

Liefke, K., & Werning, M. (2022). Factivity variation in episodic memory reports. In Y. Katsutoshi, T. Yasufumi, & K. Mineshima (Eds.), *New Frontiers in Artificial Intelligence. Lecture Notes in Computer Science*. Heidelberg: Springer.

# Factivity Variation in Episodic Memory Reports<sup>\*</sup>

Kristina Liefke<sup>1</sup> and Markus Werning<sup>2</sup>

<sup>1,2</sup> Department of Philosophy II, Ruhr University Bochum, 44780 Bochum, Germany

{[kristina.liefke](mailto:kristina.liefke@rub.de), [markus.werning](mailto:markus.werning@rub.de)}@rub.de

<sup>1</sup> <https://www.rub.de/phil-inf/> <sup>2</sup> <https://www.rub.de/phil-lang/>

**Abstract** Recent work in experimental semantics has found that some memory reports fail to give rise to theoretically predicted factivity-inferences (see, e.g., White and Rawlins; de Marneffe et al.). Our paper accounts for one domain of such failures, viz. factivity variation in episodic memory reports. The latter are reports like *John remembers a woman dancing* that require the agent’s personal experience of a past event or scene. We argue that, in episodic memory reports, the factivity inference is not triggered by the presupposition of the verb *remember* or its complement, but by the veridicality of the underlying experience: if the experience is veridical (as is often the case in perception), the factivity inference arises. If the experience is counterfactual (as is the case in hallucination and dreaming), the inference does not arise. We give a compositional semantics for episodic memory reports that captures this dependence.

**Keywords:** Episodic memory reports · Experiential attitude reports · Veridicality inferences · Factivity variation · Presupposition · Parasitic attitudes

## 1 Introduction

The verb *remember* and its cognates (e.g. *recall*, *recollect*, *reminisce*) often give rise to factivity inferences.<sup>1</sup> The latter are inferences like (1a) that conclude the truth of, e.g., a *that*-clause or gerundival complement (in (1a): *a woman was dancing*) from the truth of a sentence whose matrix verb embeds this complement. Since these inferences project through different entailment-cancelling operators (e.g. through matrix negation, see (1b), and through the scope of a question, see

---

<sup>\*</sup> The paper has profited from discussions with Kyle Blumberg, Justin D’Ambrosio, Chungmin Lee, and Thomas Ede Zimmermann. Kristina Liefke’s contribution is supported by the German Federal Ministry of Education and Research (BMBF) through the WISNA program. Markus Werning’s contribution is supported by the German Research Foundation (DFG) through grants no. 419038924 and 419040015 as part of the DFG research group *Constructing Scenarios of the Past* (FOR 2812).

<sup>1</sup> In [47], such inferences are called *veridicality inferences*. We prefer the name *factivity inferences* since it takes seriously the ‘backgrounding’ of these inferences (for a similar argument, see [14]) and since it allows us to reserve the name *veridicality* for a different (though related) property (see Sect. 4.2).

(1c)) – and since they do not contribute at-issue content –, they are often assumed to be presuppositional [14] (see [16,19]). (Below, we use Uegaki’s [44] notation for presupposition,  $\overset{\text{presup}}{\Rightarrow}$ ):

- (1) a. John remembers that a woman was dancing.  
 $\overset{\text{presup}}{\Rightarrow}$  ‘A woman was dancing.’  
 b. John does not remember that a woman was dancing.  
 $\overset{\text{presup}}{\Rightarrow}$  ‘A woman was dancing.’  
 c. Does John remember that a woman was dancing?  
 $\overset{\text{presup}}{\Rightarrow}$  ‘A woman was dancing.’

The factivity of the memory report in (1a) is evidenced by the observation that the truth of the complement in (1a) cannot be denied without yielding a contradiction (see the semantic deviance of (2)):

- (2) #John remembers that a was woman dancing, but – in fact – no woman was dancing.

It is also evidenced by the observation that, in contexts in which the speaker explicitly acknowledges their ignorance about the truth of the complement, this acknowledgement cannot be felicitously combined with a sentence that embeds this complement under *remember* (as in (3a); due to [7,8], following [39]):

- (3) a. #I do not know whether a woman was dancing, but John remembers that a woman was dancing.  
 b. *Contrast*: ✓I do not know whether a woman was dancing, but Mary believes that a woman was dancing.

The factivity of (1a) is further supported by the observation that, in contexts in which the truth of the complement has been established, a speaker can only make a genuine conversational contribution by expressing a knowledge-like attitude towards the content of this complement (see (4a); due to [7]):

- (4) A: A woman was dancing in the park.  
 a. B: ✓I {know, remember} that a woman was dancing in the park.  
 b. B: #I {believe, think} that a woman was dancing in the park.

Analogously to the above, factivity inferences are also valid in some memory reports with gerundival complements (e.g. (5a)). Since these reports require that the agent has personally experienced the event or scene that is described by the complement, we call such reports *episodic memory reports* (following [10,41]).

- (5) *Context*: During last week’s picnic in the park, John saw a woman dance.  
 a. (Now,) John remembers a/the woman dancing.  
 $\overset{\text{presup}}{\Rightarrow}$  ‘A woman was dancing (in @).’

The factivity of (5a) is evidenced by the observation that this report likewise passes the tests from (2) to (4) (see (6)–(8)).<sup>2</sup> The possibility of giving these exam-

ples a charitable interpretation (see our judgement ‘?’, not ‘#’) suggests that their factivity presupposition has a soft trigger and is easily cancelled (see [2,3]).

- (6) ?John remembers a woman dancing, but there was no such woman./  
 ..., but no woman was dancing.
- (7) a. ?I do not know whether a woman was dancing (in @), but John remembers a woman dancing.  
 b. *Contrast*: ✓I don’t know whether a woman is dancing (in @), but Mary imagines a woman dancing.
- (8) A: A woman was dancing in the park.  
 i. B: ✓I remember a woman dancing (in @).  
 ii. B: #I imagine a woman dancing (in @).

In contrast to *remember that*-reports, the validity of the factivity inference in episodic memory reports seems to vary with the context.<sup>3</sup> In particular, while this inference is valid in cases (e.g. (5)) where the remembering targets the object of a past (veridical) perception, it is invalid in cases (e.g. (9)) where the remembering targets the object of a past counterfactual experience (in (9): of a dream):

- (9) *Context*: After the picnic, John dozed off and dreamt of a hippo singing.  
 a. John remembers a hippo singing.  
 $\overset{\text{presup}}{\not\Rightarrow}$  ‘A hippo was singing (in @).’  
 BUT:  $\overset{\text{presup}}{\Rightarrow}$  ‘A hippo was singing in John’s dream.’  
 b. John does not remember a hippo singing.  
 $\overset{\text{presup}}{\not\Rightarrow}$  ‘A hippo was singing (in @).’

