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Verbs of creation

1 Introduction

Broadly speaking, verbs of creation denote the coming into being of the referent of their direct internal argument as a result of the event named by them. Such verbs are therefore often said to take 'effected objects'. Examples in which the entity created is a physical object are shown in (1).

(1) (a) Rebecca built a Victorian style house.
(b) Sarah compiled a program written in Scheme.
(c) Daniel made a Caesar salad for dinner.
(d) Rebecca drew a right triangle.
(e) Sarah painted a picture of the Hungarian parliament building.
(f) Daniel wrote a paper on verbs of creation.

The physical medium may sometimes take the form of a file saved on a computer (e.g., in (1b), and possibly in (1d) and (1f) as well), and yet computer files also count as physical objects for present purposes, for they can be modified, copied, deleted, misplaced, etc.

The deliberately broad characterization given above is intended to cover so-called performance verbs as well, though in this case the entities created are events (namely, performances) and not physical objects:

(2) (a) Rebecca said a prayer for dinner.
(b) Sarah sang a sad song.
(c) Daniel recited a poem by E. E. Cummings.
(d) Rebecca read *Fatelessness*.

In (2), the events named by the verbs are themselves the performances created, but the performances count as instances of the entities described by the object noun phrases. In (2a), for example, Rebecca creates a prayer performance of a prayer for dinner in saying such a prayer. Performance verbs may not be canonical verbs of creation, but insofar as they describe the creation of a performance it is sensible to view them as a species of verbs of creation.

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Finally, the characterization above is also meant to accommodate verbs whose internal argument denotes an abstract entity that intuitively comes into being as a result of the event in question:

(3) (a) Rebecca composed a symphony.
(b) Sarah designed a Victorian style house.
(c) Daniel invented a new salad.
(d) Rebecca fabricated a story.

Normally, the composer of a symphony writes it down, but this is a practical necessity given the usual complexity of symphonies and is not strictly necessary for the truth of a sentence such as (3a). Similarly, an architect who designs a house generally produces a blueprint of it, but again this is not necessary for the truth of a sentence like (3b). Given the relative simplicity of salad recipes, it is perhaps clearest in the case of (3c) that the invented salad need not be written down (consider also (3d) in this respect). Even so, this is not to say that the symphony, the house, the salad, and the story qua abstract entities need not be physically 'anchored' or represented in some way. On the contrary, such entities are minimally physically represented in the brains of their respective creators immediately following the corresponding creation events,[1] independently of whether or not they acquire written representations as well. However, since people tend to easily forget things, including things that they themselves have created, the main condition for abstract entities which are created is that they be represented in some physical medium, for otherwise it would be unclear what their 'coming into being' amounts to.[2]

In sum, verbs of creation fall into three subclasses, depending on the semantic character of their direct internal argument: those denoting the creation of a physical object, those denoting the creation of an event (henceforth, 'performance verbs of creation'), and those denoting the creation of an abstract entity.[3] In fact, since physical objects and events are both concrete entities, the first two subclasses form a natural subclass against the subclass of verbs denoting the

[1] While it is an empirical question how (e.g.) a salad recipe is physically stored or neurally encoded in a person's brain, I take such a neural configuration to be a physical object, much on a par with a representation in terms of collections of bytes in computer memory or on a disk.

[2] I thereby reject a Platonist view according to which preexisting abstract symphonies, houses, and salad recipes are merely 'discovered' and not veritably created. On such a view, the verbs in (3) would not be verbs of creation.

[3] According to Levin (1993, sect. 26), the verbs in (1a)–(1c) are '*build* verbs', those in (1d)–(1f), (2b)–(2c), and (3a) are 'performance verbs' (she does not mention the use of *say* in (2a), nor does she take *read* to be a verb of creation), and those in (3b)–(3d) are '*create* verbs' (*compose* also falls into this category but not as used in (3a)). Levin uses a combination of semantic and morphosyntactic criteria for her classes, but the morphosyntactic criteria do not always obviously yield semantically coherent classes. For example, it is odd to take *write* to be a 'performance verb' in the same sense that *sing* is, and by Levin's morphosyntactic criteria alone *eat* would also count as a 'performance verb'—it is ruled out because its object is not 'effected', a semantic criterion. However, such discrepancies need be examined more closely before reliable conclusions about the semantic coherence of morphosyntactic criteria can be drawn.

creation of an abstract entity. Nothing prevents a verb from belonging to more than one subclass, and the following two sets of examples suggest that *build* and *make* have a reading on which their internal argument refers to an abstract entity:

(4) (a) Rebecca built a Victorian style house that Sarah designed.
(b) Sarah designed a Victorian style house. Rebecca built it.

(5) (a) Sarah made a new salad that Daniel invented.
(b) Daniel invented a new salad. Sarah made it.

In (4a), the object noun phrase of *build* appears to designate an abstract house (namely, a house design) due to the relative clause with *design* (recall (3b)). A syntactic variant on this is given in (4b), where *it* is anaphorically dependent on the object noun phrase of *design*. Either way, it is difficult to escape the conclusion that the internal argument of *build* can sometimes refer to an abstract entity. The pairs of sentences in (5) point to the same conclusion for *make*.[4] But even granting that *build* and *make* are ambiguous with respect to the character of their internal argument (physical object vs. abstract entity), the two meanings in question are nevertheless intimately related, and any analysis should make this explicit, especially because on both readings a physical object is created.

The idea that performance verbs of creation may take an abstract entity as their internal argument is perhaps more evident. Indeed, this is the only way of construing the sentence in (2c), but it is the natural way of understanding those in (2a) and (2b) as well. In (2a), for example, Rebecca probably had either a fully specified or at least a partially specified prayer in mind to say, and the same point applies to Sarah and the song in (2b). Pairs analogous to those in (4) and (5) can also be provided for performance verbs of creation:[5]

(6) (a) Rebecca said a prayer for dinner that Sarah wrote.
(b) Sarah wrote a prayer for dinner. Rebecca said it.

(7) (a) Daniel played a piece for the piano that Rebecca composed.
(b) Rebecca composed a piece for the piano. Daniel played it.

A reasonable conjecture is that if a performance verb of creation heads a clause that is aspectually an accomplishment (which is the intended reading of the sentences in (2) and (6)–(7)), then its internal argument denotes an abstract entity.

In this paper, I present a new approach to verbs of creation that pays equal attention to each of the aforementioned subclasses. The analysis is cast in an

[4]If verbs denoting the creation of a physical object and performance verbs of creation form a natural subclass (since they both denote the creation of concrete entities, as suggested in the text), then we might expect any ambiguities to be between this natural subclass and the subclass of verbs denoting the creation of an abstract entity. This expectation seems to be borne out—at least I could not find a verb of creation taking either a physical object or an event as its internal argument.

[5]Note that *write* in (6) is used in the sense of 'to author', and in this sense it is a verb denoting the creation of an abstract entity, like those in (3).

event semantic framework that is extended with an *existence* predicate and three sorted domains of *templates*. In sections 2 and 3, I develop the details of the new account of verbs of creation, and in section 4 I briefly compare it to previous analyses due to Dowty (1979), Krifka (1989, 1992), von Stechow (2001), and McCready (2003a,b), arguing that the new account is more satisfactory than the previous ones.

2 Creating physical objects

In this section, I propose a treatment of verbs denoting the creation of a physical object (see (1)), which constitute the 'classical' case of verbs of creation. The treatment proceeds in two steps: in section 2.1, I introduce a formal language L_c for the analysis of verbs denoting the creation of a physical object, and in section 2.2 I show how such verbs are analyzed with the help of L_c.

2.1 The model structure

The semantic analysis in section 2.2 will be formulated with the help of a standard higher order extensional type theoretical language L_c with lambda abstraction, identity, and the iota operator. A *model* for L_c is a pair $\mathscr{M} = \langle \mathscr{S}, I \rangle$, where $\mathscr{S}$ is a *model structure* and I is an *interpretation function*. $\mathscr{S}$ is in turn a tuple

$$\langle D, O, E, T, \sqsubset, \prec, \mathsf{trace}, \mathsf{exist}, d_0 \rangle$$

where D, O, E, and T are nonempty sets of *individuals*,[6] $\sqsubset$, $\prec$, trace, and exist are distinguished relations on one or more of these sets, and d_0 is a special *nil individual* in D. In this section, I elaborate on these ingredients of the model structure.

