility with necessary control and in effects of lexical blocking. In Scheifele and Bücking (2020), we provide empirical evidence against a control-based analysis. Furthermore, our ontology-based approach can dispense with the additional assumption of blocking effects.

2. Survey of *werden*'s combinatorial properties

Our approach to *werden*'s combinatorial properties builds on the assumption that natural language ontology distinguishes between tropes and states. Based on, in particular, Moltmann (2007, 2009, 2013) and Maienborn (2019), we characterize these as follows. Tropes are particularized properties in a bearer specifying aspects of its internal structure. States, by contrast, are abstract temporal entities specifying the holding of a property for an entity as a whole. The distinction can be exemplified by referential expressions for tropes and states. This exemplification exploits the generalization that morphological nominalizations of typical adjectives introduce tropes, while corresponding nominalizations including a verbal syntactic layer introduce states; see (7) for illustration and Moltmann (2007) and Bücking (2012) for details.

- (7) a. {John's tiredness / #John's being tired} was extreme.
b. {Seine Schönheit / #Sein Schön-Sein} wuchs beständig.
{His beauty / His being beautiful} grew steadily
[see Moltmann (2007), (6); Bücking (2012), (29)]

The trope nominalizations *tiredness* and *Schönheit* 'beauty' are felicitous with predicates such as *extreme* or *wachsen* 'grow'. This follows from the characterization of tropes as particularized properties specifying an aspect of the internal structure of a bearer, as such predicates relate to the way in which a property is manifest in a bearer. The corresponding state nominalizations, by contrast, are infelicitous here. This follows from the characterization of states as temporal abstractions over properties that merely specify in which situation an entity as a whole is; this renders the property itself inaccessible. With this background on tropes and states in place, the following survey will show that predicates can be distinguished by whether they introduce trope ascriptions or state ascriptions and that *werden* is sensitive to this distinction.

2.1. Locatives

Locatives are generally at odds with *werden*; recall (8) (= (2a)). Steinitz (1999: 123) and Härtl (2005: 354) share this observation, but they do not provide a conclusive explanation for it.

- (8) #Mia wurde {im Garten / dort}.
Mia became {in the garden / there}

Our ontology-based approach to the combinatorics of *werden* offers the following explanation: The basic contribution of locatives is to locate a locatum at a location. Accordingly, locatives specify a relation between a locatum and a region without specifying an aspect of the internal structure of the locatum (see below for a qualification). In fact, it seems to be impossible to conceive of a locative relation as a particularized property in a bearer. Hence, locatives do not introduce trope ascriptions, but state ascriptions. Given our hypothesis that *werden* selects trope ascriptions, we thereby obtain a principled explanation for *werden*'s conflict with locatives.⁴

⁴Note as well that locatives do not support trope nominalizations such as **Dortheit* (lit. 'thereness'). Furthermore, cases such as *Örtlichkeit* (lit. 'localness', locality) do not introduce a property in a bearer, but the locality as such.

Notably, our reasoning does not entail that locatives cannot relate to internal structures of entities; we only say that the locative relation as such is not about internal structures. This qualification is based on the fact that the choice of preposition in locatives matters for the spatial configuration that is described. For instance, roughly, *on* in (9) suggests that the lamp is supported by the table in virtue of its lower part having contact with the tabletop, while *above* identifies a region along the vertical axis of the table at which the lamp is located.

(9) The lamp is {on / above} the table.

Thus, although *on* is sensitive to the internal structure of the locatum, the relevant locative relation is still not internal to the locatum.

Further support for our approach to locatives is provided by the contrast in (10).

(10) a. #Die Linie wurde {parallel / quer} zum Quadrat.
 the line became {parallel / transverse} to the square
 b. Die Linie wurde {gerade / krumm}.
 the line became {straight / bent}

The predicates *parallel* ‘parallel’ and *quer* ‘transverse’ in (10a) describe locative configurations between entities and thus contribute state ascriptions. Correspondingly, they are infelicitous with *werden*. By contrast, the predicates *gerade* ‘straight’ and *krumm* ‘bent’ in (10b) describe the internal form of entities and thus contribute trope ascriptions. Correspondingly, they are felicitous with *werden*. Notably, *parallel* and *quer* are at odds with *werden* although they are adjectives. This suggests that the conflict between locative PPs and *werden* should not just be attributed to the prepositional nature of typical locatives.

Finally, the distribution of the comitative modifier *mit* ‘with’ in German provides an independent piece of evidence in favor of a state-based analysis of locatives. Intriguingly, *mit* is at odds with trope ascriptions such as *groß* ‘tall’, while it is fine with locatives, as shown in (11).

(11) Ben ist mit {#groß / auf dem Dachboden}.
 Ben is with {tall / in the attic}
 ‘Ben has joined others in being {tall / in the attic}.’ [see Bücking (2019), (85)/(100)]

Bücking (2019) argues that *mit* introduces an accompaniment by participation and therefore selects predicates that introduce situations such as events or states that can be extended by secondary participants. As tropes are particularized properties bound to their bearers, they cannot be extended by secondary participants, which explains why *groß* is odd in (11). By contrast, one can easily conceive of an entity joining a locative relation that already holds for another entity, which explains why the locative is fine in (11). Correspondingly, locatives do not introduce tropes, but states that hold of entities in virtue of their being located at a location.

2.2. Participles

Härtl (2005: 353) notes that the copula *werden* cannot be combined with past participles; see (12) for exemplification.

