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## On the Distinction between Abstract States, Concrete States, and Tropes

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Stative verbs provide major challenges both for linguistic semantics and for ontology. On the common, Davidsonian view of the semantics of verbs, verbs take events as implicit arguments and adverbial modifiers (at least to an extent) act as predicates of such event arguments. This approach should naturally extend to stative verbs, which will then take a state as an implicit argument. However, stative verbs do not behave as one might expect on such a Davidsonian view: they for the most part allow only for a very limited set of adverbial modifiers and exclude a range of modifiers that express properties of the sort of state that stative verbs appear to describe. For example, the stative verb *resemble* does not allow for location modifiers, even though one might expect a state of resemblance to have as its location the location of its participants:

(1) a. \*John resembles Mary in France.

Stative verbs, moreover, generally cannot form an infinitival complement of a perception verb, unlike eventive verbs:

(1) b. \*Bill saw John resemble Mary.

c. Bill saw John hit Mary.

Thus, unlike events, states for the most part are unable to act as the object of direct perception.

In this paper, I will first discuss and defend a distinction between what I will call ‘abstract states’ and ‘concrete states’, a distinction that has recently been proposed by Maienborn (2005, 2007) to account for the peculiar semantic behavior of stative verbs. I will then give an explicit ontological account of the notion of an abstract state. Finally, I will relate that discussion to the category of tropes (or particularized properties) which is an older ontological notion closely linked to the semantics of adjectives, but so far neglected in the semantic literature on stative verbs. I will suggest that the category of concrete states can be dispensed with in favor of tropes, events, and

abstract states. Overall, I will argue in favor of a semantic parallelism between stative and eventive verbs and adjectives, but for more fundamental ontological distinctions among the implicit arguments that verbs and adjectives of the various sorts take.

### 11.1.1 Maienborn's distinction between abstract (Kimean) and concrete (Davidsonian) states

The majority of stative verbs are what I call abstract-state verbs. Abstract-state verbs include measure verbs such as *weigh*, verbs of possession such as *own*, and mental-state verbs such as *know*. Concrete-state verbs include verbs of body position and posture (*sit, stand, sleep, kneel*) and verbs of 'internal causation' (*glow, shimmer*) (Maienborn 2005, 2007; Rothmayr 2009).<sup>1</sup> The diagnostics for abstract-state verbs consists in their restricted ability to accept adverbial modifiers or to allow for particular readings of adverbials modifiers as well as their inability to form infinitival complements of perception verbs.

Abstract-state verbs display what is called the 'Stative Adverb Gap' (Katz 2003). This means that they do not allow for a range of adverbial modifiers, such as location modifiers, manner adverbials, instrumentals, or comitatives (Maienborn 2005, 2007), modifiers that are generally available both with eventive verbs and concrete-state verbs:

#### location modifiers:

- (2) a. \* John weighs 100 kilos in Germany.  
 b. \* John owns the horse in Germany.  
 c. \* John knows French in Munich.
- (3) a. John was walking in Munich.  
 b. John slept in the house.

#### manner modifiers:

- (4) a. \* John weighs 100 kilos with difficulty.  
 b. \* John owns the horse with effort.  
 c. ?? John knows French in an unusual way.
- (5) a. John was walking in an unusual way.  
 b. John stood at the table with difficulty.

<sup>1</sup> Maienborn (2005, 2007) calls what I call 'concrete-state verbs' 'state verbs' and what I call 'abstract-state verbs' 'stative verbs'.

instrumentals, comitatives:

- (6) a. ?? John knows French with Mary.  
 b. ?? John owns the house with a pencil.
- (7) a. John was walking with Sue.  
 b. John was standing at the table with Sue.

Apparent exceptions to the Stative Adverb Gap generally can be traced to a different semantic interpretation of the adverbial and sometimes a different syntactic function in which the adverbial acts. In particular, an adverbial may be interpreted as a predicate of an event or object associated with the state described, rather than the state itself, as discussed by Katz (2003) and Maienborn (2005). For example, *with great passion* in (8a) arguably is predicated of the activities associated with the state of John's having been a Catholic, rather than the state itself (Katz 2003):

- (8) a. John was a Catholic with great passion in his youth.

Furthermore, location adverbials in sentence-initial position may act as frame adverbials, specifying the thematic or spatio-temporal frame for the topic the entire subsequent sentence is about (Maienborn 2001):

- (8) b. In Paris John knew French well.

A number of verbs considered abstract-state verbs also show a peculiarity with respect to amount quantifiers, quantifiers such as *a little*, *a lot*, or the comparative *more*. Unlike concrete-state verbs, abstract-state verbs that admit such modifiers (*resemble*, *believe*, or *love*) do not permit what looks like a time-related interpretation, but only an interpretation that relates to the degree of the property expressed by the verb, as in (9a–c):<sup>2</sup>

- (9) a. John resembles his father a little.  
 b. John believes it a little.  
 c. John loves Mary more than Sue.

By contrast, eventive and concrete-state verbs do admit a time-related interpretation, or rather an interpretation relating to the amount of the activity described:

- (10) a. John slept more than Mary.  
 b. John walked a little.  
 c. John spoke French more than Mary.