The sets O, E, and T are pairwise disjoint and each forms a subset of D. Intuitively, O is a set of *physical objects*, E is a set of *events*, and T is a set of *times*. It is useful to introduce sorted variables for the elements of each of these three domains:

(8) O: $x, y, z, \ldots$ (physical objects)
E: $e, e', e'', \ldots$ (events)
T: $t, t', t'', \ldots$ (times)

E includes states as well as events proper, and T contains both instants and intervals. The unsorted variables a, b, c, ... range over the elements of D, which also contains 'mixed' individuals that are composed of different sorts of individuals, as we will see below.

The relation $\sqsubset$ on $D \times D$ is a mereological relation of *proper part* ($a \sqsubset b$ 'a is a proper part of b'). It is a strict partial order (i.e., irreflexive, asymmetric, and

[6]Henceforth, I employ the term *individual* in the sense of 'entity'.

transitive), and the following notions are based on it and identity (in (9c), P is a one-place predicate with an extension in D):

(9) (a) $a \sqsubseteq b \overset{\text{def}}{=} a \sqsubset b \vee a = b$ (a is a part of b)
(b) $a \circ b \overset{\text{def}}{=} \exists c[c \sqsubseteq a \wedge c \sqsubseteq b]$ (a and b overlap)
(c) $\mathsf{sum}(a,P) \overset{\text{def}}{=} \forall b[b \circ a \leftrightarrow \exists c[P(c) \wedge c \circ b]]$ (a is a sum of P)

The overlap relation in (9b) allows the following witness principle for proper part to be stated more compactly:

(10) *Axiom.* $\forall a \forall b[a \sqsubset b \rightarrow \exists c[c \sqsubset b \wedge \neg(c \circ a)]$ (one proper part implies another)

This axiom excludes the possibility that an individual has a single proper part.

The sum relation in (9c) is demonstrably functional with respect to its individual argument:[7]

(11) *Fact.* $\forall a \forall b \forall P[\mathsf{sum}(a,P) \wedge \mathsf{sum}(b,P)) \rightarrow a = b]$ (uniqueness of sums)

This fact allows us to introduce iota terms for sums in case they exist:

(12) $\sigma(P) \overset{\text{def}}{=} \iota a[\mathsf{sum}(a,P)]$ (the sum of P)

A special case of sum is when two individuals are summed:

(13) $a \oplus b \overset{\text{def}}{=} \sigma(\lambda c[c \sqsubseteq a \vee c \sqsubseteq b])$ (the sum of a and b)

The final mereological principle guarantees the existence of sums whenever the extension of P is nonempty:

(14) *Axiom.* $\exists a[P(a)] \rightarrow \exists a[\mathsf{sum}(a,P)]$ (existence of sums)

This axiom has the consequence that D also includes 'mixed' individuals such as sums of physical objects and events and sums of events and times. Although such sums do no harm, they do not belong to O, E, or T, in contrast to the 'pure' individuals and their sums from these subdomains. Letting $[X]_\sigma$ designate the closure of X under the sum operation, for a given set X, we may now define D to be the closure of the union of O, E, T, and $\{d_0\}$:

(15) $D \overset{\text{def}}{=} [O \cup E \cup T \cup \{d_0\}]_\sigma$
(D is the closure of the union of O, E, T, and $\{d_0\}$ under sums)

[7] This ultimately follows from the definition of sum and the antisymmetry of the part relation in (9a).

The relation $\prec$ is *temporal precedence*, which is a strict partial order on

$$[E \cup T]_\sigma \times [E \cup T]_\sigma$$

i.e., a two-place relation on the closure of $E \cup T$ under the sum operation. At this point, it is expedient to introduce sorted variables for the elements of $[E \cup T]_\sigma$, all of which are *temporal individuals* (namely, events or times or any of their sums):

(16) $[E \cup T]_\sigma$: $s, s', s'', \ldots$ (temporal individuals)

The following principle states that temporal precedence is incompatible with overlap ($s \prec s'$'s temporally precedes s''):

(17) *Axiom.* $\forall s \forall s'[s \prec s' \rightarrow \neg(s \circ s')]$ (temporal precedence excludes overlap)

In contrast to O and E, T has a linear structure, which means that any two times either stand in the precedence relation or overlap:[8]:

(18) *Axiom.* $\forall t \forall t'[t \prec t' \vee t' \prec t \vee t \circ t' \vee \exists t_1 \exists t_2[t_1 \sqsubseteq t \wedge t_2 \sqsubseteq t'[t_1 \prec t_2 \vee t_2 \prec t_1]]]$
(linearity of times)

Finally, instants are times without proper parts:

(19) $\mathsf{instant}(t) \stackrel{\text{def}}{=} \neg \exists t'[t' \sqsubset t]$ (instant)

The relation trace on $T \times [E \cup T]_\sigma$ is postulated to be functional with respect to its time argument, as stated in (20a), and supplies the time (or *temporal trace*) of a temporal individual ($\mathsf{trace}(t,s)$ 't is the temporal trace of s'). Furthermore, and unsurprisingly, the time of a time is simply that time, as postulated in (20b).

(20) (a) *Axiom.* $\forall t \forall t' \forall s[(\mathsf{trace}(t,s) \wedge \mathsf{trace}(t',s)) \rightarrow t = t']$
(uniqueness of temporal traces)
(b) *Axiom.* $\forall t[\mathsf{trace}(t,t)]$ (the temporal trace of a time is that time)

Given the functionality of trace with respect to its time argument, we may speak of *the* temporal trace of a temporal individual:

(21) $\tau(s) \stackrel{\text{def}}{=} \iota t[\mathsf{trace}(t,s)]$ (the time of an event or a time)

The availability of τ enables the following two axioms to be stated more succinctly:

[8] The final clause is needed because T also contains sums of disconnected times (i.e., times that are neither instants nor intervals).

(22) (a) *Axiom.* $\forall s \forall s' [\tau(s \oplus s') = \tau(s) \oplus \tau(s')]$
(the time of a sum of temporal individuals is the sum of their times)
(b) *Axiom.* $\forall s \forall s' [s \prec s' \rightarrow \tau(s) \prec \tau(s')]$
(precedence of temporal individuals implies precedence of their times)

Temporal individuals that do not stretch infinitely into the future have an end. The following definition determines what an end of a temporal individual is:

(23) $\mathsf{end}(t,s) \overset{\text{def}}{=} \mathsf{instant}(t) \wedge t \sqsubseteq \tau(s) \wedge \forall t' [(t' \sqsubseteq \tau(s) \wedge \neg(t' \circ t)) \rightarrow t' \prec t]$
(t is an end of s)

If a temporal individual has an end, then it demonstrably has a unique end, but since there may be temporal individuals that stretch infinitely into the future, end is not a total function:

(24) *Fact.* $\forall t \forall t' \forall s [(\mathsf{end}(t,s) \wedge \mathsf{end}(t',s)) \rightarrow t = t']$
(uniqueness of ends of temporal individuals)

This fact allows us to speak of *the* end of a temporal individual, provided that it has an end:

(25) $\varepsilon(s) \overset{\text{def}}{=} \iota t[\mathsf{end}(t,s)]$ (the end of s)

The iota operator plays a role in definitions of sum (σ; (12)), temporal trace (τ; (21)), and end (ε; (25)) above, and the question arises about what happens when descriptions formed with the help of the iota operator fail to be defined. I adopt a Fregean strategy to this question and postulate a nil individual d_0 as the denotation of such undefined descriptions (see also Gamut 1991, chap. 5.2). This appeal to d_0 is simply a technical convenience (or hack) that enables L_c to remain bivalent. As long as d_0 is excluded from the denotation of most predicates that we are interested in, then most claims about d_0 will be false. For example, given a one-place predicate house which denotes the set of houses, the statement $\mathsf{house}(d_0)$ is false, because d_0 is not a house. For the sake of completeness, the semantics for the iota operator is given as follows (with respect to a model $\mathscr{M}$ and an assignment function g):

(26) $[\![\iota a[\alpha]]\!]_{\mathscr{M},g}$ is the unique individual b of D such that $[\![\alpha]\!]_{\mathscr{M},g[a \mapsto b]} = 1$, if there is such an individual; otherwise $[\![\iota a[\phi]]\!]_{\mathscr{M},g} = d_0$.