- (12) #Die Birne wurde {gegessen / verfault}.
the pear became {eaten / rotted} [see Härtl (2005), (7a)]

As pointed out by Härtl, the constraint cannot be due to the danger of confusion with homonymous passive forms, as the constraint is independent of whether the underlying verb can be passivized (*essen*) or not (*verfaulen*). Instead, he suggests that both *werden* and past participles convey a telic meaning and thus yield a redundant combination. However, this explanation does not cover the additional observation that *werden* cannot be combined with atelic present participles either; see (13). Notably, this additional constraint does not seem to be due to a more general restriction on present participles with copula verbs, as the constraint is independent of whether the present participle can be combined with *sein* (13a) or not (13b); see Lübbe (2013) for a discussion of predicative present participles.

- (13) a. Die Aktienkurse {#wurden fallend / sind fallend}.
the stock prices {became falling / are falling} [see Lübbe (2013), (1b)]
b. Die Birne {#wurde faulend / #ist faulend}.
the pear {became rotting / is rotting}

Our ontology-based approach to *werden* offers a simple explanation for *werden*'s general conflict with participles. It is commonly assumed that participles introduce temporally defined states. Roughly, past participles introduce post states (e. g., the state of having been rotted), while present participles introduce cotemporal states (e. g., the state of rotting). In any case, they do not introduce trope ascriptions as required by *werden* according to our assumption.

2.3. Adjectives

Adjectives that can be used predicatively are usually classified according to the scale structure they are associated with; see Kennedy and McNally (2005) for a particularly influential proposal, Demonte (2011: Sec. 4.1) for an overview, and Section 4.2 for further notes. Relative adjectives such as *tall* or *rich* relate to open scales; correspondingly, they are gradable and their positive form is typically evaluated against a contextually salient midpoint standard. Absolute adjectives such as *clean*, *damp* or *full* relate to closed scales; correspondingly, they are also gradable, but their positive form is typically evaluated against a maximal standard (e. g., the maximal degree of cleanliness for *clean*; upper closed scale), a minimal standard (e. g., the minimal degree of dampness for *damp*; lower closed scale), or both (e. g., the minimal or maximal degree on a scale for fullness; totally closed scale). Finally, non-gradable adjectives such as *pregnant* or *dead* do not relate to scales.

Werden is generally fine with gradable adjectives, be they relative ones (14a) or absolute ones (14b). This point of view is essentially shared by Steinitz (1999: 133) and Härtl (2005: 358).⁵

- (14) a. Mia wurde {groß / reich}.
 Mia became {tall / rich}
- b. Die Decke wurde {sauber / feucht}. / Die Kiste wurde voll.
 the blanket became {clean / damp} / the box became full

In our trope-based approach, the general compatibility of *werden* with gradable adjectives follows from the assumption that gradable adjectives generally involve tropes ordered by their degree. In fact, the analysis of positive and comparative adjectives in terms of tropes (instead of just the degrees themselves) is a key motivation for assuming that natural language ontology includes tropes; see Moltmann (2009) for an extensive discussion.

The behavior of non-gradable adjectives is more intricate. There are felicitous examples:

- (15) Mia wurde {schwanger / volljährig / arbeitslos}.
 Mia became {pregnant / of full age / jobless} [see Härtl (2005), (19)]

The adjectives in (15) are not associated with scales. Nevertheless, they still introduce properties that can be conceived of as inherent to the entity that bears it. Specifically, they define aspects or roles according to which entities are classified; see Section 2.4 for related examples in the nominal domain. We conclude that these adjectives are about conceptualizations of entities and thus introduce trope ascriptions that are compatible with *werden*. However, we acknowledge that the dividing line between trope and state ascriptions in these cases is particularly subtle, as the situation in question can easily be conceived of from the alternative perspective of the state in which an entity is. This is made explicit by similar predicates such as *guter Hoffnung* ‘expecting’ (lit. ‘of good hope’) or *ohne Arbeit* ‘out of work’. These introduce state ascriptions, which are predicted to be at odds with *werden*; see (16).

- (16) #Mia wurde {guter Hoffnung / ohne Arbeit}.
 Mia became {of good hope / out of work}

Notably, the difference is not random. Specifically, the genitive case and the preposition facilitate relational interpretations that are conceptually akin to locatives. That is, the syntactic form supports that these predicates concern the states in which entities are instead of their roles. A comparable reasoning applies to the minimal pair in (17) (which we owe to Irene Rapp).

- (17) Mia wurde {panisch / #in Panik}.
 Mia became {panicked / in panic}

The adjective *panisch* ‘panicked’ is morphologically complex, but syntactically simple. This formal set-up does not provide a reason for the binding of a referent for tropes; correspondingly,

⁵There is, however, a terminological difference. In Härtl (2005: 357), all scale-based gradable adjectives are called relative, whereas it is basically the non-gradable adjectives that are called absolute.

the adjective introduces a regular trope ascription. By contrast, the PP *in Panik* ‘in panic’ builds on a preposition taking a referential expression for tropes as a complement. This syntactic structure results in a PP-internal binding of a referent for tropes. Hence, the PP cannot provide a trope ascription; instead, it informs about the state in which an entity is. Notably, there is independent evidence for a state-based analysis of the PP. In order to express the relevant change, the PP can be combined with the motion verb *geraten* ‘get into’, as in (18).