The non-factivity of the memory report in (9a) is evidenced by the fact that – unlike the truth of the complement in (5a) (see (6)) – the truth of the complement in (9a) can be denied without requiring a charitable interpretation (see (10)):

- (10) ✓John remembers a hippo singing, but there was no such hippo (who was singing in @). It all – and only (!) – happened in his dream ...

The report in (9a) further fails (!) the speaker’s ignorance test (see (11)), and the vacuous dialogue test (see (12)):

- (11) ✓I do not know whether a hippo was singing (in @), but John remembers a hippo singing (viz. in his dream).
- (12) A: A hippo was singing in John’s dream.  
 a. B: ✓I remember a hippo singing.  
 b. B: ✓I imagine hippo singing.

<sup>2</sup> Since *know* and *think* do not accept gerundive complements, we only consider the *remember*-case of (4) in (8), and replace *think* in the ‘vacuous’ case with *imagine*.

<sup>3</sup> We will show below that the factivity inference can also vary with the report’s linguistic context. This is the case when the complement contains a fictional predicate (e.g. *dream(ing)*; see (26) and Sect. 3) or when the embedded content is saliently counterfactual (as in the case of singing hippos or squared circles).

Note: To apply the speaker’s ignorance test to (9a), we evaluate the occurrences of *singing* from (11) w.r.t. different indices (viz. at the actual world, @, resp. at John’s oneiric [= dream-]scene). If we had not done this, (11) would be straightforwardly false, due to the falsity of ‘John remembers a hippo singing in @’.

Our paper seeks to explain the difference in factivity between (5a) and (9a). To motivate the need for a designated account of factivity variation in episodic memory reports, we first review leading semantic accounts of factivity and factivity variation, and show that they are unable to account for the observed variation (Sect. 2). We then introduce the core idea of our account, viz. the parasitic dependence of memory content on the content of a personal past experience (see Sect. 3). Section 4 provides a compositional semantics for gerundively complemented occurrences of *remember* that has built-in the notion of experiential parasitism. It uses this semantics to account for factivity variation in (5) and (9). The paper closes by suggesting how this semantics can be applied to explaining the observation that the factivity of some (!) *remember that*-reports (e.g. (13a)) also varies with the context:

- (13) *Context:* After his picnic in the park, John dreamt of a hippo singing.  
 a. (Now, John remembers very little about his dream in the park. But)  
 He still remembers that a hippo was singing.  
 $\overset{\text{presup}}{\neq}$  ‘A hippo was singing (in @).’

## 2 Existing Accounts

The difference in validity between the factivity inferences in (5a) and (9a) poses a challenge for existing semantic accounts of factivity. Most of these accounts explain factivity inferences like (5a) through the lexical-compositional semantics of the embedding occurrence of *remember* (e.g. (14a); see [13,33]) or through the semantics of the complementizer *that* (e.g. (15a); s. [19,21,18]). In (14a) and (15a), the factivity presupposition (i.e. ‘*p* is true at the actual world, @’) is underlined.

- (14) a.  $\llbracket \text{remember}_1 \rrbracket^{\textcircled{a}} = \lambda p^{\langle s,t \rangle} : \underline{p_{\textcircled{a}}}. \lambda z^e. \text{remember}'_{\textcircled{a}}(z, p)$  (factive)  
 b.  $\llbracket \text{remember}_2 \rrbracket^{\textcircled{a}} = \lambda p^{\langle s,t \rangle}. \lambda z^e. \text{remember}'_{\textcircled{a}}(z, p)$  (non-factive)
- (15) a.  $\llbracket \text{that}_F \rrbracket = \lambda p^{\langle s,t \rangle} : \underline{p_{\textcircled{a}}}. \lambda w. p_w$  (factive)  
 b.  $\llbracket \text{that}_T \rrbracket = \lambda p^{\langle s,t \rangle}. \lambda w. p_w$  (non-factive)

In their simplest form, the above accounts straightforwardly capture the factivity inference in (1b) (see (16) resp. (17)):

- (16)  $\llbracket (1b) \rrbracket^{\textcircled{a}} \equiv \llbracket \text{not} \rrbracket (\llbracket \text{remember}_1 \rrbracket^{\textcircled{a}} (\llbracket \text{John} \rrbracket, \llbracket (\text{that}) \text{ a woman danced} \rrbracket))$   
 $= \underline{(\exists x)[\text{woman}_{\textcircled{a}}(x) \wedge \text{dance}_{\textcircled{a}}(x)]}$   
 $\quad \neg \text{remember}'_{\textcircled{a}}(\text{john}, \lambda w \exists y. \text{woman}_w(y) \wedge \text{dance}_w(y))$   
 $\Rightarrow \exists x. \text{woman}_{\textcircled{a}}(x) \wedge \text{dance}_{\textcircled{a}}(x)$
- (17)  $\llbracket (1b) \rrbracket^{\textcircled{a}} \equiv \llbracket \text{not} \rrbracket (\llbracket \text{remember}_2 \rrbracket^{\textcircled{a}} (\llbracket \text{John} \rrbracket, \llbracket \text{that}_F \rrbracket (\llbracket \text{a woman danced} \rrbracket)))$   
 $= \neg \text{remember}'_{\textcircled{a}}(\text{john}, \underline{\lambda w \exists x. \text{woman}_{\textcircled{a}}(x) \wedge \text{dance}_{\textcircled{a}}(x)})$   
 $\quad \lambda w \exists x. \text{woman}_w(x) \wedge \text{dance}_w(x))$

$$\begin{aligned}
&\equiv (\exists x. \text{woman}_{\textcircled{a}}(x) \wedge \text{dance}_{\textcircled{a}}(x)) \wedge \\
&\quad \neg \text{remember}'_{\textcircled{a}}(\text{john}, \lambda w \exists y. \text{woman}_w(y) \wedge \text{dance}_w(y)) \\
&\Rightarrow \exists x. \text{woman}_{\textcircled{a}}(x) \wedge \text{dance}_{\textcircled{a}}(x)
\end{aligned}$$

Assuming Stephenson’s [40] semantics for episodic uses of *remember* (see (18)), ‘verb-based’ accounts (i.e. accounts like (16) that explain factivity inferences through the semantics of the embedding verb) can also capture the gerundive variant of (1a), i.e. (5a). In (18),  $s$  is a Kratzer-style situation (see [20]). Since (18) interprets ‘remember’ as a relation to a situation rather than to a proposition, we use a different non-logical constant for ‘remember’ in (18), viz. *remember''*:

$$(18) \quad \llbracket \text{remember}_3 \rrbracket^{\textcircled{a}} = \lambda p^{(s,t)} \lambda z^e \exists s : \underline{p}_s \wedge \underline{p}_{\textcircled{a}}. \text{remember}''_{\textcircled{a}}(z, s)$$

The need for a different semantics for the interpretation of (5a) (*vis-à-vis* of (1a)) is apparent from the observation that (5a) has different truth-conditions from (1a): to be true, (5a) requires that John has personally (here: visually/perceptually) experienced a woman dancing. The truth of (1a) does not make such requirement. In particular, only (1a) – but not (5a) – is true in a scenario in which Mary told John that a woman had been dancing in the park.