A temporal individual exists at a time just in case the value of τ applied to it is precisely that time—in this sense, a temporal individual has its time of existence 'built into it'. But so far there is no way of expressing the idea that a physical object x exists at a certain time but not at another. Naturally, given a canonical physical object x, it is certainly the case that x exists at some time or other, but this is weaker than saying that x exists at some specific time t. The relation exist on $O \times T$ ($\mathsf{exist}(x,t)$ 'x exists at t') fulfills the need to talk about physical objects existing at certain times. This relation is required to be divisive with respect to its time argument:

(27) *Axiom.* $\forall x \forall t[\mathsf{exist}(x,t) \rightarrow \forall t'[t' \sqsubseteq t \rightarrow \mathsf{exist}(x,t')]]$
(existence of a physical object at a time implies its existence at all subtimes)

According to this axiom, if x exists at t, then x exists at any part of t. The second principle states that exist is divisive with respect to its physical object argument as well:

(28) *Axiom.* $\forall x \forall t[\mathsf{exist}(x,t) \rightarrow \forall y[y \sqsubseteq x \rightarrow \mathsf{exist}(y,t)]]$
(existence of a physical object at a time implies existence of its parts then)

This axiom asserts that if x exists at t, then every part of x exists at t, which is a way of saying that physical objects lack temporal parts.

With the help of exist, we can define *tensed* predicates. For example, a tensed version of $\sqsubset$ is defined as follows:

(29) $x \sqsubset_t y \stackrel{\text{def}}{=} x \sqsubset y \wedge \mathsf{exist}(x,t) \wedge \mathsf{exist}(y,t)$ (x is a proper part of y at t)

In contrast to $\sqsubset$, $\sqsubset_t$ requires both of the physical objects to exist at t.

A simple example helps to illustrate the role of exist in this model structure. Consider the partial model described in (30), where O contains seven individuals and T, three. Note that the sum individuals in each set are guaranteed to exist by the sum principle in (14). Moreover, T is constrained so that t precedes t'. Finally, the extension of exist at each of the times in T is as specified.

(30) $O = \{x, y, z, x \oplus y, x \oplus z, y \oplus z, x \oplus y \oplus z\}$
$T = \{t, t', t \oplus t'\}$
$t \prec t'$
$[\![\lambda x[\mathsf{exist}(x,t)]]\!]_{\mathscr{M},g} = \{x, y, x \oplus y\}$
$[\![\lambda x[\mathsf{exist}(x,t')]]\!]_{\mathscr{M},g} = \{y, z, y \oplus z\}$
$[\![\lambda x[\mathsf{exist}(x,t \oplus t')]]\!]_{\mathscr{M},g} = \{y\}$

With respect to this model, the statements $y \sqsubset (y \oplus z)$ and $y \sqsubset_{t'} (y \oplus z)$ are true, but $y \sqsubset_t (y \oplus z)$ is false because $y \oplus z$ does not exist at t. If $y \oplus z$ existed at t, then by the principle in (28) both y and z would exist at t, but this would contradict the assumption that z does not exist at t. The formula $\mathsf{exist}(x, t \oplus t')$ is also false: if it were true, then by the axiom in (27) x would exist at t', and yet this would contradict the premise that x does not exist at t'. More strikingly, neither $x \oplus z$ nor $x \oplus y \oplus z$ exists at any time. Although both $x \oplus z$ and $x \oplus y \oplus z$ exist in the sense of being elements of O (and hence fall within the range of the existential quantifier $\exists$), they do not exist at any time despite the fact that each of their parts exists at some time. Consequently, statements such as $x \sqsubset_t x \oplus z$ are false, for any value of t. This differentiation in terms of existence among the sums of O nicely

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accounts for the intuition that $x \oplus y$ and $y \oplus z$ are 'more natural' sums than $x \oplus z$ or $x \oplus y \oplus z$: they are 'more natural' precisely because they exist at some time, whereas the latter two do not. For example, if the elements of O were houses and sums of houses, then $x \oplus y$ and $y \oplus z$ would be sums of coexistent houses, whereas $x \oplus z$ and $x \oplus y \oplus z$ would be sums of temporally disjoint houses.

2.2 The semantic analysis, I

With L_c at our disposal, we can turn to the analysis of verbs denoting the creation of a physical object. The idea is that all of these verbs share a thematic relation on $E \times O$ as their common core of meaning. I begin by defining four properties that a thematic relation may have and will then discuss the particular thematic relation in question for verbs of creation.[9]

A thematic relation R satisfies the property *uniqueness of physical objects* just in case it is functional with respect to its physical object argument, as defined in (31a). This is an expression of thematic uniqueness, familiar from syntactic theories: the thematic role in question may be assigned to at most one argument. The relation R satisfies the property *uniqueness of events* just in case it is functional with respect to its event argument, as stated in (31b). This in turn encodes a prohibition against iterativity: the physical object may stand in this relation at most once to a event.

(31) (a) $\mathsf{UNI\text{-}O}(R) \stackrel{\text{def}}{=} \forall e \forall x \forall y[(R(e,x) \wedge R(e,y)) \rightarrow x = y]$
(R satisfies uniqueness of physical objects)

(b) $\mathsf{UNI\text{-}E}(R) \stackrel{\text{def}}{=} \forall e \forall e' \forall x[(R(e,x) \wedge R(e',x)) \rightarrow e = e']$
(R satisfies uniqueness of events)

The relation R satisfies the property *weak mapping to physical objects* just in case any subevent of its event argument e is a part of a subevent of e that stands in the relation R to a part of the physical object argument of R, as shown in (32a). Notice that this property does not require every subevent of e to be mapped to a part of x, but only that every subevent of e be *covered* by such a mapping. The converse of this property is *weak mapping to events*, which is fulfilled by R only if any part of its physical object argument x is a part of a part of x that stands in the relation R to a subevent of the event argument of R, as formulated in (32b). As before, this does not require every part of x to be mapped to a part of e, but only that every part of x be included in such a mapping.

(32) (a) $\mathsf{WMAP\text{-}O}(R) \stackrel{\text{def}}{=}$
$\forall e \forall e' \forall x[(R(e,x) \wedge e' \sqsubseteq e) \rightarrow \exists e'' \exists y[e' \sqsubseteq e'' \wedge e'' \sqsubseteq e \wedge y \sqsubseteq x \wedge R(e'',y)]]$
(R satisfies weak mapping to physical objects)

[9] Anyone familiar with Krifka's (1989, 1992) approach will notice that my analysis is similar in spirit to his. Even so, there are differences as far as the treatment of verbs of creation is concerned, as I will point out in section 4.2.

(b) $\textsc{wmap-e}(R) \stackrel{\text{def}}{=}$
$\forall e \forall x \forall y[(R(e,x) \wedge y \sqsubseteq x) \rightarrow \exists z \exists e'[y \sqsubseteq z \wedge z \sqsubseteq x \wedge e' \sqsubseteq e \wedge R(e',z)]]$
(R satisfies weak mapping to events)

The four properties in (31) and (32) capture a sense in which a physical object may participate incrementally in an event. The next step is to introduce a particular thematic relation incremental that is postulated to have these properties:

(33) *Axiom.* $\textsc{uni-o}(\mathsf{incremental}) \wedge \textsc{uni-e}(\mathsf{incremental}) \wedge \textsc{wmap-o}(\mathsf{incremental}) \wedge \textsc{wmap-e}(\mathsf{incremental})$
(incremental satisfies the four properties in (31) and (32))

Observe that the relation incremental is not tensed; it says nothing about whether or not its physical object exists at a given time, hence it is neutral with respect to whether or not its event argument designates a creation event. The thematic relation created is a tensed version of incremental that requires the physical object to exist at the end of the event in question and at no time during the event before its end:

(34) $\mathsf{created}(e,x) \stackrel{\text{def}}{=}$
$\mathsf{incremental}(e,x) \wedge \mathsf{exist}(\varepsilon(e),x) \wedge \forall t[(t \sqsubseteq \tau(e) \wedge t \prec \varepsilon(e)) \rightarrow \neg \mathsf{exist}(t,x)]$
(x is created in e)

Since created is partly defined in terms of incremental, it clearly inherits the four thematic properties that the latter has:

(35) *Fact.* $\textsc{uni-o}(\mathsf{created}) \wedge \textsc{uni-e}(\mathsf{created}) \wedge \textsc{wmap-o}(\mathsf{created}) \wedge \textsc{wmap-e}(\mathsf{created})$
(created satisfies the four properties in (31) and (32))

The common meaning component of verbs denoting the creation of a physical object is precisely the relation created. For an illustration of created in action, consider the proposed analysis of the sentence in (1a), which is headed by *build*. Although the details of the semantic composition may be worked out in various ways, for present purposes I adopt Kratzer's (1996) proposal that the external argument of a verb is not included in its semantic representation but rather enters the semantic composition at a higher syntactic level.[10] This means that transitive verbs (e.g., *build*) are treated as two-place relations between events and physical objects and not as three-place relations that include an agent argument as well. With this background, the verb *build*, the agentive element, and the two noun phrases of (1a) are analyzed as follows (ignoring tense):

(36) (a) build $\rightsquigarrow \lambda y \lambda e[\mathsf{build}(e) \wedge \mathsf{created}(e,y)]$
(b) AGENT $\rightsquigarrow \lambda P \lambda x \lambda e[P(e) \wedge \mathsf{agent}(e,x)]$
(c) a Victorian style house $\rightsquigarrow \lambda R \lambda e[\exists y[R(e,y) \wedge \mathsf{victorian\text{-}style\text{-}house}(y)]]$

[10]For Kratzer, the higher level is a so-called Voice Phrase, but the exact label of this syntactic projection is not crucially relevant here.

(d) Rebecca $\rightsquigarrow$ rebecca

Assuming that the sentence in (1a) has the schematic syntactic structure indicated in (37a), its corresponding event predicate is shown in (37b), which is the straightforward result of type-driven functional application:

(37) (a) [(Rebecca) [(AGENT) [(build) (a Victorian style house)]]]
(b) $\lambda e[\exists y[\mathsf{build}(e) \wedge \mathsf{created}(e,y) \wedge \mathsf{victorian\text{-}style\text{-}house}(y)] \wedge \mathsf{agent}(e,\mathsf{rebecca})]$

The event predicate in (37b) denotes the set of events in which Rebecca builds a Victorian style house. Suppose now that one of these events is e'' and the house that she builds in e'' is z, as depicted in Figure 1. Due to the role of created, z exists at the end of e'' ($= \varepsilon(e'')$) but not at any time earlier in e''. However, this still allows for various proper parts of z to exist earlier. As shown, x is created in e and begins to exist at the end of e, and y is likewise created in e' and begins to exist at the end of e', where x and e are proper parts of y and e', respectively. Note that weak mapping to physical objects (see (32a)) does not require every subevent of e'' to be a creation event. The mixing of cement, the sawing of wood, and the plastering of walls are all subevents of e'', yet none of these are creation events per se. What weak mapping to physical objects requires is that each of these events be a part of a creation subevent of e'', which is plausible. For example, the building of the foundation of z is a creation subevent of e'' that has the mixing of cement as a subevent even though the latter is not a creation subevent. Conversely, weak mapping to events (see (32b)) does not demand that every part of z be created in a subevent of e''. The door and windows of z were not created in e'', because Rebecca bought them prebuilt, ready to be installed. What weak mapping to events demands is that they each be a part of a part of z that is created, which seems correct. For instance, the three windows are parts of the facade of z, which is created in a subevent of e''.

Although aspectual issues are not the main focus here, I point out that the event predicate in (37b) is demonstrably *quantized* (which is characteristic of accomplishments). This is a consequence of the fact that the nominal predicate victorian-style-house is quantized and of the properties of the thematic relation created. Quantized reference for one-place predicates of individuals is defined in (38a), and the corresponding result for the event predicate in (37b) is given in (38b).[11]

(38) (a) $\mathsf{QUA}(P) \stackrel{\text{def}}{=} \forall a \forall b[(P(a) \wedge b \sqsubset a) \to \neg P(b)]$ (P is quantized)
(b) *Fact.* $\mathsf{QUA}(\lambda e[\exists y[\mathsf{build}(e) \wedge \mathsf{created}(e,y) \wedge \mathsf{victorian\text{-}style\text{-}house}(y)] \wedge \mathsf{agent}(e,\mathsf{rebecca})])$
(the event predicate in (37b) is quantized)

[11] The proof makes use of uniqueness of objects, uniqueness of events, weak mapping to objects, and of course the fact that victorian-style-house is quantized (compare Krifka 1992, T11, p. 41).

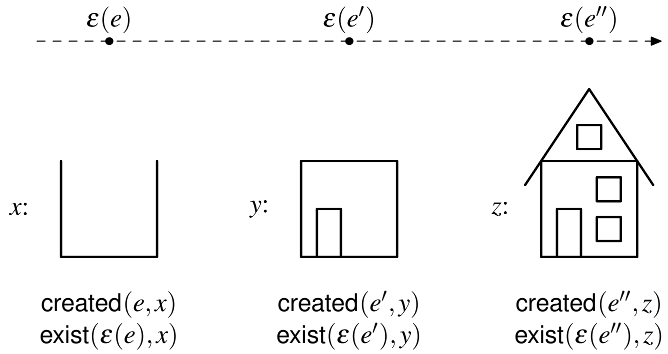

Figure 1: Building a house

A remark for those familiar with Krifka's theory is that the proof of the quantization of an event predicate based on a verb denoting the creation of a physical object together with a quantized nominal predicate restricting its internal argument does not depend on Krifka's stronger property of mapping to objects—the weaker one in (32a) is sufficient.

The analysis of the other sentences in (1) are analogous to that of (1a). In each case, the thematic relation created is employed to connect the physical object created to the event in question. As mentioned in section 1, the physical object created may be a collection of bytes, e.g., a binary file saved on a disk, like the program that Sarah compiles in (1b), but it counts as a physical object nevertheless.

3 Creating events and templates

In this section, I propose a treatment of performance verbs of creation (see (2)) and those denoting the creation of an abstract individual (see (3)). As before, the treatment proceeds in two steps: in section 3.1, I extend the model structure for L_c with three domains of *templates* and two new relations, naming the extended language L_c^+, and in section 3.2 I show how verbs of creation belonging to these two subclasses are analyzed with the help of L_c^+.

3.1 Extending L_c

To help fix intuitions, consider the three individuals depicted in Figure 2. At the left, denoted by x, is the Victorian style house that Rebecca built and now lives in. At the right, designated by y, is the architectural plan of the abstract house design realized on a sheet of paper (imagine a blueprint). Finally, at the bottom,

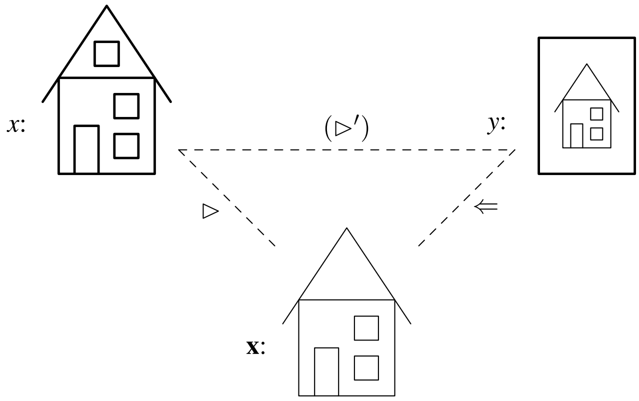

Figure 2: A house (x), a house template ($\mathbf{x}$), and a house plan (y)

named by $\mathbf{x}$, is the abstract house design (or a house *template*; see below).[12] Clearly, these are three different things, for both the physical house and the architectural house plan could get destroyed in a fire, but no fire could touch the abstract house design per se.[13] Furthermore, Rebecca lives in the physical house but she could not live in the architectural house plan or in the abstract house design. Yet all three have in common that they may be created.