- (18) Mia geriet {#panisch / in Panik}.
 Mia got {panicked / into panic}

As one can get into situations, but not into properties, *geraten* conveys a change of location for entities as wholes (be this in a physical or metaphorical sense), that is, it conveys a change of state. As will be seen from the further discussion, the use of motion verbs with change of state predicates is a recurrent pattern that supports our ontology-based approach.

In contrast to the felicitous examples in (15), there are also several non-gradable adjectives that are infelicitous with *werden*. Let us begin with the examples in (19).

- (19) #{Mia / Die Firma / Das Radio} wurde {tot / pleite / kaputt}.
 {Mia / the company / the radio} became {dead / broke / broken}
 [see Härtl (2005), (51)]

Intuitively, *tot* ‘dead’, *pleite* ‘broke’, and *kaputt* ‘broken’ specify that entities are devoid of existence or function as wholes. Hence, these adjectives contribute state ascriptions, which are at odds with *werden*. But why not consider these adjectives predicates of aspects of entities, as just argued for the adjectives in (15)? Perhaps there is no definite conceptual explanation for this. In fact, a lexicalist approach predicts that the lexicalizations of borderline concepts can be subject to idiosyncrasies. However, there is also suggestive support for a state-based analysis. First, the changes associated with *tot* ‘dead’, *pleite* ‘broke’, and *kaputt* ‘broken’ affect the being of entities in a more fundamental and thus holistic way than the changes associated with *schwanger* ‘pregnant’, *volljährig* ‘of full age’ and *arbeitslos* ‘jobless’; this could explain why the corresponding lexicalizations behave like state predicates. Second, the changes associated with *pleite* and *kaputt* can be expressed by using the motion verb *gehen* ‘go’, as in (20).

- (20) {Die Firma / Das Radio} ging {pleite / kaputt}.
 {the company / the radio} went {broke / broken} [see Härtl (2005), (52b/c)]

Motions involve a change of the location at which an entity is located and, thus, a change of the state an entity is in; recall the discussion of locatives in Section 2.1 and the behavior of *geraten* ‘get into’ discussed above. It is therefore plausible that the metaphorical use of *gehen* in (20) removes the concrete spatial component, while it preserves the change of state component. This, then, fits with the analysis of *pleite* and *kaputt* as state ascriptions.⁶

⁶It is also worthwhile to consider nominalizations. *Kaputt* does not have a non-syntactic nominal counterpart, and the nominals *Pleite* ‘bankruptcy’ and *Tod* ‘death’ differ from *Arbeitslosigkeit* ‘joblessness’, etc. by introducing events instead of tropes. This is in line with the assumption that *kaputt*, *pleite*, and *tot* do not introduce tropes.

There are further minimal contrasts that suggest an explanation in terms of a distinction between state and trope ascriptions. Consider (21).

- (21) Der Knoten wurde {#offen / #auf / locker / fest}.
 the knot became {open / open / loose / tight}

As the adjectives *offen* ‘open’ and *auf* ‘open’ concern the existence of the knot as a whole, they convey state ascriptions that are infelicitous with *werden*. The adjectives *locker* ‘loose’ and *fest* ‘tight’, by contrast, concern the internal form of the knot. As this goes with trope ascriptions, they are felicitous with *werden*. In (22), *offen*, *auf*, and *zu* ‘closed’ do not concern the existence of the door. However, it is still plausible that they introduce state ascriptions: they describe whether the door is in a spatial configuration with its environment that supports access between locations. From this perspective, the given predicates are not about the internal form of the door, but about the relation between the door and its environment.

- (22) #Die Tür wurde {offen / auf / zu}.
 the door became {open / open / closed}

Notably, in order to express the relevant change, the critical predicates can again be combined with the motion verb *gehen* ‘go’, as in (23). This supports their analysis as state ascriptions.

- (23) Die Tür ging {?offen / auf / zu}.
 the door went {open / open / closed}

There are also examples where the acceptability of *werden* covaries with the subject:

- (24) a. #Mia wurde nackt.
 Mia became naked
 b. Der Mensch wurde im Laufe der Evolution nackt.
 the human being became in the course of the evolution naked
 [see Härtl (2005), (14a)/(48a’)]
- (25) a. #Der Gefangene wurde frei.
 the prisoner became free [see Steinitz (1999: 123)]
 b. Der Stuhl wurde frei.
 the chair became free

In (24a), *nackt* ‘naked’ describes that no clothes apply to Mia. As this can be conceived of as a local relation between Mia and the clothes, it is plausible that *nackt* contributes a state ascription here, which is incompatible with *werden*. In (24b), by contrast, *nackt* describes a genetic disposition. Correspondingly, *nackt* can be conceived of as a property of the internal structure of human beings; it, then, contributes a trope ascription, which is compatible with *werden*.⁷ *Frei* in (25a) concerns a fundamental change of entities as wholes; specifically, released prisoners

⁷While (24b) is judged better than (24a), it is still not completely acceptable; this could be due to the fact that there is an obvious alternative state-based conception: the state of not having hair.

are not prisoners anymore. Furthermore, the relevant change is akin to a change of location. So it should contribute a state ascription. In (25b), by contrast, *frei* does not have a comparable effect on the existence or the location of the chair. It rather describes a sort of role a chair can bear and thus contributes a trope ascription. Notably, the release reading can be expressed by using the motion verb *kommen* ‘come’ instead of *werden*; see (26). That is, the conceptual distinction we invoke is again partially reflected in the use conditions of a motion verb.

- (26) {Der Gefangene / #Der Stuhl} kam frei.
 {the prisoner / the chair} came free

Finally, we turn to the set of infelicitous examples in (27).