Finally, abstract-state verbs, unlike concrete-state verbs, cannot form infinitival complements of perception verbs (Maienborn 2005, 2007):

<sup>2</sup> This has been observed for *a little* or German *ein bisschen* 'a little bit' by Maienborn (2005); see also Rothmayr (2009). The observation can be generalized to all quantifiers of amount.

- (11) a. \* John saw Bill weigh 100 kilos.  
 b. \* John saw Bill own the house.  
 c. \* Mary saw John resemble his father.  
 d. \* Mary heard John know French.

There are a number of verbs that allow for an eventive and an abstract-state interpretation and thus pattern in both ways, for example *surround*, *obstruct*, *depress*, *help*, or *threaten* (Rothmayr 2009).

A particularly interesting class of abstract-state predicates consists in the combination copula *be+* adjective, for short *be+A*. Maienborn (2005, 2007) observes that *be+A* satisfies the relevant criteria for abstract-state predicates. They resist the relevant classes of modifiers, and they cannot form infinitival complements of perception verbs:<sup>3</sup>

- (12) a. \*John was hungry in front of the refrigerator.  
 b. ?? John was nervous in Munich.
- (13) \* John was nervous with trembling hands.
- (14) ?? John was strong with Mary.
- (15) a. \* Mary saw John be hungry.  
 b. \* Mary saw Sue be beautiful.

Two approaches have been proposed in the semantic literature to account for the Stative Adverb Gap: a semantic one and an ontological one. Katz (2003), taking the semantic approach, argued that abstract-state verbs lack an event argument position entirely. This means that there would just be no entity for adverbial modifiers or perception verbs to apply to. By contrast, Maienborn (2005, 2007), taking the ontological approach, distinguishes two kinds of states and argues that the kind of state that abstract-state verbs take as implicit argument simply does not have the sorts of properties that the relevant modifiers would attribute, such as a location, a particular realization, or a role as an object of immediate perception. The reason is, Maienborn argues, that abstract states are states as conceived on a Kimean account of events (Kim 1976). On Kim's account, events are individuated strictly on the basis of a property or relation and its argument. By contrast, concrete states, Maienborn argues, fall under a Davidsonian account of events (Davidson 1967). This means they are relatively

<sup>3</sup> There are differences in acceptability of such examples, depending on the kind of adjective. *Be nervous* can accept location modifiers if they play a particular semantic role: (12a) is acceptable if the car is a reason or trigger for John's nervousness. In this case, the location modifier arguably undergoes coercion, changing its original semantic role of specifying the location of the event/state argument of the predicate to one specifying the trigger of the psychological state.

independent of the description used, are in space and time, and are causally efficacious abstract states as Kimean states have the following properties (Maienborn 2005, 2007):

- (16) a. Abstract states cannot vary in the way they are realized (which means they cannot be more specific than the descriptive content of the description used to describe them).  
 b. Abstract states are not accessible to direct perception and have no location in space.  
 c. Abstract states are accessible to higher cognitive operations.  
 d. Abstract states can be located in time.

I will add a fourth property that I take to be essential to abstract states, namely the absence of a part-whole structure and of a measurable extent:

- (17) Abstract states do not have a part-whole structure, and they do not have a measurable extent.

If abstract states are entities with such characteristics, the behavior of abstract-state verbs with the different sorts of adverbials and perception verbs is straightforwardly explained. Manner adverbials and instrumentals relate to a particular realization of an entity and thus cannot apply to abstract states (which cannot be more specific than the content of the predicate used to refer to them). The absence of a time-related reading of amount quantifiers follows if abstract states are not ordered by a part-whole relation and do not have a measurable extent.

It remains to explain how the degree-related reading is possible with verbs like *resemble*, *believe*, and *love*. I will turn later to that question (which I consider a challenge to the abstract-state account of such verbs).

It still needs to be explained how exactly the five characteristics of abstract states follow from Kim's original account of events. But before turning to that question, let me mention just some arguments in favor of Maienborn's ontological approach as such. Most importantly, the ontological approach preserves semantic uniformity: the semantic uniformity of predicates as generally taking an implicit event/state argument, the semantic uniformity of nominalizations as expressions that pick up the implicit event/state argument of the base verb, and the semantic uniformity of adverbial modifiers. Abstract-state verbs do not resist all adverbial modifiers; in particular they accept temporal modifiers of various sorts. On a standard Davidsonian view, temporal modifiers are considered predicates of the implicit event argument, just like location and manner adverbials. Preserving a unified semantics of temporal and other adverbials as predicates of the implicit event or state arguments appears naturally preferable to a semantics that treats them differently, let's say temporal adverbials as operators influencing the time of evaluation and other adverbials as event predicates (Katz 2003). Another argument in favor of implicit abstract-state arguments comes

from the observation that abstract-state verbs do allow for anaphoric reference to a state (Maienborn 2005, 2007):

(18) John once owned a car. That did not last very long, though.

The temporal predicate requires the pronoun *that* to refer to a state, rather than a fact that the preceding sentence might describe as a whole. Only states, but not facts have a temporal duration.