The relation between the physical house and the abstract house design in Figure 2 is one of *instantiation*, symbolized as $\rhd$: $x \rhd \mathbf{x}$ 'x instantiates $\mathbf{x}$'. The relation between the architectural house plan and the abstract house design is one of *representation*, symbolized as $\Rightarrow$: $y \Rightarrow \mathbf{x}$ 'y represents $\mathbf{x}$'. Both of these relations are irreflexive, asymmetric, and intransitive, thus the abstract house design neither instantiates the physical house nor represents the architectural house plan. With the help of these two relations it is possible to define a notion of *derivative instantiation*, designated by $\rhd'$, which relates the physical house to the architectural house plan: $x \rhd' y$ 'x derivatively instantiates y'. The physical house derivatively instantiates the architectural house plan because there is an abstract house design that the former instantiates and the latter represents.

A conspicuous difference between the physical house and both the abstract house design and the house plan in Figure 2 is that the former has, but the latter

[12]For convenience, the abstract house design in Figure 2 is displayed in the form of an image of a house. But this could be misleading, because the abstract house design is not an image, and it would be more apt to think of it as a set of propositional functions describing the design in question, e.g., {the facade of $\mathbf{x}$ has at least two windows, $\mathbf{x}$ has a slanted roof, ...}. Naturally, the design may be more or less specified, and less specified designs would in this way be treated as subsets of more specified designs.

[13]As we will see below, especially in connection with (41) and (42), an abstract house design ceases to exist at a time in a certain sense if it is not represented by a physical object existing at that time. Thus, a fire may indirectly affect the existence of an abstract house design by destroying all of its representations, but the point remains that a fire cannot touch an abstract house design directly.

two lack, a window from the second story. The idea is that a concrete individual may be (in fact, usually is) more detailed than an abstract individual that it instantiates, provided that its extra detail does not conflict with the information that the abstract individual specifies. Thus, although the abstract house design **x** does not specify a window from the second story, it also does not specify that there is no such window, hence the physical house x may have such a window and not conflict with the abstract house design. This permits a concrete individual to instantiate many different abstract individuals, where the latter differ from each other according to the information (greater or less detail) that they specify. In contrast, the relation of representation as construed here is much less liberal and requires a tight fit between the representing individual and the represented individual. This means that if the house plan y had a window from the second story, then it would not represent this particular abstract house design **x**. A way to capture this is to say that any concrete individual represents at most one abstract individual (see (43)).

Naturally, and as just suggested, there may be many physical houses that instantiate the abstract house design in Figure 2, just as there may be many representations of it. Nor does every representation of an abstract house design have to be realized on paper, though this is probably the standard way of representing house designs. If Sarah, who is an architect, creates an abstract house design, she may initially only have it 'in her head', so to speak, before she gets a chance to make a blueprint. But however exactly this abstract house design is neurally encoded in her brain, the particular neural configuration also counts as a physical representation of the abstract house design that she created, though obviously it is one that only she has access to. Her abstract house design can also be represented by a computer file that is created with the help of a draw program. There may also be many abstract house designs, which are individuated in terms of the information they specify. An abstract house design that specified one tall window on the facade instead of two small windows would be distinct from the abstract house design **x**, despite the fact that they would have everything else in common.

On the present conception, the abstract house design in Figure 2 is an abstract *individual* and not a (first order) property or a kind. This is a somewhat delicate distinction, because properties and kinds may be treated as individuals, and yet such a possible treatment should not affect the distinction in question. For example, Dölling (2001) analyzes (first order) properties as (first order) individuals, calling them 'kinds'. He relates ordinary individuals to kinds with the help of a relation INST 'instance of'. For instance, he would formalize the statement that x is a house as 'x INST *house*', which is paraphrasable as 'x is an instance of the kind *house*'. More generally, his kinds play the same role that (first order) predicates play in L_c^+ (and L_c). However, Dölling's strategy of treating properties as kinds qua individuals is orthogonal to (and hence compatible with) the present point that the abstract house design **x** is an abstract individual but not a kind qua individual. In L_c^+, the formalization of the statement that $\mathbf{x}$ is a house (namely, an abstract house design) would be '$\mathsf{HOUSE}(\mathbf{x})$', where HOUSE is a (first order) predicate of abstract house designs. Observe that if we adopted Dölling's approach here and treated HOUSE as a kind qua individual, the formalization of the previous statement would be '$\mathbf{x}$ INST HOUSE', which would also bring home the point that $\mathbf{x}$ is being treated as a particular individual (albeit abstract) and not as a kind qua individual.

The three-way distinction drawn for houses in Figure 2 is more generally applicable. Take salads: a physical salad is something that can be eaten, the salad recipe is something that it instantiates, and the salad recipe in a recipe book is a representation of the recipe. More subtle are computer programs: a physical program is a binary file that can be executed, it instantiates an abstract program, and the source code saved in a file represents the abstract program. Or consider prayers: an event in which a prayer is said instantiates the abstract prayer, which is in turn represented by the prayer in a prayer book. Clearly, songs, poems, and symphonies are analogous to prayers, differences in structure aside.

In order to be able to talk about abstract individuals like the abstract house design $\mathbf{x}$ in Figure 2, I extend the model structure for L_c with three pairwise disjoint nonempty sets of *templates*:[14]

(39) O_m: $\mathbf{x}, \mathbf{y}, \mathbf{z}, \ldots$ (templates for physical objects)
E_m: $\mathbf{e}, \mathbf{e}', \mathbf{e}'', \ldots$ (templates for events)
T_m: $\mathbf{t}, \mathbf{t}', \mathbf{t}'', \ldots$ (templates for times)[15]

Defining the set M to be the union of these three sets of templates, we then introduce variables for templates of any sort:

(40) (a) $M \stackrel{\text{def}}{=} O_m \cup E_m \cup T_m$ (M is the union of O_m, E_m, and T_m)
(b) M: $\mathbf{m}, \mathbf{m}', \mathbf{m}'', \ldots$ (templates)

A notion of *derivative existence* at a time for templates can be defined in terms of the existence at a time of physical objects that *represent* them, as in (41). The notion of representation ($\Rightarrow$), a relation on $O \times M$, was introduced above to relate the house plan to the house design in Figure 2.

[14]The term 'template' may not be ideal, but I prefer it to 'type', which would have unintended connotations in the present context. With other applications in mind, Levy and Olson (1992) construe templates as physical objects that determine artifacts of a certain type. For example, a cookie cutter is a template for them, because under the right conditions it determines cookies of the same size and shape. The templates that I appeal to, although abstract individuals, are much more akin to cookie cutters than to properties or universals.

[15]The templates for times are included for the sake of completeness, though it is admittedly not so clear whether they are really needed. Perhaps theories of time (e.g., a theory of linear time vs. a theory of branching time) are examples of templates for times.

(41) $\textsf{EXIST}(\mathbf{m},t) \stackrel{\text{def}}{=} \exists x[\mathsf{exist}(x,t) \wedge x \Rightarrow \mathbf{m}]$ ($\mathbf{m}$ derivatively exists at t)

In Figure 2, the house design derivatively exists at a time t if the house plan exists at t. The following principle requires every template to derivatively exist at a time:

(42) *Axiom.* $\forall \mathbf{m}[\exists t[\textsf{EXIST}(\mathbf{m},t)]]$ (templates derivatively exist at a time)

This axiom requires every template to be existentially anchored to a physical object that represents it. Without this axiom, templates could just as well be Platonic objects with no necessary existential tie to physical objects. Note also that a template ceases to exist at a time (in the sense of EXIST) once there is no longer any physical object representing it that exists at that time.

The tight fit between a physical object and a template that it represents (recall the discussion above) is captured by the following principle, which states that $\Rightarrow$ is functional with respect to its template argument:

(43) *Axiom.* $\forall x \forall \mathbf{m} \forall \mathbf{m}'[(x \Rightarrow \mathbf{m} \wedge x \Rightarrow \mathbf{m}') \rightarrow \mathbf{m} = \mathbf{m}']$
(uniqueness of templates in representation)

However, the converse should not hold, because a given template may be represented by more than one physical object (e.g., imagine several blueprints of a house design).