- (27) a. #Mia wurde frei von Sorgen. / #Der Kopf wurde frei von Läusen.
 Mia became free from worries / the head became free from lice
 b. #Der Parkplatz wurde kostenlos.
 the parking space became free of cost [see Härtl (2005), (48b/c)]
 c. #Mia wurde bereit für den Test.
 Mia became ready for the test

These examples have in common that they facilitate a relational interpretation. That is, the relevant situations are not conceived of from the perspective of the internal structure of entities, but from the perspective of their external relation to something else; this is conceptually analogous to locatives. Correspondingly, the predicates in (27) contribute state ascriptions, which explains why they are infelicitous with *werden*. However, the dividing line between trope and state ascriptions is not as clear as it is with locatives. This has a reason. In addition to their relational component, the given adjectives also provide substantial contents according to which entities can be classified. If this meaning component is made prominent, the adjectives can contribute conceptualizations of entities and thus introduce trope ascriptions; recall the discussion of *schwanger*, etc. above. We speculate that two factors can facilitate classifying uses and thereby enhance the compatibility of the given predicates with *werden*. First, Härtl (2005) observes that the generic example in (28) (indicated by the use of a bare plural subject) is judged better than its non-generic counterpart in (27b). As generics are about regularities for classes of entities, it is plausible that the generic use supports a classifying interpretation of *kostenlos* ‘free of cost’ and thereby overrides the standard change of state interpretation.

- (28) Parkplätze wurden kostenlos.
 parking spaces became free of cost [see Härtl (2005), (48b’/c’)]

Second, the structure of the predicate can play a role. Specifically, it is widely assumed that complex morphological units tend to be classifying, whereas corresponding complex syntactic units tend to be descriptive. For instance, as argued by Bücking (2009), newly coined compounds such as *Blautee* ‘blue:tea’ are particularly suitable for naming a coherent class of objects, whereas their syntactic counterparts such as *blauer Tee* ‘blue tea’ do not trigger a classifying interpretation. Against this background, the behavior of *frei* ‘free’ is potentially revealing, as it supports both a word-internal morphological and a word-external syntactic integration of the relational component; see (29) in contrast to (27a) above.

- (29) ?Mia wurde sorgenfrei. / ?Der Kopf wurde läusefrei.
 Mia became worries:free / the head became lice:free

In fact, the morphological units seem to be better with *werden* than their syntactic counterparts. This, then, corroborates our claim that the interpretation of non-gradable adjectives is subject to conceptual variation and, in turn, to variation between trope and state ascriptions.

In sum, our ontology-based approach to the combinatorics of *werden* can account for *werden*'s principled compatibility with gradable adjectives and for its fairly intricate interaction with non-gradable adjectives. Specifically, we have provided conceptual arguments for why non-gradable adjectives can contribute either state ascriptions or trope ascriptions; this includes the acknowledgment of borderline cases where they are expected from a conceptual point of view. Furthermore, for several critical non-gradable adjectives, the analysis in favor of a state-based analysis is confirmed by their compatibility with motion verbs.

2.4. PPs headed by *zu* 'to'

The examples in (30) show that PPs headed by *zu* 'to' are fine with *werden*.

- (30) {Die Flüssigkeit / Ben} wurde {zu Eis / zum Bäcker}.
 {the liquid / Ben} became {to ice / to a baker}
 '{The liquid / Ben} became {ice / a baker}.' [see Härtl (2005), (11b)]

Standardly, PPs relate entities as wholes, and as such should be at variance with *werden*. The *zu*-PPs in (30), though, describe internal aspects of their bearers, such as the kind of aggregation in the case of *zu Eis* 'to ice', or their professional role in the case of *zum Bäcker* 'to a baker'; see the discussion of role nouns in Asher (2011) and Zobel (2017). In this non-spatial use, *zu*-PPs thus introduce tropes, which comply with *werden*; see also Maienborn (2020) for an analysis of roles as subtypes of tropes. In their spatial use, *zu*-PPs are still at odds with *werden*; see (31). As expected from the discussion of *frei kommen* 'come free' in Section 2.3, they license a motion verb such as *gehen* 'go' to convey the subject's change of location.

- (31) Mia {#wurde / ging} zu Paula.
 Mia {became / went} to Paula

Notably, it is not the non-spatial use of PPs per se that allows for the combination with *werden*. Non-spatial PPs with *aus* 'out of' such as (32) describe the coming into existence of an entity as a whole and are thus at odds with *werden*; see the corresponding explanation for the infelicity of the opposite kind of relation (e. g., *#tot werden* 'become dead') in Section 2.3.

- (32) #Die Skulptur wurde aus Eis.
 the sculpture became out of ice

3. Sketch of a type-logical analysis of *werden*'s combinatorics

The upshot of Section 2 is that *werden* is sensitive to a conceptual distinction between trope ascriptions and state ascriptions. In order to spell out this sensitivity to conceptual types, we

propose a lexical semantics account according to which felicitous composition is based on a match between the presupposed type of a functor and the proffered type of its argument, while infelicitous composition is based on a corresponding type mismatch. We hereby follow the spirit of the type composition logic as developed by Asher (2011) and as applied and further developed by, for instance, Bücking and Maienborn (2019). This type-logical approach distinguishes between two layers of types: a standard intensional semantics with familiar types such as entities and truth-values and a proof-theoretic semantics with more fine-grained conceptual types such as events, tropes, humans, animals, bearers, etc.⁸ Correspondingly, an example such as #*The dancing fell off the table* is well formed on the standard intensional layer (roughly, a predicate of type $\langle e, t \rangle$ such as *fall off the table* can be combined with a subject of type e such as *the dancing*), but it is ill formed on the proof-theoretic conceptual layer (roughly, *fall off the table* presupposes application to a physical entity instead of an event as proffered by *the dancing*). A proper treatment of this distinction requires special technical measures; these are particularly relevant for the resolution of type mismatches by systematic adaptive mechanisms such as coercion. However, as we are mainly interested in an easily accessible exposition of our core idea, we will dispense with an advanced version of a type-logical analysis. We simply assume that entities are sorted by fine-grained types with the respective types appearing as subscripts to the relevant variables; this should suffice to show whether types match or not.