Maienborn's ontological approach to the Stative Adverb Gap not only has the advantage of maintaining semantic uniformity of predicates, adverbial modifiers, and nominalizations. The distinction between abstract states on the one hand and concrete states and events on the other hand appears an important one for independent reasons. The very same distinction can also be found in the philosophical literature, in particular in Steward's (1997) book *The Ontology of the Mind*. States, Steward argues, depend for their identity entirely on the content of a canonical description, whereas events are relatively independent of the content of the description used to describe them: they may have a 'secret life' not captured by the content of the description, as Steward puts it. The distinction then has consequences for the identity of the physical and the mental, as Steward argues. Mental states, being dependent on a description within a mentalistic vocabulary, could not possibly be identical to physical states, but mental events, being as such independent of a particular description, could be identical to physical events.

### 11.2 Kimean and Davidsonian conceptions of events

Maienborn's appeal to a Kimean conception of events remains a bit suggestive: it has yet to be shown why abstract states on a Kimean account will have just the kinds of properties they are meant to have. To address this question, let us first review Kim's original account of events. Kim's account consists in stating identity and existence conditions for events, as entities obtained from a property, an object, and a time, by a function  $f$  as below:

- (19) a. For a property  $P$ , an object  $o$ , and a time  $t$ , the event  $f(P, o, t)$  exists iff  $P$  holds of  $o$  at  $t$ .
- b. For properties  $P$  and  $P'$ , objects  $o$  and  $o'$ , and times  $t$  and  $t'$ , if  $f(P, o, t)$  and  $f(P', o', t')$  exist, then  $f(P, o, t) = f(P', o', t')$  iff  $P = P'$ ,  $o = o'$ ,  $t = t'$ .

This account does not explicitly define events in terms of a property, an object, and a time. Rather it gives an implicit definition of events, stating their existence and identity conditions in terms of an object, a property, and a time. In particular, events are not taken to be composed in some way of properties, objects, and times. Kim's account in fact introduces events by a form of Fregean abstraction (Frege 1884, see also Wright 1983 and Hale 1987). Frege's abstraction principle below just gives identity conditions

for objects obtained by the abstraction function  $g$  from entities  $o$  and  $o'$  that stand in some equivalence relation:

(20) For an equivalence relation  $R$ ,  $g(o) = g(o') \leftrightarrow R(o, o')$ .

Thus, for Frege directions are entities introduced by abstraction from parallel lines, and natural numbers entities obtained by abstraction from concepts standing in a one-to-one correspondence. (20) can naturally be generalized to  $n$ -place abstraction functions applying to  $n$  objects that stand in respective equivalence relations to each other:

(21) For equivalence relations  $R_1, R_2, \dots, R_n$ ,  
 $g_n(a_1, a_2, \dots, a_n) = g_n(b_1, b_2, \dots, b_n) \leftrightarrow R_1(a_1, b_1), \dots, R_n(a_n, b_n)$

Taking the equivalence relations to in fact be the identity relation, (19b) will come out as a special instance of (21). On Kim's view, the property, the object, and the time that introduce an event are given by the description used to describe the event. Thus, Kimean events are strictly dependent for their identity on the event description that is used.

What is particular about Fregean abstraction is that it introduces an object by simply specifying some of its properties, in particular its identity conditions. The object so introduced then could not have any other properties than are logically derivable by what is specified by the abstraction principle; though of course it can be the object of mental attitudes.

As a consequence, Kim's account won't allow events to have the properties that concrete objects have, such as a spatial location or a particular realization, or to be the object of direct perception.

For this reason, it is generally agreed that Kim's account in fact defines facts rather than events (Steward 1997).<sup>4</sup> Facts do not have a spatial location, do not act as objects of (direct) perception, and, arguably do not enter causal relations (but only relations of causal explanation (Steward 1997)). Moreover, they cannot be more specific than the content of the corresponding canonical fact description, that is, a description of the form *the fact that*  $S$ , where, in the simple case,  $S$  provides the property, the object, and the time. Facts, though, can be the objects of cognitive attitudes such as being aware of, thinking about, or noticing.

Kim's account is also suited as an account of abstract states. States, unlike facts, though, have a duration and can be 'at' a time. This can be captured by taking states to be obtained only from a property and an object, and not a time, and by making the existence condition of states dependent on a time:

<sup>4</sup> That is, on a Strawsonian conception of facts in which facts are not 'in' the world, but 'at' the world (Strawson 1950). On an Austinian conception, facts are rather 'in' the world (Austin 1979b). See also Asher (1993) for discussion.

(22) A Kimean account of states:

- a. For a property  $P$ , an object  $o$ , the state  $s(P, o)$  obtains at a time  $t$  iff  $P$  holds of  $o$  at  $t$ .
- b. For properties  $P$  and  $P'$ , objects  $o$  and  $o'$ , and times  $t$  and  $t'$ ,  $s(P, o, t) = s(P', o', t')$  iff  $P = P'$ ,  $o = o'$ , and  $t = t'$ .<sup>5</sup>

It is a consequence of this implicit definition of abstract states that abstract states will have temporal, but no spatial properties. Moreover, like facts, abstract states will not involve a particular realization, but will be strictly dependent on the property and object given by the state description.

Existence predicates in natural languages give further support for the ontological closeness between facts and abstract states. Thus the existence predicate *obtain* in English specifically applies to facts and states; it cannot apply to objects or events (for which there are the existence predicates *exist* and *occur* instead).