Its merits notwithstanding, the above accounts fail to capture the non-factivity of (9a): To explain the non-validity of factivity inferences, verb-based accounts could employ Karttunen-style [17] ‘plugs’ (which block presuppositions from projecting) or could assume that the verb *remember* is ambiguous between two homophonous lexical entries, viz. a factive *remember*<sub>1</sub> and a non-factive *remember*<sub>2</sub> (see (14)).<sup>4</sup> The non-factivity of (9a) could then be captured by analyzing the matrix verb in this report as *remember*<sub>2</sub> (see (14b)):

$$\begin{aligned}
(19) \quad \text{a.} \quad \llbracket (9a) \rrbracket^{\textcircled{a}} &\equiv \llbracket \text{remember}_2 \rrbracket^{\textcircled{a}}(\llbracket \text{John} \rrbracket, \llbracket \text{a hippo sang} \rrbracket) \\
&= \text{remember}'_{\textcircled{a}}(\text{john}, \lambda w \exists x. \text{hippo}_w(x) \wedge \text{sing}_w(x)) \\
&\not\equiv \exists x. \text{hippo}_{\textcircled{a}}(x) \wedge \text{sing}_{\textcircled{a}}(x)
\end{aligned}$$

However, since plugs typically take the form of lexical material (e.g. a counterfactual attitude verb like *dream*; see (20)) – and since such material is absent in (9a) –, Karttunen’s strategy cannot be used to explain the non-factivity of (9a).

(20) John remembers a hippo singing in his dream.

Analogously to the above, ‘complement-based’ accounts (i.e. accounts like (17) that explain factivity inferences through the semantics of the complement; see [21,18]) could try to locate the difference between (5a) and (9a) instead in the complement of the matrix verb. The difference in factivity of these reports could then be explained through the use of two different (silent) complementizers,  $\emptyset_1$  (our earlier *that*<sub>F</sub>; see (21a)) and  $\emptyset_2$  (our earlier *that*<sub>T</sub>; see (21b)), or of two different silent determiners,  $\Delta_1$  and  $\Delta_2$ , (see (22), where  $s$  is a variable over events or scenes). The former strategy follows Kratzer’s [21] distinction between a factive and a ‘trivial’ complementizer *that*. The latter strategy follows Kastner’s [18] assumption of a covert presuppositional determiner,  $\Delta$ .

<sup>4</sup> These two alternatives are given – and rejected – as explanatory options in [8].

- (21) a.  $\llbracket \emptyset_1 \rrbracket = \lambda p: \underline{p}_@. \lambda w. p_w$  (factive) b.  $\llbracket \emptyset_2 \rrbracket = \lambda p. \lambda w. p_w$  (non-factive)  
 (22) a.  $\llbracket \Delta_1 \rrbracket = \lambda p: \underline{p}_@. \eta s. p_s$  (factive) b.  $\llbracket \Delta_2 \rrbracket = \lambda p. \eta s. p_s$  (non-factive)

The possibility of rephrasing (1a) – but not the *that*-clause variant, (24a), of (9a) – through a *fact*-DP (see (23) *vis-à-vis* (24b)) makes the Kastner-style route promising.

- (23) John remembers *the fact* that a woman was dancing (in the real world).  
 (24) a. John remembers that a hippo was singing (in his dream).  
 b. ??John remembers *the fact* that a hippo was singing.

This route has further appeal since the complement in (5a) behaves syntactically very much like a definite DP (see [12]). However, this appeal is weakened by the observation that (5a) and (9a) display the same syntactic behavior. As a result, it seems implausible to analyze them through different silent determiners. The use of  $\Delta_1$  and  $\Delta_2$  is further challenged by the difficulty of integrating them into existing semantics for the verb *remember*.

## Strategy

We propose to explain the difference in factivity between (5a) and (9a) through the observation that the content of the reported remembering depends on the content of an underlying experience.<sup>5</sup> In the context for (5a) (i.e. (5)), this experience is John’s (visual) perceiving. In the context for (9a) (i.e. (9)), the relevant experience is John’s dreaming. To capture this dependence, we call remembering the *parasite attitude* (following Maier [27]; see [5,6,28]). We dub the experience the *host attitude* (or the *host experience*) and describe the dependence between the two as *experiential parasitism* (see [25]). The different veridicality properties of these experiences (typically: the veridicality of (visual) perception and the non-veridicality, or counterfactuality, of dreaming) then explain the different inference behavior of (5a) and (9a): since perception is typically veridical, the factivity inference arises in (5a). Since dreaming is typically counterfactual [= non-veridical], the factivity inference does not arise in (9a).

## 3 Background: experiential parasitism

Our examples in (5) and (9) have explicitly introduced a visual, respectively an oneiric [= dream-] experience on which John’s remembering is parasitic. The parasitic dependence of remembering on these primary experiences is supported by the observation that, in the contexts from (5) and (9), (5a) and (9a) can be paraphrased by reports, i.e. (25) resp. (26), that explicitly refer to the target of this experience (here: to the visual scene that features a dancing woman resp. to the oneiric scene that features a singing hippo). In the paraphrases below, the para-

<sup>5</sup> This dependency motivates the name *experiential remembering* (see, e.g., [4,25]). In psychology and cognitive science, experiential remembering is often called *episodic remembering*, following the work of Endel Tulving (see e.g. [10,42]).

site attitude [= remembering] is given a grey frame. The host experience [= visual perception resp. dreaming] is highlighted in grey.

- (25) a. John remembers a (particular) visual scene in which a woman was dancing.  
 b. John remembers the woman whom he saw at the park last week dancing in the park .

- (26) a. John remembers an oneiric scene in which a hippo was singing.  
 b. John remembers the hippo from his dream singing in his dream .

Other examples of experiential parasitism are given in (27) and (28). Example (27) is due to Ninan [31, ex. (18)]. Example (28) is inspired by Blumberg [6, ex. (102)]:

- (27) Ralph is imagining the man whom he sees sneaking around on the waterfront flying a kite in an alpine meadow (in his imagination.)  
 (28) Ida is imagining the unicorn of which she dreamt last night basking in the sun (in her imagination).