Against this background, we propose the lexical entry for *werden* in (33). It represents that *werden* presupposes a trope ascription as its predicative argument. Formally, a trope ascription is a predicate of type $\langle \text{BEARER}, \langle \text{TROPE}, T \rangle \rangle$, that is, a relation between tropes and their bearer.

$$(33) \quad \llbracket \text{werden} \rrbracket = \lambda P_{\langle \text{BEARER}, \langle \text{TROPE}, T \rangle \rangle} \lambda x_{\text{BEARER}} \lambda e_{\text{EVENT}} \cdot \exists r_{\text{TROPE}} [e : \text{become}'(P(x)(r))]$$

The sorting of predicates is exemplified by the examples in (34) and (35). *Müde* ‘tired’ and *zum Bäcker* ‘to a baker’ in (34) introduce trope ascriptions, which correctly predicts a match with the typing requirements of *werden*. By contrast, *im Garten* and *kaputt* in (35) introduce state ascriptions, which correctly predicts a mismatch with the typing requirements of *werden*.

$$(34) \quad \begin{array}{l} \text{a. } \llbracket \text{müde} \rrbracket = \lambda x_{\text{BEARER}} \lambda r_{\text{TROPE}} \cdot \text{tiredness}'(r) \wedge \text{bearer}'(r, x) \\ \text{b. } \llbracket \text{zum Bäcker} \rrbracket = \lambda x_{\text{BEARER}} \lambda r_{\text{TROPE}} \cdot \text{baker}'(r) \wedge \text{bearer}'(r, x) \end{array}$$

$$(35) \quad \begin{array}{l} \text{a. } \llbracket \text{im Garten} \rrbracket = \lambda x_{\text{ENTITY}} \lambda s_{\text{STATE}} \cdot s : \text{in}'(x, \text{tg}[\text{garden}'(g)]) \\ \text{b. } \llbracket \text{kaputt} \rrbracket = \lambda x_{\text{ENTITY}} \lambda s_{\text{STATE}} \cdot s : \text{out of operation}'(x) \end{array}$$

Correspondingly, a well-formed example such as (36a) receives the truth conditions in (36b) by regular composition (which includes the simplified assumption that the referential event argument of *werden* is bound by existential closure and which ignores all information related to aspect and tense): (36a) is true iff there is an event e and a trope r such that e is characterized by Mia becoming a bearer of tiredness r .

⁸The proof-theoretic semantics is rooted in the basic idea that a variable x is proven to be of type TYPE iff it complies with the conditions that our conceptual system imposes on TYPE. Therefore, these types can integrate very fine-grained conceptual distinctions.

- (36) a. Mia wurde müde.
 b. 1 iff $\exists e_{\text{EVENT}} \exists r_{\text{TROPE}} [e: \text{become}'(\text{tiredness}'(r) \wedge \text{bearer}'(r, \text{Mia}))]$

The type-based approach can also handle intriguing pairs such as (37) (= (17)). The adjective *panisch* in (38a) introduces a trope ascription, which is compatible with *werden*. By contrast, the PP *in Panik* in (38b) introduces a state ascription, which is incompatible with *werden*.

- (37) Mia wurde {panisch / #in Panik}.
 Mia became {panicked / in panic}
- (38) a. $\llbracket \text{panisch} \rrbracket = \lambda x_{\text{BEARER}} \lambda r_{\text{TROPE}} \cdot \text{panic}'(r) \wedge \text{bearer}'(r, x)$
 b. $\llbracket \text{in Panik} \rrbracket = \lambda x_{\text{BEARER}} \lambda s_{\text{STATE}} \cdot \exists r_{\text{TROPE}} [s: \text{panic}'(r) \wedge \text{bearer}'(r, x)]$

Recall from Section 2.3 that the PP-internal binding of the trope in (38b) is rooted in the complex syntactic structure of the PP and is therefore motivated on structural grounds. This example, then, also shows that the combinatorics of *werden* cannot be captured by some vague conceptual association of predicates with tropes. It is their composition that is crucial.

4. The distinction between tropes and states and the combinatorics of stative copulas

This section considers the implications of our ontology-based approach to *werden* for the combinatorics of stative copulas. Specifically, we will briefly address the copula *sein* ‘be’ in German and then focus on the *ser/estar* alternation in Spanish.

4.1. On *sein* ‘be’ in German

The stative copula *sein* ‘be’ in German can apply to both trope and state ascriptions; see (39).

- (39) Mia ist {müde / im Garten}.
 Mia is {tired / in the garden}

This can be captured by the disjunctive type P in (40), which is mapped to (40a) or (40b) depending on whether the incoming P is actually a trope ascription or a state ascription. For *müde* ‘tired’, (40a) is used; for *im Garten* ‘in the garden’, (40b) is used.