Although every template is represented by a physical object, it need not be *instantiated* by any individual.[16] The notion of instantiation ($\rhd$), which is a relation on $(O \cup E \cup T) \times M$, was introduced above to connect the physical house to the house design in Figure 2. If a template is instantiated by a concrete individual, then the concrete individual has to be of the appropriate sort. Specifically, if a template for physical objects is instantiated, it is instantiated by a physical object, if a template for events is instantiated, it is instantiated by an event, and if a template for times is instantiated, it is instantiated by a time:

(44) *Axiom.* $\forall a \forall \mathbf{m}[a \rhd \mathbf{m} \rightarrow (\exists \mathbf{x}[\mathbf{m} = \mathbf{x}] \leftrightarrow \exists x[a = x]) \wedge (\exists \mathbf{e}[\mathbf{m} = \mathbf{e}] \leftrightarrow \exists e[a = e]) \wedge (\exists \mathbf{t}[\mathbf{m} = \mathbf{t}] \leftrightarrow \exists t[a = t])]$
(sortal correspondence for the instantiation of templates)

A notion of *derivative instantiation*, a relation on $(O \cup E \cup T) \times O$, can be defined in terms of instantiation and representation, as in (45). This notion was appealed to above to relate the physical house to the house plan in Figure 2.

(45) $a \rhd' x \stackrel{\text{def}}{=} \exists \mathbf{m}[a \rhd \mathbf{m} \wedge x \Rightarrow \mathbf{m}]$ (a derivatively instantiates x)

Templates may have subtemplates. For instance, the house template in Figure 2

[16] In terms of houses, this means that there could be an abstract house design and a house plan that represents it without there also being a physical house that instantiates the abstract house design.

has a subtemplate that leaves out the information about the door and the windows. In line with the present strategy of tying templates as tightly as possible to their physical representations, we define a notion of *proper subtemplate* ($\sqsubset'$) in terms of representation and proper part:

(46) $\mathbf{m} \sqsubset' \mathbf{m}' \stackrel{\text{def}}{=} \exists x \exists y[x \Rightarrow \mathbf{m} \wedge y \Rightarrow \mathbf{m}' \wedge x \sqsubset y]$ ($\mathbf{m}$ is a proper subtemplate of $\mathbf{m}'$)

With respect to Figure 2, this definition states that any template is a proper subtemplate of the house template just in case it is represented by a proper part of the house plan.

With the notion of proper subtemplate in hand, it is straightforward to define template analogues of the mereological relations in (9), (12), and (13) (where Q in (47c) is a one-place predicate of templates):

(47) (a) $\mathbf{m} \sqsubseteq' \mathbf{m}' \stackrel{\text{def}}{=} \mathbf{m} \sqsubset' \mathbf{m}' \vee \mathbf{m} = \mathbf{m}'$ ($\mathbf{m}$ is a subtemplate of $\mathbf{m}'$)

(b) $\mathbf{m} \circ' \mathbf{m}' \stackrel{\text{def}}{=} \exists \mathbf{m}''[\mathbf{m}'' \sqsubseteq' \mathbf{m} \wedge \mathbf{m}'' \sqsubseteq' \mathbf{m}']$ ($\mathbf{m}$ and $\mathbf{m}'$ overlap)

(c) $\textsf{SUM}(\mathbf{m}, Q) \stackrel{\text{def}}{=} \forall \mathbf{m}'[\mathbf{m}' \circ' \mathbf{m} \leftrightarrow \exists \mathbf{m}''[Q(\mathbf{m}'') \wedge \mathbf{m}'' \circ' \mathbf{m}']]$ ($\mathbf{m}$ is a sum of Q)

(d) $\sigma'(Q) \stackrel{\text{def}}{=} \iota \mathbf{m}[\textsf{SUM}(\mathbf{m}, Q)]$ (the sum of Q)

(e) $\mathbf{m} \oplus' \mathbf{m}' \stackrel{\text{def}}{=} \sigma(\lambda \mathbf{m}''[\mathbf{m}'' \sqsubseteq' \mathbf{m} \vee \mathbf{m}'' \sqsubseteq' \mathbf{m}'])$ (the sum of $\mathbf{m}$ and $\mathbf{m}'$)

While the proper subtemplate relation inherits the properties of the proper part relation (hence it provably is a strict partial order and satisfies the template analogue of the witness principle in (10)), the template analogue of the sum principle in (14) does not automatically follow.[17] Consequently, the existence of sums of templates has to be ensured separately:[18]

(48) *Axiom.* $(\exists \mathbf{m}[Q(\mathbf{m})] \wedge (\forall \mathbf{m}[Q(\mathbf{m}) \rightarrow \exists \mathbf{x}[\mathbf{m} = \mathbf{x}]] \vee \forall \mathbf{m}[Q(\mathbf{m}) \rightarrow \exists \mathbf{e}[\mathbf{m} = \mathbf{e}]] \vee$
$\forall \mathbf{m}[Q(\mathbf{m}) \rightarrow \exists \mathbf{t}[\mathbf{m} = \mathbf{t}]])) \rightarrow$
$\exists \mathbf{m}[\textsf{SUM}(\mathbf{m}, Q)]$
(existence of sums for templates)

We also have to allow for the possibility that descriptions of sums of templates formed with the help of the iota operator in (47d) are not defined, which is the case if the denotation of Q is empty. Parallel to the semantic clause in (26), I assume that such descriptions denote the nil individual d_0.

Three mapping principles regulate the relations of instantiation and repre-

[17] It would follow if there were a principle guaranteeing that for every physical object there is a template that it represents. However, such a principle would make the connection between physical objects and templates even tighter than envisioned here. In particular, the present approach allows for there to be more physical objects than templates, because there may be physical objects that do not represent templates but by (42) every template is represented by a physical object (that by (43) represents only it).

[18] For a more general formulation, we would have to allow for 'mixed' templates consisting of templates of different sorts, not dealt with here. The principle in (48) only guarantees the existence of sums of templates of the same sort.

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sentation. The first, *mapping from templates to instantiations*, states that if an individual a instantiates a template $\mathbf{m}$ and $\mathbf{m}'$ is a subtemplate of $\mathbf{m}$, then there is a part of a that instantiates $\mathbf{m}'$, as in (49a). The second principle, *mapping from templates to representations*, asserts that if a physical object x represents a template $\mathbf{m}$ and $\mathbf{m}'$ is a subtemplate of $\mathbf{m}$, then there is a part of x that represents $\mathbf{m}'$, as in (49b). Finally, the third principle is the converse of the previous one and states that if a physical object x represents a template $\mathbf{m}$ and y is a part of x, then there is a subtemplate of m that y represents, as in (49c).

(49) (a) *Axiom.* $\forall a \forall \mathbf{m} \forall \mathbf{m}'[(a \rhd \mathbf{m} \wedge \mathbf{m}' \sqsubseteq' \mathbf{m}) \rightarrow \exists b[b \sqsubseteq a \wedge b \rhd \mathbf{m}']]$
(mapping from templates to instantiations)

(b) *Axiom.* $\forall x \forall \mathbf{m} \forall \mathbf{m}'[(x \Rightarrow \mathbf{m} \rightarrow \mathbf{m}' \sqsubseteq' \mathbf{m}) \rightarrow \exists y[y \sqsubseteq x \wedge y \Rightarrow \mathbf{m}']]$
(mapping from templates to representations)

(c) *Axiom.* $\forall x \forall y \forall \mathbf{m}[(x \Rightarrow \mathbf{m} \rightarrow y \sqsubseteq x) \rightarrow \exists \mathbf{m}'[\mathbf{m}' \sqsubseteq' \mathbf{m} \wedge y \Rightarrow \mathbf{m}']]$
(mapping from representations to templates)

The converse of the principle in (49a) would not be desirable, because instantiations may be more detailed than the templates that they instantiate, as discussed in connection with the window from the second story in Figure 2, and the converse would require every part of an individual to correspond to a subtemplate of a template that it instantiates, which would be too strong. However, in the case of representations, both the principle in (49b) and its converse in (49c) are desirable, precisely because of the tight fit between physical objects and the templates that they represent.