In (25)–(28), the parasitic behavior of the reported attitude (there: remembering resp. imagining) is made explicit by the presence of a predicate for the host experience (there: *visual/saw* resp. *oneiric/dreamt*). However, the experience-dependence of episodic memory reports is also evidenced when the experience is not made explicit. This evidence includes intuitively valid inferences from episodic memory reports to reports of the remembering agent’s experience of the scene described in the memory report [40] (see (29)–(30)). In what follows, we will call such inferences *experientiality inferences*.

- (29) a. John remembers a woman dancing. (see (5a))  
 ⇒ b. ‘John has (seen/perceptually) experienced a woman dancing.’  
 (30) a. John remembers a hippo singing. (see (9a))  
 ⇒ b. ‘John has (mentally/counterfactually) experienced a hippo singing.’

Support for experiential parasitism further comes from the observation that false memory reports (esp. *misremember*-reports like (31a)) only have intuitive truth-conditions on a reading that evaluates the topic of the complement (i.e. what the statement expressed by the complement is about [36,22]) directly at the experienced scene. The relevant reading still evaluates the comment of the complement (i.e. what is said about the topic) at Bill’s mnemonic scenario [= at a designated member of the set of his ‘false memory’-alternatives]. In the complement of (31a), the topic expression is the embedded subject pronoun *her*; the comment expression is the embedded predicate *have clear, untattooed skin*. The example in (31) is modelled on Blumberg’s [6] ‘burgled Bill’-case:

- (31) *Context*: Last night, Bill dreamt of a woman with tattoos (no one in particular whom he has come across in real life).

- a. Now, he misremembers her having clear, untattooed skin.
- ≠ i. *de re*: There exists a tattooed woman whom Bill misremembers (as) having clear, untattooed skin. (✗)
- ≠ ii. *de dicto*: Bill remembers (wrongly) an inconsistent situation in which a woman simultaneously did and did not have tattoos. (✗)
- ≡ b. Bill misremembers the tattooed woman from his dream having clear, untattooed skin. (✓)

To capture parasitic dependencies like the above, Blumberg [5] has proposed to parametrize the familiar semantic values of attitude complements (i.e. sets of possible ‘parasite’ worlds; above: Bill’s misremembering-alternatives) by the respective ‘host’ worlds (here: Bill’s oneiric alternatives). This parametrization yields sets of ordered pairs of worlds [= Blumberg’s *paired propositions*] (see also [25], [30, Ch. 2]). The first element in these pairs is a ‘host’ world. The second element is a ‘parasite’ world that depends on the host alternative.

The syntactic analyses of (31a) in (32) capture this parametrization by positing distinct variables for the alternatives that are introduced by the matrix/parasite attitude (in (31): Bill’s misremembering), i.e.  $w_2$ , and for the alternatives that are introduced by the host experience (there: Bill’s dreaming), i.e.  $w_1$  (see [5,6]; following [32,34]). The readings from (31a-i), (31a-i), and (31b) are given by the LFs in (32). The relevant LF – on which (31a) is true – is given in (32c).

- (32) a. [a woman-in-@] [ $\lambda t$ . Bill misremembers in @ [ $\lambda w_1$  [ $\lambda w_2$ .  $t$  has clear skin in  $w_2$ ]]]]]
- b. Bill misremembers in @ [ $\lambda w_1$  [ $\lambda w_2$ . a woman-in- $w_2$  has clear skin in  $w_2$ ]]]
- c. Bill misremembers in @ [ $\lambda w_1$  [ $\lambda w_2$ . a woman-in- $w_1$  has clear skin in  $w_2$ ]]]
- (the designator of) a paired proposition

Above, the hyphens in the analysis of *a woman* (see ‘woman-in- $w$ ’) indicate that the topic expression *a woman* has a rigid use w.r.t. the world  $w$ . On this use, the semantic value of *a woman* [= the salient female individual in  $s_1$ ] is constant across all worlds. This individual is then imported in the interpretation of the complement (at  $w_2$ , where interpretation is indicated without hyphens). This import can proceed through a rigidifying operator (e.g. through a variant of Kaplan’s [15] *dthat* that can fix the topic’s reference at any world).

Using Blumberg’s ‘double indexing’-approach, the most plausible readings of (5a) and (9a) are given in (33) respectively in (34):

- (33) John remembers in @ [ $\lambda w_1$  [ $\lambda w_2$ . a woman-in- $w_1$  dances in  $w_2$ ]]]
- (34) John remembers in @ [ $\lambda w_1$  [ $\lambda w_2$ . a hippo-in- $w_1$  sings in  $w_2$ ]]]



Note that – analogously to (32c) – the comment expression in (33)/(34) (here: the predicate, *dances* resp. *sings*) is evaluated at the parasite [= memory-]alternative,  $w_2$ , while the topic expression (i.e. the embedded subject, *a woman* resp. *a hippo*) is evaluated at the host alternative,  $w_1$ . The evaluation of the topic expression at  $w_1$  is needed to ‘anchor’ the actual referent of *a woman* resp. *a hippo* to the host experience. The evaluation of the comment at  $w_2$  is required by Percus’ *Generalization X*. The latter demands that the situation variable that a predicate selects for must be co-indexed with the nearest lambda above it [32, p. 41].

Admittedly, the interpretation of the topic and the comment in (5a) at different alternatives goes against the intuition from (25) (which interprets both *a woman* and *dance* w.r.t. John’s visual scene from the park).<sup>6</sup> Our interpretation of episodic uses of *remember* solves this problem, as we will show below.

## 4 A Uniform Semantics for Episodic *Remember*

To capture the parasitic dependence of remembering on a personally experienced event, we give episodic uses of *remember* the semantics in (35). The latter is a uniform semantics that is used in the interpretation of the factive (5a) [*John remembers a woman dancing*] and of the non-factive (9a) [*John remembers a hippo singing*]:

$$(35) \quad \llbracket \text{remember}_{\text{EXP}} \rrbracket^{\textcircled{a}} = \lambda R \lambda z \lambda e \overbrace{(\exists e') [ \text{exp}_{w_{\textcircled{a}}}(e', z) \wedge (\exists s_1: s_1 < w_{\textcircled{a}}. s_1 < \omega(e')) ]}^{\text{experientiality requirement}} \underbrace{\wedge \text{remember}_{\textcircled{a}}(e, z, \eta_e s_2: s_2 = s_1. R(s_1, s_2))}_{\text{the object of remembering: a situation}}$$

Above,  $\text{exp}_{w_{\textcircled{a}}}(e', z)$  expresses that, in (some specific spatio-temporal location of) the world,  $w_{\textcircled{a}}$ , of which  $\textcircled{a}$  is part, the agent  $z$  has had an experience  $e'$ .  $\omega$  is a function that maps the event of  $z$ ’s experiencing,  $e'$ , to the situation (scene) that serves as the object of  $z$ ’s experience. For John’s seeing event from (5), this object is the scene (perceived from John’s particular visual perspective in the park) in which a woman is dancing. The partiality of the inclusion between the memory object,  $s_1$ , and the experience object,  $\omega(e')$ , i.e.  $s_1 < \omega(e')$ , is motivated by the observation that agents typically only remember a part of the experienced scene.