- (40) $\llbracket \text{sein} \rrbracket = \lambda P_{\langle \text{BEARER} \vee \text{ENTITY}, \langle \text{TROPE} \vee \text{STATE}, \text{T} \rangle \rangle} \lambda x_{\text{BEARER} \vee \text{ENTITY}} \lambda s_{\text{STATE}} \cdot$
 a. $\exists r_{\text{TROPE}} [s: P(x)(r)]$ if P is of type $\langle \text{BEARER}, \langle \text{TROPE}, \text{T} \rangle \rangle$
 b. $P(x)(s)$ if P is of type $\langle \text{ENTITY}, \langle \text{STATE}, \text{T} \rangle \rangle$

The systematic difference between (40a) and (40b) does not affect the felicity of *sein*’s combinatorics. Nevertheless, it reflects a contrast between the ways in which predication proceeds. (40a) amounts to aspect-oriented internal predication (*müde* predicates of an aspect of Mia), while (40b) amounts to holistic external predication (*im Garten* locates Mia as a whole). To be sure, this does not say that the resulting truth conditions must always reflect this difference. For instance, the predicates in (41) trigger different ways of predicating: the trope ascription *panisch* ‘panicked’ induces the use of (40a), and the state ascription *in Panik* ‘in panic’ induces the use of (40b). However, the resulting truth conditions are the same; see (42). In other words,

the difference is merely that the binding of the trope antecedes the combination with the copula for *in Panik*, while it comes about in the course of the combination with the copula for *panisch*.

(41) Mia ist {panisch / in Panik}.
Mia is {panicked / in panic}

(42) 1 iff $\exists s_{\text{STATE}} \exists r_{\text{TROPE}} [s: \text{panic}'(r) \wedge \text{bearer}'(r, \text{Mia})]$

This approach captures the observation that the variants in (41) contribute identical contents although the underlying predicates differ in a way that is crucial for their combinatorics with *werden*.

This section has sketched the analysis of an unselective stative copula. This raises the follow-up question of whether there are stative copulas that show lexicalized reflexes of the distinction between trope ascriptions and state ascriptions. The next section will address the *ser/estar* alternation in Spanish as a potential case in point.

4.2. On the *ser/estar* alternation in Spanish

The distribution of *ser* and *estar* in Spanish has received much attention in the literature. This section will not provide a comprehensive overview of this research, but it will reconsider the alternation from an ontology-based perspective. To this end, we will recap the recent approach to the alternation in Gumiel-Molina et al. (2015) and link their core ideas to the distinction between tropes and states. As we are mainly interested in an integrated view on core ideas, we will largely ignore the technical implementation that is defended by Gumiel-Molina et al. (2015). Specifically, in contrast to Gumiel-Molina et al. (2015), we will stick to a lexical semantics approach to combinatorial restrictions without making use of functional syntactic structures. A proper evaluation of the different implementations is left for another occasion.

4.2.1. Overview of relevant data

Following Gumiel-Molina et al. (2015), the combinatorics of *ser* and *estar* with adjectives can be characterized as follows. First, classifying (uses of) adjectives go along with *ser*, but not with *estar*. This is particularly evident from relational adjectives such as *vegetariano* ‘vegetarian’ or *español* ‘Spanish’; see the examples in (43) and recall the discussion of corresponding classifying role nouns in Section 2.4. Similarly, so-called lexical dispositional adjectives such as *cruel* ‘cruel’ or *inteligente* ‘intelligent’ classify entities by their disposition to show a specific behavior in relevant normal situations; see (44). Notably, the combination of these types of adjectives with *estar* is not outright ungrammatical; however, the use of *estar* yields non-classifying readings such as ‘to act in a {Spanish / cruel} way (in a particular situation)’.

(43) Ben {es / #está} {vegetariano / español}.
Ben {is_{ser} / is_{estar}} {vegetarian / Spanish}

(44) Ben {es / #está} {cruel / inteligente}.
Ben {is_{ser} / is_{estar}} {cruel / intelligent}

Second, so-called perfective adjectives show the opposite distribution. As shown by (45), examples such as *ausente* ‘absent’, *desnudo* ‘naked’, *muerto* ‘dead’ or *perplejo* ‘perplexed’ go along with *estar*, but not with *ser*. According to Gumiel-Molina et al. (2015: 966-967), perfective adjectives have in common that they introduce result states. While details are controversial, this commonality is generally reflected in a morphological relation to verbal participles.

- (45) Ben {#es / está} {ausente / desnudo / muerto / perplejo}.
 Ben {is_{ser} / is_{estar}} {absent / naked / dead / perplexed}

Third, the majority of adjectives go with both *ser* and *estar*. However, the choice induces combinatorial effects. In particular, Gumiel-Molina et al. (2015: Section 4) argue that the choice of *ser* yields relative readings of adjectives, while the choice of *estar* yields absolute readings of adjectives. This is illustrated by the examples in (46) and (47).

- (46) a. Mia es más alta que Ben, pero Mia no es alta.
 Mia is_{ser} more tall than Ben but Mia not is_{ser} tall
 ‘Mia is taller than Ben, but Mia is not tall.’
 b. #Mia está más alta que Ben, pero Mia no está alta.
 Mia is_{estar} more tall than Ben but Mia not is_{estar} tall
- (47) a. Esta camisa es más transparente que la falda, pero no es transparente.
 this shirt is_{ser} more see-through than the skirt, but not is_{ser} see-through
 ‘This shirt is more see-through than the skirt, but it is not see-through.’
 b. #De tanto lavarla, esta camisa está más transparente que la falda, pero no
 of much clean-it, this shirt is_{estar} more see-through than the skirt, but not
 está transparente.
 is_{estar} see-through
 ‘Having been washed so often, this shirt is more see-through than the skirt, but it
 is not see-through.’