Taking stock, the model structure for L_c has been extended with three domains of templates and two new relations connecting templates to concrete individuals. The extended language is L_c^+, and a model for L_c^+ is a pair $\mathscr{M} = \langle \mathscr{S}, I \rangle$, where $\mathscr{S}$ is a model structure and I is an interpretation function. $\mathscr{S}$ is now a tuple

$$\langle D, O, E, T, O_m, E_m, T_m, \sqsubset, \prec, \mathsf{trace}, \mathsf{exist}, \rhd, \Rightarrow, d_0 \rangle$$

where O_m, E_m, T_m are nonempty sets of templates for physical objects, templates for events, and templates for times, respectively, $\rhd$ is a relation of instantiation (between concrete individuals and templates), $\Rightarrow$ is a relation of realization (between physical objects and templates), and the other components of $\mathscr{S}$ are as they are in the model structure for L_c. Clearly, L_c^+ is more expressive than L_c, though not in a logical sense but rather in the sense that L_c^+ can express things about sorts of individuals (namely, the three sorts of templates) that L_c cannot say things about. I will make use of this greater expressibility in the next section.

3.2 The semantic analysis, II

The idea about performance verbs of creation and verbs denoting the creation of abstract individuals is that they both take an internal argument designating a template. To implement this idea, we need to introduce a thematic relation INCREMENTAL between events and templates that is the analogue of the relation incremental between events and physical objects. Thematic properties corresponding to those in (31a) and (32a) are also called for, which are defined as follows (where S is a two-place relation between events and templates):

(50) (a) $\mathsf{UNI\text{-}O}(S) \stackrel{\text{def}}{=} \forall e \forall \mathbf{m} \forall \mathbf{m}'[(S(e,\mathbf{m}) \wedge S(e,\mathbf{m}')) \rightarrow \mathbf{m} = \mathbf{m}']$
(S satisfies uniqueness of templates)

(b) $\mathsf{WMAP\text{-}O}(S) \stackrel{\text{def}}{=} \forall e \forall e' \forall \mathbf{m}[(S(e,\mathbf{m}) \wedge e' \sqsubseteq e) \rightarrow \exists e'' \exists \mathbf{m}'[e' \sqsubseteq e'' \wedge e'' \sqsubseteq e \wedge \mathbf{m}' \sqsubseteq' \mathbf{m} \wedge S(e'',\mathbf{m}')]]$
(S satisfies weak mapping to templates)

(c) $\mathsf{WMAP\text{-}E}(S) \stackrel{\text{def}}{=} \forall e \forall \mathbf{m} \forall \mathbf{m}'[(S(e,\mathbf{m}) \wedge \mathbf{m}' \sqsubseteq' \mathbf{m}) \rightarrow \exists \mathbf{m}'' \exists e'[\mathbf{m}' \sqsubseteq' \mathbf{m}'' \wedge \mathbf{m}'' \sqsubseteq' \mathbf{m} \wedge e' \sqsubseteq e \wedge S(e',\mathbf{m}'')]]$
(S satisfies weak mapping to events)

The relation INCREMENTAL is postulated to have these three thematic properties:

(51) *Axiom.* $\mathsf{UNI\text{-}O}(\textsc{incremental}) \wedge \mathsf{WMAP\text{-}O}(\textsc{incremental}) \wedge \mathsf{WMAP\text{-}E}(\textsc{incremental})$
(INCREMENTAL satisfies the three properties in (50))

Although we could define a template analogue of uniqueness of events (see (31b)), the relation INCREMENTAL should not have this property, because it is possible to create a given template more than once. For example, if Sarah designs a Victorian style house (say the house template in Figure 2), it is certainly possible for someone else to independently design exactly the same house on another occasion. Indeed, even Sarah herself may design the same house twice, especially if she forgets and loses all record of her first design.

The next step is to define a template variant of the thematic relation created introduced in (34). The new relation is CREATED, defined with the help of INCREMENTAL and created as follows:

(52) $\textsc{created}(e,\mathbf{m}) \stackrel{\text{def}}{=} \textsc{incremental}(e,\mathbf{m}) \wedge \exists x[\mathsf{created}(e,x) \wedge x \Rightarrow \mathbf{m}]$
($\mathbf{m}$ is created in e)

This says that a template $\mathbf{m}$ is created in an event e just in case $\mathbf{m}$ is incremental in e and there is a physical object x created in e which represents $\mathbf{m}$.

For an application of the relation CREATED, consider the analysis of the sentence in (3b), headed by *design* (compare (36)). The verb *design* denotes a two-place relation between events and templates for physical objects, as in (53a). The agentive element is given in (53b) (repeated from (36b)), and the noun phrase *a Victorian style house*$_m$ is analyzed as an existential quantifier over house templates, as in (53c). This noun phrase (among many others) is thus treated as systematically ambiguous between a existential quantifier over physical houses (see (36c)) and one over house templates, where the index ‘m’ marks the latter. Last but not least, *Sarah* is treated as a constant, as in (53d).

(53) (a) design $\rightsquigarrow \lambda \mathbf{x} \lambda e[\mathsf{design}(e) \wedge \textsc{created}(e, \mathbf{x})]$
(b) AGENT $\rightsquigarrow \lambda P \lambda x \lambda e[P(e) \wedge \mathsf{agent}(e, x)]$
(c) a Victorian style house$_m$ $\rightsquigarrow$
$\lambda S \lambda e[\exists \mathbf{x}[S(e, \mathbf{x}) \wedge \textsc{victorian-style-house}(\mathbf{x})]]$
(d) Sarah $\rightsquigarrow$ sarah

Given the schematic syntactic structure displayed in (54a), the corresponding event predicate is shown in (54b) (compare (37)).

(54) (a) [(Sarah) [(AGENT) [(design) (a Victorian style house$_m$)]]]
(b) $\lambda e[\exists \mathbf{x}[\mathsf{design}(e) \wedge \textsc{created}(e, \mathbf{x}) \wedge \textsc{victorian-style-house}(\mathbf{x})] \wedge$
$\mathsf{agent}(e, \mathsf{sarah})]$

This event predicate denotes the set of events in which Sarah designs a Victorian style house template. Due to the definition of CREATED, a physical object representing the Victorian style house template is created as a result of such an event, but note that *design* crucially denotes a relation between designing events and templates, and not between designing events and representations of templates. Moreover, there is no entailment that a physical house instantiating the house template is created.

The other sentences in (3) with *compose* and *invent* receive the same kind of analysis. However, one difference is that *compose* takes a template for events as its internal argument. Consider an analysis of the verb phrase of the sentence in (3a):

(55) (a) compose $\rightsquigarrow \lambda \mathbf{e} \lambda e[\mathsf{compose}(e) \wedge \textsc{created}(e, \mathbf{e})]$
(b) a symphony$_m$ $\rightsquigarrow \lambda S \lambda e[\exists \mathbf{e}[S(e, \mathbf{e}) \wedge \textsc{symphony}(\mathbf{e})]]$
(c) compose a symphony$_m$ $\rightsquigarrow$
$\lambda e[\exists \mathbf{e}[\mathsf{compose}(e, \mathbf{e}) \wedge \textsc{created}(e, \mathbf{e}) \wedge \textsc{symphony}(\mathbf{e})]]$

The event predicate in (55c) denotes the set of events in which a symphony template is created. By the semantics of CREATED, a representation of the symphony is also created, but of course no instantiation of the symphony (i.e., no performance) is entailed.

Performance verbs of creation such as *recite* (see (2)) differ from those denoting the creation of a template in that they entail an instantiation of the template in question. More precisely, such verbs take an internal argument denoting a template for events and they assert an instantiation of this template. However, the relation CREATED cannot be used to capture this, precisely because no template is created—the individual created is the event (i.e., the performance) itself. To fill the gap, a new thematic relation PERFORMANCE may be defined in terms of INCREMENTAL and instantiation:

(56) $\textsc{performance}(e, \mathbf{e}) \stackrel{\text{def}}{=} \textsc{incremental}(e, \mathbf{e}) \wedge e \rhd \mathbf{e}$ (e is a performance of $\mathbf{e}$)

An event e is a performance of a template $\mathbf{e}$ just in case $\mathbf{e}$ is incremental in e and e instantiates $\mathbf{e}$. In the case of performances, no physical object is created, hence there is no need to appeal to the relation exist.