The semantics in (35) construes episodic remembering as a relation to a situation (i.e. an event or scene,  $\eta_e s_2. R(s_1, s_2)$ ) whose content  $z$  has previously experienced with their own senses (see [10,40]). Since the situation that serves as the object of episodic remembering intuitively varies with the remembering event,  $e$ , we identify it through a choice function,  $\eta_e$ , that is dependent on  $e$ . This function selects a situation from the ‘classical’ proposition (viz. the set of situations,  $\lambda s_2. R(s_1, s_2)$ ) that results from filling the first argument slot of a paired proposition ( $R$ ) with the ‘host’ situation,  $s_1$  (in (5a): with John’s perceived visual scene in which a woman is dancing). For the semantic value of the complement in (33) (see (36a)), this classical proposition is the set of possible worlds in which the woman from  $s_1$  dances, i.e.  $\{w : \text{a woman-in-}s_1 \text{ dances in } w\}$  (see

<sup>6</sup> An analogous observation holds w.r.t. and (9a) and (26).

(36b)). To enable the identification of memory objects with (partial) situations (rather than total worlds), we generalize possible worlds to possible situations,  $s$ .

$$\begin{aligned}
(36) \quad & \text{a. } \underbrace{\llbracket \lambda s' [\lambda s. \text{a woman-in-} \mathbf{s}' \text{ dances in } s] \rrbracket}_{\text{a paired proposition}}(s_1) \\
& = \text{b. } \underbrace{\lambda s' \lambda s (\exists x) [\text{dthat}(\text{ty. woman}_{\mathbf{s}'}(y)) = x \wedge \text{dance}_s(x)]}_{\text{a 'classical' proposition}}(s_1) \\
& \equiv \lambda s (\exists x) [\text{dthat}(\text{ty. woman}_{\mathbf{s}_1}(y)) = x \wedge \text{dance}_s(x)]
\end{aligned}$$

In (36b), *dthat* is a situation-general variant of Kaplan's 'dthat'-operator. To obtain an easy translation of *a woman* in (5a), we use Russell's iota operator [37,38]. Our use of this operator (esp. of its uniqueness requirement) is warranted by the observation that John's misremembering in (31a) concerns a specific woman (viz. the woman whom he has seen at the park).

#### 4.1 Capturing Experientiality Inferences

We have already pointed out that episodic memory reports give rise to experientiality inferences (see (29)–(30); the former is copied in (37)):

$$\begin{aligned}
(37) \quad & \text{a. John } \boxed{\text{remembers}} \text{ a woman dancing.} \\
& \Rightarrow \text{b. 'John } \boxed{\text{has (seen/perceptually) experienced}} \text{ a woman dancing.'}
\end{aligned}$$

To capture the validity of these inferences, we place an 'experientiality requirement' on episodic uses of *remember*. This requirement demands that, in (some specific spatio-temporal location of) the world,  $w_{@}$ , of which @ is part, the agent has had<sup>7</sup> an experience,  $e'$  (see  $\exists e'. \text{exp}_{w_{@}}(e', z)$ ), whose object,  $\omega(e')$  [= the experienced situation], is informationally included in the object of their remembering,  $[s_1 =] \eta_e s_2. R(s_1, s_2)$  (i.e.  $s_1 \leq \omega(e')$ ).<sup>8</sup>

The required inclusion relation between the objects of memory and experience ensures that the agent's experience is relevant to the reported remembering. This relation e.g. excludes the use of episodic *remember* for the description of vicarious memories (see (38)). The latter are non-actual mental experiences (typically: the product of another agent's vivid description of an emotionally intense event) that have the same phenomenological qualities (e.g. imagery, perspectivity, emotional intensity) as an actual, real-world experience [26,29,35] (see [46]).

$$\begin{aligned}
(38) \quad & \textit{Context:} \text{ Paul has never seen a woman dancing in the park, but John has.} \\
& \text{In fact, John has told Paul about the woman and her dancing}
\end{aligned}$$

<sup>7</sup> To keep our semantics as simple as possible, we assume that the 'past-directedness' of remembering (i.e. that the point in time at which the experience event  $e'$  occurred precedes the point in time of the remembering event  $e$ , i.e.  $t_{e'} \prec t_e$ ) is built into *exp*.

<sup>8</sup> Following [24, p. 659], we assume that a situation,  $s_1$ , includes a situation  $s_2$ , i.e.  $s_2 \leq s_1$ , if the location  $l_1$  and time  $t_1$  of the world-part about which  $s_1$  contains contextually salient information includes the location  $l_2$  and time  $t_2$  of the world-part about which  $s_2$  contains contextually salient information (s.t.  $l_1$  maintains or expands the perimeters of  $l_2$  and  $t_1$  starts before or simultaneously with  $t_2$  and ends after or simultaneously with  $t_2$ ).

in meticulous detail on so many occasions that Paul has come to believe that he has himself witnessed the event.

- a. #Paul remembers a woman dancing.

In virtue of the above, our semantics for episodic *remember* straightforwardly captures the inference in (37)/(29).<sup>9</sup> This is so since, given  $s_2 = s_1$ , the situation (i.e.  $s_2$ ) in which the woman-in- $s_1$  dances will be part of the object,  $\omega(e')$ , of John's experience. (Since the unique (!) referent of *a woman* is determined at  $\omega(e')$  – and since (29b) does not require exporting the referent-at- $s_1$  of *a woman* to another situation –, we can safely replace ' $\exists x. dthat(\iota y. woman_{s_1}(y)) = x$ ' by ' $\exists x. woman_{\omega(e')}(x)$ ' in (39b).)