[see Gumiel-Molina et al. (2015), (39b)/(41a), (45)]

Usually, *alto* ‘tall’ is associated with an open scale and thus with a relative interpretation. The combination with *ser* in (46a) preserves this interpretation. As no maximal standard for tallness is involved, being taller than someone else does not require someone to be tall. By contrast, the combination with *estar* in (46b) is contradictory. That is, *estar* triggers an evaluation relative to a maximal standard (that is, an absolute interpretation) such that being taller than someone else now requires someone to be tall. For *transparente* ‘transparent’ in (47), the point of departure is reversed, but the result is the same. Usually, *transparente* is associated with a closed scale and thus with an absolute interpretation. In this case, *ser* triggers a change towards a relative interpretation, as in (47a), while *estar* preserves the absolute interpretation, as in (47b).⁹

This overview reveals striking similarities between *werden* and *ser*. Both go particularly well with classifying predicates and relative adjectives. They are also both fine with gradable absolute adjectives. However, the examples in (48) suggest that, in contrast to *ser*, *werden* does not

⁹For reasons of space, we do not discuss effects resulting from the type of subject and further participants.

impose relative interpretations. That is, *werden* does not override scale-related information, but preserves the association of the respective adjectives with an absolute interpretation. In (48a), *feucht* ‘damp’ is associated with a minimal standard for dampness; therefore, becoming more damp than something else requires being damp. In (48b), *sauber* ‘clean’ is associated with a maximal standard for cleanliness; therefore, becoming cleaner than *x* implies that *x* is not clean.

- (48) a. #Die Decke wurde feuchter als das Kissen, aber die Decke {ist / wurde}
 the blanket became more damp than the pillow but the blanket {is / became}
 nicht feucht.
 not damp
- b. Das T-Shirt wurde sauberer als der Pulli. → Der Pulli {ist / wurde}
 the T-shirt became cleaner than the sweater the sweater {is / became}
 nicht sauber.
 not clean

The selectional constraints of *werden* and *ser* are also alike. The ontology-based generalization is simple: both copulas are at odds with state predicates. While Gumiel-Molina et al. (2015) do not frame it this way, their account of *ser*’s constraints in terms of result states is clearly linked to ontology. We suggest the following merits of a generalized ontology-based approach.

First, our discussion of *werden*’s combinatorics has shown that adjectives can convey state ascriptions even if they lack a morphologically transparent relation to participles. A generalized restriction on state predicates thus covers examples such as (45) independently of their controversial morphological status. Transparent participles are just the most obvious case in point for state ascriptions. Second, in view of our acknowledgment of fine-grained lexical distinctions, it is possible that a predicate in one language contributes a state ascription, while the putative counterpart in another language contributes a trope ascription. For instance, *cansado* ‘tired’ in Spanish lexicalizes the result of a tiring process and thus contributes a state ascription (hence the conflict with *ser*). By contrast, *müde* ‘tired’ in German lexicalizes the relevant internal property as such and thus contributes a trope ascription (hence no conflict with *werden*). Third, both *ser* and *werden* are incompatible with locatives, as shown in (49) (recall (6)).

- (49) Ben {#es / está} en el jardín.
 Ben {is_{ser} / is_{estar}} in the garden

Gumiel-Molina et al. (2015: 997) raise the question of how to integrate locative PPs into their analysis, which is tailored to adjectives. Our ontology-based generalization covers locatives in a straightforward way: *ser* is incompatible with locatives because they convey state ascriptions.

The next section will sketch the analysis of the *ser/estar* alternation in Gumiel-Molina et al. (2015) and flesh out its integration into an ontology-based approach.

4.2.2. The analysis in Gumiel-Molina et al. (2015) and its ontology-based reconception

Gumiel-Molina et al. (2015: 981) argue that *ser* and *estar* are sensitive to “ways of contributing properties to subjects”, with these ways being induced by different types of comparison classes.

Specifically, *ser* selects predications that are evaluated relative to a between-individuals comparison class and, thus, exclude counterparts of the subject. (Counterparts of entities are their stages at different world-time indices.) *Estar*, by contrast, selects predications that are evaluated relative to a within-individual comparison class and, thus, include counterparts of the subject. The representations in (50) and (51) provide simplified and adapted exemplifications (with adjectives contributing standard measure functions and M' being a context-sensitive function that maps measure functions and comparison classes to standards of comparison).

- (50) a. John es alto para ser jugador de fútbol.
 John is_{ser} tall for be player of soccer
 ‘John is tall for a soccer player.’
 b. 1 iff s : $\text{tall}'(\text{John}) \geq M'(\text{tall}')(\lambda y.\text{soccer player}'(y))$
- (51) a. El bar está lleno para ser miércoles.
 the bistro is_{estar} full for be Wednesdays
 ‘The bistro is full for a Wednesday.’
 b. 1 iff s : $\text{full}'(\iota b[\text{bistro}'(b)]) = M'(\text{full}')$
 ($\lambda c.c = \text{typical counterpart of } \iota b[\text{bistro}'(b)] \text{ on Wednesdays}$)
 [see Gumiel-Molina et al. (2015), (55), (58)]

In prose, (50a) is true iff there is a state such that the degree to which John is tall is equal to or greater than the standard degree of tallness for soccer players. That is, the comparison class comprises individuals different from the subject. (51a) is true iff there is a state such that the degree to which the bistro is full equals the standard degree of fullness for typical counterparts of the bistro on Wednesdays. That is, the comparison class comprises stages of the subject.