The Kimean account of abstract states in (22) explains the Stative Adverb Gap straightforwardly. The account leaves no space for a spatial location, causal relations, a more specific realization, a part–whole structure, or a measurable extent.

### 11.3 Tropes and abstract states

Abstract states are thus fundamentally distinct from events as well as concrete states (should there be any—I will address that question shortly). But there is another ontological category that contrasts in the same way with abstract states. It is lesser known in linguistic semantics, but widely discussed in philosophy. This is the category of tropes or particularized properties.<sup>6</sup> Tropes are the particular manifestations of properties in individuals. Unlike properties conceived as universals, tropes depend on a particular individual and thus are generally taken to involve a particular spatio-temporal location. Tropes differ from properties also in that they are causally efficacious and can act as the objects of visual perception. Typical examples of tropes are ‘Genji’s handsomeness’ and ‘Socrates’ wisdom’.

Tropes are generally taken to be the referents of adjective nominalizations, as in the examples just given. Assuming a general Davidsonian approach to nominalizations, this would mean that tropes act as implicit arguments of adjectives. Adjectives themselves allow for a range of modifiers, and in fact, as I argued in Moltmann (2009), these modifiers represent precisely the kinds of properties that tropes are supposed to have, such as properties of causal effect, of perception, and of particular manifestation, as illustrated below:

<sup>5</sup> It will then be a general lexical condition on the meaning of stative verbs that a stative verb  $V$  holds of a state  $s$  and an individual  $d$  at a time  $t$  only if  $s$  obtains at  $t$ .

<sup>6</sup> Williams (1953) (who coined the term) is the classic modern reference on tropes. Further references include Woltersdorff (1970) and Campbell (1990).



- (23) a. Mary is visibly / profoundly happy.  
 b. Mary is extremely / frighteningly / shockingly pale.

In fact, the same adverbials can act as predicates with an NP as subject whose head is the corresponding adjective nominalization:

- (24) a. Mary's happiness is visible / profound.  
 b. Mary's paleness is extreme / frightening / shocking.

In Moltmann (2009), I argued that degree adverbials, in particular, should be considered predicates of tropes.

Unlike events and like states, tropes do not consist in changes in properties. But tropes are fundamentally distinct from abstract states. Abstract states are just the obtaining of a property of an individual, however indeterminable or unspecific the property may be. Abstract states do not care how the property manifests itself in the individual. Tropes, by contrast, are fully specific. They must at least be grounded in determinate and natural properties and thus generally are more specific than the property expressed by the expression used to refer to them (Moltmann 2007). For example, 'Genji's handsomeness' is constituted by the very particular features in virtue of which Genji is handsome, and 'Socrates' wisdom' is constituted by the particular way in which and extent to which Socrates is wise.

Tropes thus are concrete in the sense of being entirely specific, in being objects of perception, and in being causally efficacious. Abstract states, by contrast, are abstract in the sense of not involving a particular realization, in not acting as relata of causal relations, and in not acting as objects of perception.

The very same predicate can be used, though, to describe both an abstract state and a trope. In particular, the same adjective can be used for a nominalization describing an abstract state and a nominalization describing a trope. Thus, *Socrates' being wise* refers to an abstract state, but *Socrates' wisdom* refers to a trope, and *Genji's handsomeness* refers to a trope, but *Genji's being handsome* refers to a state. The difference between abstract states and tropes is reflected in the kinds of predicates the two nominalizations allow. 'Socrates's wisdom' may be 'profound', 'greater than Xanthippe's', 'subtle', or 'accumulated over a long life'; 'Socrates' being wise' can be none of those things. Trope nominalizations, moreover, can be the complements of perception verbs, whereas state nominalizations cannot:

- (25) a. John looked at Mary's distraction.  
 b. ?? John looked at Mary's being distracted.
- (26) a. I saw John's nervousness.  
 b. \*I saw John's being nervous.

In fact, abstract-state nominalizations are just as unacceptable with perception verbs as infinitival complements formed from an abstract-state predicate, such as *be+A*:

- (27) a. \*I saw John be nervous.  
 b. \*I saw John be distracted.

Abstract states and tropes also differ with respect to their part structure: abstract states, like facts, cannot have parts, but tropes can. For example, saying ‘part of Socrates’ wisdom was acquired in his youth’ is natural. By contrast, ‘part of Socrates’ being wise’ does not make sense. Furthermore, amount quantifiers such as *little*, *a lot*, or *more* can go along with trope nominalizations, but not with abstract-state nominalizations, as has been observed already by Woltersdorf (1970) and Levinson (1978):<sup>7</sup>

- (28) a. John has more wisdom than Mary.  
 b. \*John has more being wise than Mary.

In fact, tropes as referents of gradable adjective nominalizations generally come with an intrinsic ordering, reflecting the ‘degree’ to which they exhibit the property in question or some other measureable extent.<sup>8</sup> States, by contrast, come with no such ordering. This is reflected not only in the applicability of amount quantifiers, but also in the applicability of comparative predicates such as *exceed* or *is greater than*:

- (29) a. John’s happiness exceeds / is greater than Mary’s happiness.  
 b. \*John’s being happy exceeds / is greater than Mary’s being happy.