$$\begin{aligned}
(39) \quad & \text{a. } \llbracket \text{John remembers}_{\text{EXP}} [\lambda s' [\lambda s. \text{a woman-in-}s' \text{ dances in } s]] \rrbracket^{\textcircled{a}} \\
& = \llbracket \text{remember}_{\text{EXP}} \rrbracket (\llbracket \text{John} \rrbracket, \llbracket \lambda s' [\lambda s. \text{a woman-in-}s' \text{ dances in } s] \rrbracket) \\
& = \llbracket \text{remember}_{\text{EXP}} \rrbracket (\text{john}, \quad (\downarrow \text{ see (36b)}) \\
& \quad \lambda s' \lambda s (\exists x) [\underbrace{dthat(\iota y. woman_{s'}(y)) = x \wedge dance_s(x)}_{\text{experientiality requirement}}]) \\
& = (\exists e) \overbrace{(\exists e') [exp_{w_{\textcircled{a}}}(e', \text{john}) \wedge (\exists s_1: s_1 < w_{\textcircled{a}}. s_1 < \omega(e')) \wedge} \\
& \quad \text{remember}_{\textcircled{a}}(e, \text{john}, \eta_e s_2: s_2 = s_1. \\
& \quad \exists x. dthat(\iota y. woman_{s_1}(y)) = x \wedge dance_{s_2}(x))]} \\
\Rightarrow & \text{b. } (\exists e') [exp_{w_{\textcircled{a}}}(e', \text{john}) \wedge (\exists s_1: s_1 < w_{\textcircled{a}}. s_1 < \omega(e')) \wedge \\
& \quad (\exists x. dthat(\iota y. woman_{s_1}(y)) = x \wedge dance_{s_2}(x))] \\
& \equiv (\exists e': \omega(e') < w_{\textcircled{a}}) [exp_{w_{\textcircled{a}}}(e', \text{john}) \wedge (\exists x. woman_{\omega(e')}(x) \wedge dance_{\omega(e')}(x))] \\
& = \llbracket \text{John has experienced a woman dancing} \rrbracket^{\textcircled{a}}
\end{aligned}$$

The modelling of the inference in (30) is fully analogous.

Note that, in the semantics for *remember* in (35), the experientiality requirement contributes primary [= at issue]-content, rather than just secondary (e.g. presuppositional) content. The at-issue status of the experience is apparent from the fact that the experience is entailed by positive episodic *remember*-reports like (5a) (see (5)), but does not project through negation (see (40)). It is further supported by the observation that the agent's having had the experience can be directly targeted by negation (see (41)):

- (40) John does not remember a woman dancing.  
 $\not\Rightarrow$  'John has witnessed [= experienced/seen] a woman dancing.'
- (41) a. Paul: I remember a woman dancing in the park yesterday.  
b. John:  $\checkmark$ That can't be true. You weren't even there – I told you about it/her over dinner after I returned.

Note that (39) leaves the particular mode of the experience (expectedly: visual perception) unspecified. In (5), this mode is provided by the situational, real-

<sup>9</sup> In the final compositional step in (39), we introduce existential closure over the remembering event  $e$ , as is common in Neo-Davidsonian semantics (see e.g. [9]).

world context. Alternatively, the mode of the experience could be specified linguistically (e.g. by an overt predicate for this mode; see (25b), copied in (42)) or by a default assumption about the identity of this mode (e.g. visual perception [46]).

(42) John remembers the woman whom he saw at the park ... dancing.

## 4.2 Capturing Factivity Inferences

Intuitively, different modes of experience (here: visual perception vs. dreaming) have different veridicality properties. For example, visual perception is typically taken to be veridical, in the sense that it validates inferences of the form of (43). Imagination, hallucination, and dreaming are often taken to be non-veridical, in the sense that they do not validate inferences like (44).<sup>10</sup>

(43) a. John has seen [= visually perceived] a woman dance(ing).  
 $\Rightarrow$  b. ‘A woman was dancing (in @).’

(44) a. John has dreamt of a hippo singing.  
 $\not\Rightarrow$  b. ‘A hippo was singing (in @).’

Our semantics for episodic uses of *remember* treats veridical experience-based memory as the default case. It implements this default by presupposing that the object of the agent’s remembering (in (35):  $[s_1 =] \eta_e s_2. R(s_1, s_2)$ ) is informationally included in the world,  $w_{@}$ , in which the remembering event  $e$  is located (i.e.  $s_1 < w_{@}$ ). On its global interpretation, this presupposition validates the factivity inference from (5a) (see (45)):

(45) a. global:  $\llbracket \text{John has experienced a woman dancing} \rrbracket^{\textcircled{a}}$   
 $= (\exists e') [\underline{\omega(e')} < w_{@} \wedge \text{exp}_{w_{@}}(e', \text{john}) \wedge$   
 $\qquad\qquad\qquad (\exists x. \text{woman}_{\omega(e')}(x) \wedge \text{dance}_{\omega(e')}(x))] ]$   
 $\equiv (\exists e') [\text{exp}_{w_{@}}(e', \text{john}) \wedge (\exists x) [( \text{woman}_{\omega(e')}(x) \wedge \text{dance}_{\omega(e')}(x) ) \wedge$   
 $\qquad\qquad\qquad ( \text{woman}_{w_{@}}(x) \wedge \text{dance}_{w_{@}}(x) ) ] ]$   
 $\Rightarrow$  b.  $(\exists x) [\text{woman}_{w_{@}}(x) \wedge \text{dance}_{w_{@}}(x)]$   
 $= \llbracket \text{A woman is dancing} \rrbracket^{w_{@}} = \llbracket \text{A woman was dancing} \rrbracket^{\textcircled{a}}$

It is well-known that embedded presuppositions can be cancelled (or *suspended*; see e.g. [16,1,39]). This holds in particular for the presuppositions of so-called ‘soft’ triggers [3] (incl. cognitive factives like *recognize* and *remember*; see [1]). Abrisán [2] has proposed that the complements of factive verbs are only pre-

<sup>10</sup> Much of the contemporary semantics literature treats fiction verbs like *imagine* and *dream* as anti-veridical (or anti-factive) predicates (see e.g. [11,43]). The latter are predicates that entail (resp. presuppose) the falsity of their complement (see (†)):

(†) a. John has dreamt of a hippo singing.  
 $\Rightarrow$  b. ‘It is not the case that a hippo was singing (in @).’

Since non-veridicality is a weaker property than anti-veridicality, we here treat *dream* as a non-veridical predicate.

supposed in the absence of additional contextual information. When such information is present (as is the case in our ‘John dreaming’ example, see (46a)), the presupposition may not even be triggered in the first place (see [3, p.182]). Given our semantics for episodic uses of *remember*, Abrusán’s account straightforwardly explains both the validity of the factivity inference in (5a) (see (45)) and the non-validity of this inference in (9a) (see (46a)):

- (46) *Note:* Below, the ~~///~~-strikeout of ‘ $\omega(e') < w_{\textcircled{a}}$ ’ expresses that the context in (9) (or equivalently, the preposition *from his dream* in (26b)) blocks the triggering of the presupposition that  $\omega(e') < w_{\textcircled{a}}$ .
- a.  $\llbracket \text{John has experienced a hippo singing} \rrbracket^{\textcircled{a}}$   
 $= \llbracket \text{A hippo is singing in John’s (non-veridical) experience} \rrbracket^{\textcircled{a}}$   
 $= (\exists e': \psi(e') \not< \psi_{\textcircled{a}}) [ \text{exp}_{w_{\textcircled{a}}}(e', \text{john}) \wedge (\exists x. \text{hippo}_{\omega(e')}(x) \wedge \text{sing}_{\omega(e')}(x)) ]$
- $\neq$  b.  $(\exists x)[\text{hippo}_{w_{\textcircled{a}}}(x) \wedge \text{sing}_{w_{\textcircled{a}}}(x)]$   
 $= \llbracket \text{A hippo is singing} \rrbracket^{w_{\textcircled{a}}} = \llbracket \text{A hippo was singing} \rrbracket^{\textcircled{a}}$

We close this section by applying our proposed semantics to reports of false memories. Since these reports can also contain episodic uses of *remember*, they have an interesting effect on the validity of factivity inferences in reports of memories of veridical experiences.