In a nutshell, this approach can handle the combinatorics of adjectives with *ser* and *estar* as follows. First, classifying (uses of) adjectives go with *ser* instead of *estar* because individuals are gathered in classes in virtue of a comparison between individuals. Second, as perfective adjectives contribute result states, Gumiel-Molina et al. (2015: 987-988) suggest that they encode natural transitions between states and thus induce a comparison between the states an individual is in, that is, a within-individual comparison. Correspondingly, perfective adjectives go with *estar* instead of *ser*. Finally, following Toledo and Sassoon (2011), the type of comparison class bears on the distinction between relative and absolute interpretations. A comparison between individuals – which is essential for *ser* – results in an evaluation relative to a midpoint standard, that is, a relative interpretation. The reason is simple: the natural representative value of a property for different individuals is an average; a natural endpoint value does not exist in this case. By contrast, a comparison within the same individual – which is essential for *estar* – results in an evaluation relative to an endpoint standard, that is, an absolute interpretation. For one individual, there are absolute values available that can be used as the standard.

According to our considerations in Section 4.2.1, the *ser/estar* alternation is ultimately rooted in ontological distinctions. We propose that the comparison class-based analysis by Gumiel-Molina et al. (2015) can be integrated into an ontology-based approach as follows. There is a clear conceptual kinship between comparison classes and ontology. Tropes are particularized properties that are inherent to their bearers; therefore, they are not directly related to changes

in time. Correspondingly, a comparison between tropes should be one between individuals. States, by contrast, are temporal abstractions over properties; therefore, they are directly related to changes in time. Correspondingly, a comparison between states can, or, in view of the contrast to tropes, even should, be one within individuals. In short, a comparison between individuals is rooted in trope ascriptions, while a comparison within an individual is rooted in state ascriptions. Against this background, we integrate the core insights of the analysis by Gumiel-Molina et al. (2015) into the following ontology-based analysis of *ser* and *estar*.

$$(52) \quad \begin{array}{l} \text{a. } \llbracket \text{ser} \rrbracket = \lambda P_{\langle \text{BEARER}, \langle \text{TROPE}, \text{T} \rangle \rangle} \lambda x_{\text{BEARER}} \lambda s_{\text{STATE}} \cdot \exists r_{\text{TROPE}} [s: P(x)(r)], \\ \quad \text{where } P(x)(r) \text{ contrasts with relevant } P(y)(r') \\ \text{b. } \llbracket \text{estar} \rrbracket = \lambda P_{\langle \text{ENTITY}, \langle \text{STATE}, \text{T} \rangle \rangle} \lambda x_{\text{ENTITY}} \lambda s_{\text{STATE}} \cdot P(x)(s), \\ \quad \text{where } P(x)(s) \text{ contrasts with relevant } P(c_x)(s') \end{array}$$

According to (52a), *ser* selects trope ascriptions, which comes with a presupposition to the effect that the trope ascription to the given subject referent is contrasted with trope ascriptions to further relevant individuals. So *ser* triggers a between-individuals comparison class. According to (52b), *estar* selects state ascriptions, which comes with a presupposition to the effect that the state ascription to the given subject referent is contrasted with state ascriptions to counterparts of this referent. So *estar* triggers a within-individual comparison class.

According to our proposal, both *werden* and *ser* select trope ascriptions; recall (53).

$$(53) \quad \llbracket \text{werden} \rrbracket = \lambda P_{\langle \text{BEARER}, \langle \text{TROPE}, \text{T} \rangle \rangle} \lambda x_{\text{BEARER}} \lambda e_{\text{EVENT}} \cdot \exists r_{\text{TROPE}} [e: \text{become}'(P(x)(r))]$$

This accounts for the observation that the combinatorics of both copulas are essentially the same, including their conflict with locatives. However, we have also observed that, in contrast to *ser*, *werden* does not impose relative interpretations. The lexical entry in (53) complies with this by lacking the presupposition that the trope ascription to the subject referent must be contrasted with tropes as borne by other individuals. Hence, *werden* does not require a comparison between individuals yielding a relative interpretation. This lack of an additional presupposition might have a principled reason. *Werden* differs from stative copulas by introducing a change by its proffered semantics. That is, the proffered semantics already comes with a prominent temporal contrast, which renders additional presuppositions superfluous.

5. Conclusion

We have argued that the copula *werden* ‘become’ in German is sensitive to ontological types. It combines with expressions for trope ascriptions (e. g., relative adjectives, predicates specifying roles), but not with expressions for state ascriptions (e. g., locatives, participles, adjectives specifying the holding of a property for entities as wholes). We have proposed a lexical semantics account according to which the combinatorics of *werden* follows from a (mis)match between the typing presuppositions of *werden* and the proffered type of its predicative argument. In addition, we have related our results to the combinatorics of stative copulas, focusing on the *ser/estar* alternation in Spanish. The sensitivity of the alternation to comparison classes is recast in ontological terms. This approach captures combinatorial analogies between *ser* and *werden*; it also sheds new light on the ontological foundation of comparison classes.

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