Given the nature of tropes and their semantic role in the semantics of adjectives, the question is, how do tropes relate to concrete states? Should concrete states be identified with tropes or should they be distinguished from them as a separate ontological category? I will only briefly address this question at the end of this paper. I will first turn to a simpler question that tropes as implicit arguments of adjectives raise, namely the question of the semantics of copula constructions of the sort *be+A*.

#### 11.4 *Be+adjective*

We have seen that *be+A* counts as an abstract-state predicate regardless of the content of the adjective *A*. If adjectives take tropes as implicit arguments, this means that the implicit trope argument of the adjective does not act as the implicit argument of the copula verb. The abstract-state argument of *be+A*, however, can be obtained from the implicit trope argument of the adjective, namely as the state of being a bearer of a trope that is an argument of the adjective. Thus, the semantics of *be+A* will be as below, where ‘B’ stands for the bearerhood relation, the relation that holds between a trope and its bearer, and *f* is, as before, the state abstraction function:

<sup>7</sup> Woltersdorff and Levinson actually talk about ‘property nominalizations’ rather than what I call ‘abstract-state nominalizations’.

<sup>8</sup> In Moltmann (2009), I argued that this requires entities as referents of adjective nominalizations that are more complex than tropes as standardly conceived.

- (30) For an individual  $d$  and a state  $s$ ,  $\langle d, s \rangle \in [be\ A]$  iff  $\exists t(\langle t, d \rangle \in [A] \ \& \ s = f(d, \lambda x[B(x, t)])$ )

The abstract state that acts as an implicit argument of  $be+A$  is of course the very same state as the one that acts as the referent of a state nominalization:

- (31)  $[John's\ being\ A] = \iota s[\langle s, [John] \rangle \in [be\ A]]$

Maienborn's (2005) account is somewhat different. For her, the abstract-state argument of  $be+A$  is actually obtained from the content of the adjective  $A$  taken as a one-place property, as below, where  $[A]$  is the one-place property expressed by  $A$ :

- (32)  $[be\ A] = \lambda z x[z = f(x, [A])]$

This means that the abstract state argument is completely redundant: it just reifies the content of the predicative complement. Within the trope-based semantics of adjectives, the state argument of  $be+A$  is not quite as redundant: it reifies the relation of the subject referent to a particular trope, not the content of the adjective as such. We will see later with the predicate *exist* that the abstract-state predicate may be obtained not just from the property expressed by the predicate, but the conceptual content of the predicate together with another implicit or explicit argument of the predicate.

### 11.5 The concreteness of events

For Maienborn, abstract states are fundamentally different from events, and their lack of a location and a particular realization is entirely independent of any conceptual content associated with the stative predicate or the nature of one particular state as opposed to another. The opposite view has been taken by Dölling (2005), who argued that states and events are on a par ontologically: both may have or lack location properties due to their particular nature. For example, an event like that of John's becoming forty years old, Dölling argues, fails to have a spatial location just like 'abstract' states. In what follows, I will give further support for Maienborn's view, namely that the abstractness of states and the concreteness of events is independent of the particular conceptual content associated with the predicate. One kind of support comes from copula constructions of the form  $become+A$ ; another from the existence predicates *exist* and *occur*.

#### 11.5.1 Become + adjective

While  $be+A$  is an abstract-state predicate,  $become+A$  obviously is an event predicate. The crucial observation in the present context is that  $become+A$  generally describes concrete events. This is remarkable because  $become+A$  differs in conceptual content from  $be+A$  only in that it describes a transition from a state of not being  $A$  to a state of being  $A$ .

Unlike with *be*+A, with *become*+A location and manner adverbials are perfectly acceptable, at least for suitable adjectives A:

- (33) a. Mary became hungry in front of the refrigerator.  
 b. Mary became nervous in the cellar.  
 c. Mary became ill in the car.
- (34) Mary became ill in a strange way.

Furthermore, *become*+A can form an infinitival complement of a perception verb:

- (35) a. John saw Mary become ill.  
 b. Bill saw John become very nervous.

This clearly shows that events of obtaining a property A are concrete, quite unlike the corresponding abstract state of being A. But why should the event argument of *become* be concrete rather than abstract; that is, why couldn't it be obtained by abstraction, in the sense in which abstract states are obtained by abstraction from a property and individuals? Of course, events are not states and thus could not be obtained by abstraction in the very same way, that is, from a single property or relation and individuals. Events rather are (or at least generally involve) property changes. The question then is, why could not events be transitions among abstract states? If events are constituted in some way by a transition relation and that relation applies to abstract states, then events should display the same kind of abstractness as abstract states. In particular, if the event argument of *become*+A is a transition from a state *s* of not being A to a state *s'* of being A and *s'* is the state argument of *be*+A, then an event so conceived should be as abstract as the entities from which it is composed (assuming *s* to be an abstract state as well). However, the event argument of *become*+A simply is concrete, just like all events in fact. Why should that be so? If events as property changes essentially involve transitions of some sort, then the answer must be that the transition relation as such can simply not apply to abstract states; it is a relation that can apply only to entities that are concrete and 'in' the world, not entities obtained by abstraction from things in the world.