### 4.3 Reports of False Episodic Memories

We have observed in (38) that episodic memory reports cannot be used to report vicarious memories. However, such reports are often felicitously used to report *false* memories (see (47)):

- (47) *Context:* During last week’s picnic, John saw a woman dancing.
- a. John remembers the woman wearing sneakers.  $\checkmark$ But in fact, she was dancing barefoot.
- $\equiv$  b. John {falsely remembers, misremembers} a woman wearing sneakers.

These uses also extend to reports of (false) memories of non-veridical experiences:

- (48) *Context:* After the picnic, John dozed off and dreamt of a hippo singing.
- a. John remembers the hippo tapping its feet.  $\checkmark$ But (in John’s dream) it wasn’t tapping its feet.
- $\equiv$  b. John {falsely remembers, misremembers} a hippo tapping its feet.

Our semantics for episodic uses *remember* can capture these cases. This is so since the identity between the situation  $s_1$  (at which *a woman* resp. *a hippo* is interpreted) and the object of remembering (at which the comment is interpreted) is also encoded as a presupposition. The possibility of cancelling this presupposition then captures cases of misremembering (see, e.g., (49)):

- (49) a.  $\llbracket \text{John remembers}_{\text{EXP}} [\lambda s' [\lambda s. \text{a woman-in-}s' \text{ wears sneakers in } s]] \rrbracket^{\textcircled{a}}$   
 $= (\exists e)(\exists e') [ \text{exp}_{w_{\textcircled{a}}}(e', \text{john}) \wedge (\exists s_1: \underline{s_1} < w_{\textcircled{a}}, s_1 < \omega(e') \wedge \text{remember}_{\textcircled{a}}(e, \text{john}, \eta_e s_2: \underline{s_2} \neq \underline{s_1}. \exists x. \text{dthat}(\text{ly. woman}_{s_1}(y)) = x \wedge \text{wears sneakers}_{s_2}(x))) ]$

- $\Rightarrow$  b.  $(\exists e') [exp_{w@}(e', john) \wedge (\exists x) [(woman_{w@}(e')(x)) \wedge (woman_{w@}(x))]]$   
 $= \llbracket \text{John has experienced (there being) a woman} \rrbracket^{w@}$   
 $\Rightarrow$  c.  $\llbracket \text{There is a woman} \rrbracket^{w@} = (\exists x) [woman_{w@}(x)]$   
 $\not\Rightarrow$  d.  $\llbracket \text{A woman is dancing} \rrbracket^{w@}$

(49) is consistent with cases where the woman from the park is only wearing sneakers in John’s memory, but not in John’s veridical perception (from the park). The satisfaction of the presupposition ‘ $s_2 = s_1$ ’ is thus a criterion for the accuracy of the episodic memory.

Since inaccurate remembering introduces memory content that was not part of the original experience (in (47a): that the woman was wearing sneakers), it is another source (next to the experience’s non-veridicality) for the invalidity of factivity inferences in episodic memory reports (see (49b–d)).

The observation that  $s_1$  and  $s_2$  come apart in misremembering justifies our use of Blumberg-style paired propositions as inputs to the compositional machinery in (35): Without this observation – and the attendant co-evaluation of the topic and the comment expression in all cases –, it would suffice to stick to the ‘classical’ [= one-dimensional] propositions. We have shown in [25] that, since Blumberg’s framework is required for the interpretation of episodic misremembering and imagistic imagining, only *it* enables the systematic discussion and treatment of different experiential attitude verbs.

## 5 Outlook

Our discussion in this paper has focused on episodic memory reports that are expressed by embedded gerundives. Recent work on clausal selection suggests that episodic memory recall can also be expressed through *remember that*-constructions (e.g. (50a); see [23,40]). This especially holds for languages (e.g. German) where ‘remember’ rejects gerundive complements: while German can report episodic recall through a non-manner *how*- [*wie*-]clause DP (in (51a); see [45]), *that*- [*dass*-]clause reports like (51b) are much more frequently used for this purpose.

(50) *Context*: After his picnic in the park, John dreamt of a hippo singing.

- a. (Today,) John still remembers that a hippo was singing.  
 $\overset{\text{presup}}{\not\Rightarrow}$  ‘A hippo was singing (in @).’

- (51) a. John {erinnert sich, weiß noch}, wie ein Nilpferd gesungen hat.  
 [gloss: John {remembers-REFL, knows still}, how a hippo sung has.]  
 b. John {erinnert sich, weiß noch}, dass ein Nilpferd gesungen hat.

In future work, we will study whether factivity variation also arises in reports like (50a) and (51b), and – if this should turn out to be the case – how our account can capture factivity variation in these reports. This work will also identify markers and diagnostics that help distinguish episodic uses of *remember that*-reports (e.g. (50a); which we expect will be subject to factivity variation) from ‘propositional’ *remember that*-reports (e.g. (52); which we expect will always be factive).

(52) John remembers { $\checkmark$ that kumquats are fruit,  $\#$ kumquats being fruit}.