There are two kinds of concrete entities that the transition relation constitutive of events could apply to: tropes and concrete states. As mentioned earlier already, I will address the question of the difference between concrete states and tropes at the end of this paper. Given that tropes as an ontological category play a significant role in the ontology of natural language anyway, it is reasonable to assume that events that are property changes are in fact transitions among tropes. Thus, if *trans* is the temporal transition relation constitutive of events, then the event argument of *become* A will be as below (where, again, *B* is the relation 'is bearer of'):

- (36) For a time  $t^*$ , an event  $e$  and an individual  $d$ ,  $\langle e, d \rangle \in [\textit{become}+A]t^*$  iff  $e = \textit{trans}(t, t')$  for tropes  $t$  and  $t'$  such that  $t$  and  $t'$  are during  $t^*$ ,  $\langle t', d \rangle \in [A]$ ,  $B(d, t)$ , and  $t$  is incompatible with  $t'$ .

That is, an event of *d* becoming *A* is the transition from a trope of *d* being something incompatible with *d*'s being *A* to a trope of *d*'s being *A*.

### 11.5.2 Predicates of existence

Predicates of existence, in particular the two existence predicates *exist* and *occur*, make a similar point about the concreteness of events. A few words, though, are first needed concerning existence predicates as such. Despite a philosophical tradition that denies that existence is a (first-order) property, natural language displays a range of existence predicates which obviously express at least a formal first-order property (since they generally go along with singular terms):

- (37) a. The French president exists.  
b. The king of France does not exist.

A number of philosophers have more recently defended the view that *exist* with a singular term in subject position is a first-order predicate (Miller 1975, Salmon 1987, McGinn 2000). But its content has generally been taken to be a simple one: *exist* is true of actually existing objects and false if the subject either does not refer or else stands for a merely intentional or 'non-existing' entity. It appears, though, that at least tensed *exist* has a more specific time-related meaning. This is first of all apparent in a particular semantic selectional restriction that tensed *exist* exhibits: tensed *exist* is applicable only to entities that are not events, that is, it is applicable only to enduring, not perduring objects. There are instead specific existence predicates for events, such as *occur*, *take place*, or *happen*:

- (38) a. \* The murder existed this morning.  
b. The murder occurred / took place / happened this morning.

In the following, I will restrict myself to *occur*.

A further semantic difference between *exist* and *occur* consists in their actionsart. *Exist* is a stative predicate, whereas *occur* is an eventive predicate. One indication of the stativity of *exist* is the nominalization *existence*. 'The existence of the building' is a state; it cannot have typical event properties such as 'being sudden', 'being fast', or 'being quick'. Another indication for the stativity of *exist* is its inability to take the progressive:

- (39) \* The house has been existing for a while.

The behavior of adverbial modifiers clearly shows that *exist* classifies as an abstract state verb. Below we see that *exist* does not take location modifiers:<sup>9</sup>

<sup>9</sup> Location modifiers are possible, though, in *exist*-sentences with bare mass nouns or plurals in subject position:

- (i) Giraffes exist / Wildlife exists not only in Africa.

- (40) a. \* The French president exists in France.  
 b. \* The box exists on the shelf.  
 c. \*Mao does not exist in China anymore.

To make the point, it is important to understand the sense in which *exist* does not permit location modifiers. There are in principle two ways in which location modifiers may function: as adjuncts and as arguments. The common view is that in the former case, the modifiers will act semantically as predicates of the event argument of the verb, where in the latter case they provide arguments of the relation expressed by the verb. Certainly, for identifying a predicate as an abstract-state predicate, only the former function will be relevant. Since adverbial modifiers in that function are available without having to be selected by the verb, the location modifiers as adjuncts are available syntactically, but they are excluded for semantic reasons.

Just considering the kind of state that *exist* should describe, it is not obvious why it should resist location predicates. The existence of an entity *d* should be a state whose location may seem straightforward: it is located just where *d* is located. But such reasoning fails. A state of existence resists location predicates rather because it is an abstract state, which by nature does not have such properties as a location in space.

Further evidence that *exist* is an abstract-state predicate is its failure to take manner adverbials and to form an infinitival complement of a perception verb:

- (41) a. ?? The president of Italy exists in a flamboyant way.  
 b. ?? The building exists unnoticed.
- (42) \*John saw the building exist last year.

What is it about the lexical meaning of *exist* that makes *exist* counts as an abstract-state verb? The restriction of *exist* to enduring objects motivates an account of its lexical meaning based on a common philosophical view of endurance: an enduring object *d* exists at a time *t* just in case *d* is wholly present at each moment of *t*, where ‘being wholly present at *t*’ means each part of the object is present at *t* (Hawley 2007). Given that (non-minimal) events have temporal parts, events cannot endure, that is, be wholly present at each moment of their duration. In first approximation, the lexical meaning of *exist* can be given as follows:

- (43) For a world *w*, an entity *x* that cannot have temporal parts, and an interval *t*,  $\langle e, x \rangle \in [exist]^{w,t}$  iff *e* consists in the presence of (the whole of) *x* in *w* at *t*’ for any subinterval *t*’ of *t*.

More formally, the event argument of *exist* can be obtained by abstraction from the time-relative property in (44a), so that we will have (44b) (with ‘AT’ standing for the relation ‘being temporally at’):

Here *exist* expresses location-relative existence (Fine 2006). Perduring objects cannot have location-relative existence, but kinds arguably can.

- (44) a.  $P = \lambda x t [\forall t' (t' \leq t \rightarrow AT(x, t'))]$   
 b.  $\langle e, d \rangle \in [exist]^t$  iff  $e = f(\lambda x [P(x, t)], d)$

Note that this means that the abstract-state argument of *exist* does not reify the lexical content of *exist* as a one-place predicate, but rather a two-place property involving an implicit temporal restriction.

Let us then turn to the existence predicate *occur*. *Occur* like other existence predicates for events (*take place* and *happen*) is an eventive verb. It displays standard diagnostics for eventive predicates, such as allowing for the progressive:

- (45) The protest is taking place / is happening / is occurring right now.

Moreover, the corresponding nominalizations clearly refer to events, allowing for typical event predicates:

- (46) The occurrence of the murder was sudden / quick.

But what are occurrences, that is, what distinguishes the occurrence of an event *e* from the event *e* itself? Occurrences have fewer properties than the corresponding occurring events; in particular, they lack a range of qualitative properties. For example, instrumental and comitative predicates are hardly applicable to occurrences, while they may be fine with the corresponding occurring events:

- (47) a. The victim was murdered with an axe.  
 b. The murder was done with an axe.  
 c. ?? The murder occurred with an axe.
- (48) a. John murdered the victim with Mary.  
 b. The murder was done with Mary.  
 c. ?? The murder took place with Mary.

But still events of occurrence classify as concrete. First, they allow for location and manner adverbials:

- (49) a. The murder occurred in the kitchen.  
 b. The car accident occurred in a very unusual way.

Moreover, they can form the infinitival complement of a perception verb:

- (50) John saw the murder occur with his own eyes.

Given the behavior of adverbial modifiers, it appears that ‘occurrences’ are events that have ‘lost’ the qualitative features of the original event, but they are still concrete in other respects. If qualitatively thick events are transitions among qualitative tropes, then occurrences may be viewed as transitions among purely temporal tropes, features of the sort ‘an event *e*’s being at a time *t*’— $T(e, \lambda x [AT(x, t)])$ , for short. The lexical

meaning of *occur* can then be formulated as follows, where *trans* is the function mapping a sequence of temporal tropes onto the transition among those tropes:<sup>10</sup>

(51) *The meaning of occur*

For events  $e$  and  $e'$  and a time  $t$ ,  $\langle e, e' \rangle \in [occur]^t$  iff  $e = \text{transit}(T(e_1, \lambda x[AT(x, t_1)], T(e_2, \lambda x[AT(x, t_2)], \dots))$  and  $e_1, e_2, \dots$  are relevant parts of  $e$ , with  $t_1, t_2, \dots$  respectively as their duration.

The contrast between *exist* and *occur* shows once more the fundamental ontological difference between abstract states and events. *Exist* and *occur* are both existence predicates, with *occur* hardly richer in conceptual content than *exist*. But *occur* is an eventive predicate and as such it describes concrete events, unlike *exist*, which is a stative predicate and in fact an abstract-state predicate.

### 11.6 Abstract states, tropes, and the lexical meaning of verbs

The fundamental ontological distinction between abstract states on the one hand and events and tropes on the other hand raises two important questions which I can address only briefly. First, why should a verb take an abstract state as argument rather than an event or a trope? That is, does taking an abstract-state argument follow from the conceptual content of certain types of verbs as such or from the particular conceptual content of a given verb? Second, given the nature and the semantic role of tropes, is a distinction between concrete states and tropes needed or is the category of concrete states dispensable in favor of tropes?

I will touch upon the first question with only a few remarks. There are certainly cases of verbs whose lexical content could only permit an abstract-state interpretation, or rather where an abstract state could only coincide with a trope—or so it seems. One such case are verbs of possession. Verbs of possession, expressing a legal relation, do not express a ‘natural’ or determinable relation, which means they do not allow for a particular manifestation. A state of possession could hardly be distinct from something that is a particular manifestation of the possession relation, or so it seems. In fact, considering the two corresponding nominalizations, it does not look like there is any ontological difference between ‘John’s owning the house’, an abstract state, and what is denoted by *John’s ownership of a house*, presumably a trope nominalization.

But this is not generally so for stative verbs. Measurement verbs also involve a non-natural, artificially imposed relation; but they already present a different case. Stative verbs of measurement such as (non-agentive) *weigh* or *measure* clearly classify as abstract-state verbs. Given the very nature of measurement, measurement verbs in fact could only allow for an abstract-state argument and would not allow for a particular manifestation of a measurement relation. Measurement verbs do not

<sup>10</sup> There is of course the question what a transition is, in particular whether it is itself a relational trope. I address that question in greater detail in Moltmann (forthcoming).



express a ‘natural’ relation, but rather a stipulated mapping onto (ordered) objects of measurement, to reflect relations among actual objects. Such a stipulated relation is not a ‘determinable’ relation allowing for different manifestations, and so states of measuring should be abstract by nature. But still there are differences between the quantitative trope ‘John’s weight (of 100 kilos)’ and the measurement state ‘John’s weighing 100 kilos’. John’s weight (of 100 kilos) is intrinsically ordered with respect to other weights: it may ‘exceed’ or ‘be greater than’ Bill’s weight and it may be ‘the same as’ (that is, exactly similar to) Mary’s weight. But John’s weighing cannot be said to be ‘greater than’ Bill’s weighing 60 kilos or ‘be the same as’ Mary’s weighing 60 kilos.<sup>11</sup> Furthermore, John’s weight appears to have a part structure: part of John’s current weight may be due to his new cook. By contrast, the construction ‘part of John’s weighing 100 kilos’ is impossible.