## References

1. Abbott, B.: Where have some of the presuppositions gone? In: Birner, B., Ward, G. (eds.) *Drawing the Boundaries of Meaning*, pp. 1–20. John Benjamins (2006)
2. Abrusán, M.: Predicting the presuppositions of soft triggers. *Linguistics and Philosophy* **34**(6), 491–535 (2011)
3. Abrusán, M.: Presupposition cancellation: explaining the ‘soft–hard’ trigger distinction. *Natural Language Semantics* **24**, 165–202 (2016)
4. Bernecker, S.: *Memory: A philosophical study*. Oxford University Press (2010)
5. Blumberg, K.: Counterfactual attitudes and the relational analysis. *Mind* **127**(506), 521–546 (2018)
6. Blumberg, K.: *Desire, Imagination, and the Many-Layered Mind*. Ph.D. thesis, New York University (2019)
7. Bondarenko, T.: Factivity alternation due to semantic composition: *think* and *remember* in Barguzin Buryat. Master’s thesis, Massachusetts Institute of Technology (March 2019)
8. Bondarenko, T.: Factivity from pre-existence. *Glossa* **109**, 1–35 (2020)
9. Champollion, L.: The interaction of compositional semantics and event semantics. *Linguistics and Philosophy* **38**, 31–66 (2016)
10. Cheng, S., Werning, M., Suddendorf, T.: Dissociating memory traces and scenario construction in mental time travel. *Neuroscience and Biobehavioral Reviews* **60**, 82–89 (2016)
11. Giannakidou, A., Mari, A.: *Truth and Veridicality in Grammar and Thought*. The University of Chicago Press, Chicago (2021)
12. Grimm, S., McNally, L.: The *-ing* dynasty. *Semantics and Linguistic Theory (SALT)* **25**, 82–102 (2015)
13. Hintikka, J.: *Semantics for propositional attitudes*. In: *Models for Modalities* (1969)
14. Jeong, S.: The effect of prosody on veridicality inferences in Korean. In: Sakamoto et al., M. (ed.) *New Frontiers in Artificial Intelligence. JSAI-isAI 2020*, pp. 133–147. Springer (2020)
15. Kaplan, D.: *Demonstratives: An essay on the semantics, logic, metaphysics, and epistemology of demonstratives and other indexicals*. In: Almog, J., Perry, J., Wettstein, H. (eds.) *Themes from Kaplan*, pp. 489–563. Oxford University Press (1989)
16. Karttunen, L.: Some observations on factivity. *Research on Language and Social Interaction* 4.1 (1971) **4**(1), 55–69 (1971)
17. Karttunen, L.: Presuppositions of compound sentences. *Linguistic Inquiry* **4**(2), 169–193 (1973)
18. Kastner, I.: Factivity mirrors interpretation. *Lingua* **164**, 156–188 (2015)
19. Kiparsky, P., Kiparsky, C.: *Fact*. In: Bierwisch, M., Heidolph, K.E. (eds.) *Progress in Linguistics*, pp. 143–173. De Gruyter Mouton (1970)
20. Kratzer, A.: Facts: particulars or information units? *Linguistics and Philosophy* **5-6**(25), 655–670 (2002)
21. Kratzer, A.: *Decomposing attitude verbs*. Manuscript (2006)
22. Krifka, M.: Basic notions of information structure. *Acta Linguistica Hungarica* **55**(3–4), 243–276 (2008)
23. Liefke, K.: Two kinds of English non-interrogative, non-manner *how*-complements. In: Jedrzejowski, L., Umbach, C. (eds.) *Non-Interrogative Subordinate Wh-Clauses*. Oxford Studies in Theoretical Linguistics, Oxford University Press (to appear)

24. Liefke, K., Werning, M.: Evidence for single-type semantics: an alternative to *e/t*-based dual-type semantics. *Journal of Semantics* **35**(4), 639–685 (2018)
25. Liefke, K., Werning, M.: Experiential imagination and the inside/outside-distinction. In: Okazaki et al., N. (ed.) *New Frontiers in Artificial Intelligence. JSAI-isAI 2020*, LNCS, vol. 12758, pp. 96–112. Springer, Cham (2021)
26. Loftus, E.F.: The reality of repressed memories. *American Psychologist* **48**(5), 518–537 (1993)
27. Maier, E.: Parasitic attitudes. *Linguistics and Philosophy* **38**(3), 205–236 (2015)
28. Maier, E.: Referential dependencies between conflicting attitudes. *Journal of Philosophical Logic* **46**(2), 141–167 (2017)
29. McCarroll, C.J.: Remembering the personal past: Beyond the boundaries of imagination. *Frontiers in Psychology* **11**, 26–52 (2020)
30. Ninan, D.: *Imagination, Content, and the Self*. Ph.D. thesis, Massachusetts Institute of Technology (2008)
31. Ninan, D.: Counterfactual attitudes and multi-centered worlds. *Semantics and Pragmatics* **5**(5), 1–57 (2012)
32. Percus, O.: Constraints on some other variables in syntax. *Natural Language Semantics* **8**, 173–229 (2000)
33. Percus, O.: Antipresuppositions. In: *Studies of Reference and Anaphora*, pp. 52–73 (2006)
34. Percus, O.: Index-dependence and embedding. In: Gutzmann, D., Matthewson, L., Meier, C., Rullmann, H., Zimmermann, T.E. (eds.) *The Companion to Semantics*. Wiley, Oxford (2020)
35. Pillemer, D.B., Steiner, K.L., Kuwabara, K.J., Kirkegaard Thomsen, D., Svob, C.: Vicarious memories. *Consciousness and Cognition* **36**, 233–245 (2015)
36. Reinhart, T.: Pragmatics and linguistics: An analysis of sentence topics. *Philosophica* **27**, 53–94 (1982)
37. Russell, B.: On denoting. *Mind* **14**(56), 479–493 (1905)
38. Russell, B.: *Introduction to Mathematical Philosophy*. Allen & Unwin, London (1919)
39. Simons, M.: On the conversational basis of some presuppositions. *Semantics and Linguistic Theory (SALT)* **11**, 431–448 (2001)
40. Stephenson, T.: Vivid attitudes: Centered situations in the semantics of *remember* and *imagine*. *Semantics and Linguistic Theory (SALT)* **20**, 147–160 (2010)
41. Tulving, E.: Memory and consciousness. *Canadian Journal of Psychology* **26**, 1–26 (1985)
42. Tulving, E.: Episodic memory and auto-noesis: Uniquely human? In: Terrace, H.S., Metcalfe, J. (eds.) *The Missing Link in Cognition: Origins of self-reflective consciousness*, pp. 3–56. Oxford University Press, Oxford (2005)
43. Uegaki, W.: Content nouns and the semantics of question-embedding. *Journal of Semantics* **33**(4), 623–660 (2016)
44. Uegaki, W.: The existential/uniqueness presupposition of *wh*-complements projects from the answers. *Linguistics and Philosophy* **44**, 911–951 (2021)
45. Umbach, C., Hinterwimmer, S., Gust, H.: German *wie*-complements: Manners, methods and events in progress. *Natural Language and Linguistic Theory* **40**, 307–343 (2022)
46. Vendler, Z.: Vicarious experience. *Revue de Métaphysique et de Morale* **84**(2), 161–173 (1979)
47. White, A.S.: Lexically triggered veridicality inferences. In: Östman, J.O., Verschueren, J. (eds.) *Handbook of Pragmatics*, pp. 115–148. John Benjamins Publishing Co. (2019)