Many stative verbs in fact allow for two sorts of nominalizations: for particular manifestations as well as for abstract states, with clear differences being displayed between the two sorts of entities. Another such case is the verb *resemble*. *Resemble* is generally considered an abstract-state verb, exhibiting resistance to location modifiers and perception verbs:

- (52) a. \* John resembles Mary in Germany.  
b. \* Bill saw Sue resemble Mary.

*Resemble* allows for two sorts of nominalizations with quite different ranges of acceptable predicates, nominalizations of the sort *John and Mary’s resemblance* and nominalizations of the sort *John’s resembling Mary*. ‘John and Mary’s resemblance’ clearly involves a particular realization: it can be stronger than another resemblance and it can be unusual or striking. Moreover, it can be observed and noticed. But ‘John’s resembling Mary’ is an abstract state: it cannot be stronger than another resembling or be unusual or striking, and it can hardly be noticed or observed. Maienborn’s view is that *resemble* takes abstract states as arguments. But obviously this is not so because a concrete-state-like entity is unavailable.

In fact, in the case of *resemble*, the admissible adverbial modifiers are not all indicative of an abstract-state argument. *Resemble* allows for degree modifiers or in fact modifiers relating to a particular realization:

- (53) a. John resembles Bill more than Joe.  
b. John resembles Bill in an unusual / striking way.

Also *believe* is a verb that allows for two kinds of nominalizations, *John’s belief that S* and *John’s believing that S*. The former allows for the kinds of predicates that naturally act as ‘degree modifiers’ of *believe*, such as *strong* or *firm*. Other stative verbs with the same behavior are subject experienter verbs such as *love*, *like*, or *admire*. They

<sup>11</sup> See Moltmann (2009) for further discussion of the phenomenon.

also allow for the two kinds of nominalizations, and they show the same behavior of ‘degree expressions’.

Katz (2003) and Rothmayr (2009) argue that degree adverbials do not in fact act as predicates of the implicit state argument, but rather form a complex predicate together with the predicate and thus allow reification of the abstract state to be based on the property expressed by the complex predicate. But in fact, degree adverbials, as already mentioned, naturally act as predicates of tropes. Moreover, they can generally be dropped, allowing for the inference below (which was one of the motivations for the Davidsonian account in the first place):

- (54) John resembles Bill a little / in an unusual / striking way.  
John resembles Bill.

One possibility to account for degree modifiers of stative verbs like *resemble* or *believe* is to take the implicit argument to be a trope rather than an abstract state. The absence of location modifiers and perception verbs would then have to be explained differently. In fact, it is not obvious that tropes themselves generally have a location. *The resemblance of John and Mary in Munich* is hardly possible if *in Munich* specifies the location that John and Mary happen to have while they resemble each other (see also Moltmann, forthcoming). With perception verbs, though, there is a clear difference in behavior between trope nominalizations and abstract-state nominalizations:

- (55) a. Bill saw John and Mary’s resemblance.  
b. Bill saw John resemble Mary.

An alternative analysis to pursue would be to take degree modifiers to act as predicates of tropes that are not the implicit arguments of the verb, but rather are just associated with the states described by the verb. This of course requires a general account of why some adverbials may apply to the associated trope rather than the implicit state argument of the verb.

### 11.7 The question of concrete states

There is also a general question about the need for concrete states, as a category apart from abstract states and events. Rothmayr (2009) recently argued that all verbs for which concrete states had originally been invoked count in fact either as abstract-state verbs or as eventive verbs, making a category of concrete states dispensable. Thus, Rothmayr argues that position verbs like *stand*, *lie*, or *sit* count as abstract-state verbs when taking a location modifier (*John stood at the table*, *John sat in the corner*). They do not count as abstract-state verbs on a posture reading though (*John sat rather than stood*). But in this case, Rothmayr argues, they in fact take an event argument, an event composed of an intention and a posture intentionally maintained. Finally, verbs like

*glow*, *sparkle*, or *shimmer*, which Rothmayr calls ‘verbs of inner causation’ count for her as eventive verbs: they take events as arguments in which the subject referent plays the instrument role.

If Rothmayr’s arguments are right, then we can conclude that the ontology involved in natural language is one of events and tropes as well as, more derivatively, of abstract states, but not of concrete states.

### 11.8 Conclusion

In this paper, I have proposed an account of Maienborn’s notion of a Kimean state, or what I called an ‘abstract state’, in terms of Fregean abstraction, an account that explains why events and abstract states are so fundamentally different. Concrete states are ontologically close to tropes and may even be dispensable in favor of the latter. I have concluded with some open-ended remarks about the categorization of some stative verbs as trope predicates rather than abstract-state predicates and of apparent concrete-state predicates as abstract-state predicates and event predicates. Obviously, those issues invite much further research both in ontology and lexical semantics.