With the relation PERFORMANCE available, consider the analysis of the sentence in (2c), headed by *recite*:

(57) (a) recite $\rightsquigarrow \lambda \mathbf{e} \lambda e[\mathsf{recite}(e) \wedge \textsc{performance}(e, \mathbf{e})]$
(b) a poem$_m$ by E. E. Cummings $\rightsquigarrow$
$\lambda S \lambda e[\exists \mathbf{e}[S(e, \mathbf{e}) \wedge \textsc{poem-by-e.e.-cummings}(\mathbf{e})]]$
(c) Daniel $\rightsquigarrow$ daniel

Note that the noun phrase *a poem$_m$ by E. E. Cummings* is an existential quantifier over templates of poems by E. E. Cummings (and poem templates are templates for events). Given the syntactic structure sketched in (58a), the resulting event predicate for the sentence is shown in (58b).

(58) (a) [(Daniel) [(AGENT) [(recite) (a poem$_m$ by E. E. Cummings)]]]
(b) $\lambda e[\exists \mathbf{e}[\mathsf{recite}(e) \wedge \textsc{performance}(e, \mathbf{e}) \wedge \textsc{poem-by-e.e.-cummings}(\mathbf{e})] \wedge \mathsf{agent}(e, \mathsf{daniel})]$

The other sentences in (2) are treated in a similar fashion.

I began in section 1 with three subclasses of verbs of creation and have shown how the verbs of each subclass are handled in the present approach. Verbs denoting the creation of a physical object (see (1)) are analyzed as relations between events and physical objects with the help of the thematic relation created (e.g., (36)). Performance verbs of creation (see (2)) are treated as relations between events and templates for events (e.g., (57)) with the aid of the thematic relation PERFORMANCE. Finally, verbs denoting the creation of a template (see (3)) are analyzed as relations between events and templates (e.g., (53) and (55)) with the assistance of the thematic relation CREATED. While these are indeed the primary analyses, the data indicate the need for *sort shifters* that are able to shift the internal argument of a verb from one sort to another.

Recall that the pairs of sentences in (4) and (5) suggest that verbs denoting the creation of a physical object sometimes appear to be able to take templates as their internal arguments. In (4a), if the noun phrase *a Victorian style house that Sarah designed* is treated as an existential quantifier over house templates, which is reasonable in the light of *design* (see (53a)), then it will not be able to combine with *build* as analyzed in (36a) due to a sortal conflict. A solution is to postulate a particular sort shifter (SSH-1) that applies to a verb denoting a relation between events and physical objects and yields a verb denoting a relation between events and templates such that the templates are instantiated by a physical object:

(59) SSH-1 $\rightsquigarrow \lambda R \lambda \mathbf{x} \lambda e[\exists y[R(e, y) \wedge y \rhd \mathbf{x}]]$ (sort shifter 1)

Applying the shifter SSH-1 to *build*, we get:

(60) SSH-1(build) $\rightsquigarrow \lambda \mathbf{x}\lambda e[\exists y[\mathsf{build}(e) \wedge \mathsf{created}(e,y) \wedge y \rhd \mathbf{x}]]$

Assuming that *a Victorian style house that Sarah designed* is analyzed as the existential quantifier over house templates in (61a) and that the sentence in (4a) has the schematic syntactic structure in (61b), then the corresponding event predicate is displayed in (61c).

(61) (a) a Victorian style house$_m$ that Sarah designed $\rightsquigarrow$
$\lambda S\lambda e[\exists \mathbf{x}[S(e,\mathbf{x}) \wedge \textsf{VICTORIAN-STYLE-HOUSE}(\mathbf{x}) \wedge \exists e'[\mathsf{design}(e') \wedge \textsf{CREATED}(e',\mathbf{x}) \wedge \mathsf{agent}(e',\mathsf{sarah})]]]]$
(b) [(Rebecca) [(AGENT) [(SSH-1(build)) (a Victorian style house$_m$ that Sarah designed)]]]
(c) $\lambda e[\exists \mathbf{x}[\exists y[\mathsf{build}(e) \wedge \mathsf{created}(e,y) \wedge y \rhd \mathbf{x}] \wedge \textsf{VICTORIAN-STYLE-HOUSE}(\mathbf{x}) \wedge \exists e'[\mathsf{design}(e') \wedge \textsf{CREATED}(e',\mathbf{x}) \wedge \mathsf{agent}(e',\mathsf{sarah})]] \wedge \mathsf{agent}(e,\mathsf{rebecca})]$

This event predicate denotes the set of events in which Rebecca builds a physical object that instantiates a Victorian style house that Sarah designed. The analysis of the second sentence in (4b) would also make use of SSH-1(*build*), and the pronoun *it* would refer to the Victorian style house template that Sarah designed that is introduced in the first sentence.

But SSH-1 is not the only sort shifter needed. Imagine the following sentence in the context of an architect's office, where *the house on the wall* refers to the blueprint of a house hanging on the wall:

(62) Rebecca built the house on the wall.

To handle this case, we need a version of *build* that takes a physical object representing a template as its internal argument and asserts that this representation is derivatively instantiated (see (45)). Such a version is derived with the aid of the sort shifter in (63a) (SSH-2), which is applied to *build* in (63b).

(63) (a) SSH-2 $\rightsquigarrow \lambda R\lambda z\lambda e[\exists y[R(e,y) \wedge y \rhd' z]]$ (sort shifter 2)
(b) SSH-2(build) $\rightsquigarrow \lambda z\lambda e[\exists y[\mathsf{build}(e) \wedge \mathsf{created}(e,y) \wedge y \rhd' z]]$

Applied to a physical object z, the relation in (63b) denotes the set of events in which a physical object y is built that derivatively instantiates z.

A sort shifter is not required for the analysis of the pairs of sentences in (6) and (7), because performance verbs of creation (e.g., *say*, *play*) already receive a primary treatment in which they assert that a template for events is instantiated. However, the following example suggests that such verbs sometimes take a physical object representing a template for events—which, by the axiom in (43), is unique—as their internal argument:

(64) Rebecca said the prayer on page 25 of the prayer book.

To handle this use of *say*, a sort shifter is needed (SSH-3) that applies to a performance verb of creation and yields a verb taking a physical object as its internal argument that represents a template for events which the events denoted are performances of. The shifter SSH-3 is defined in (65a), the primary analysis of *say* as a performance verb of creation is given in (65b), and the result of applying SSH-3 to *say* is displayed in (65c).

(65) (a) SSH-3 $\rightsquigarrow \lambda S \lambda y \lambda e[\exists \mathbf{e}[S(e,\mathbf{e}) \wedge y \Rightarrow \mathbf{e}]]$ (sort shifter 3)
(b) say $\rightsquigarrow \lambda \mathbf{e} \lambda e[\mathsf{say}(e) \wedge \mathsf{PERFORMANCE}(e,\mathbf{e})]$
(c) SSH-3(say) $\rightsquigarrow \lambda y \lambda e[\exists \mathbf{e}[\mathsf{say}(e) \wedge \mathsf{PERFORMANCE}(e,\mathbf{e}) \wedge y \Rightarrow \mathbf{e}]]$

Applied to a physical object y, the relation in (65c) denotes the set of events which are saying performances of a template for events **e** that y represents.

I conclude with a brief mention of yet another sort shifter (SSH-4) that takes a verb denoting the creation of an abstract individual and yields a verb taking a physical object as its internal argument which instantiates a template for physical objects. This sort shifter is needed for examples such as the following:

(66) Sarah designed the house on the corner.

The definition of SSH-4 is given in (67a) and its application to *design* (see (53a)) is shown in (67b).

(67) (a) SSH-4 $\rightsquigarrow \lambda S \lambda y \lambda e[\exists \mathbf{x}[S(e,\mathbf{x}) \wedge y \rhd \mathbf{x}]]$ (sort shifter 4)
(b) SSH-4(design) $\rightsquigarrow \lambda y \lambda e[\exists \mathbf{x}[\mathsf{design}(e) \wedge \mathsf{CREATED}(e,\mathbf{x}) \wedge y \rhd \mathbf{x}]]$

Applied to a physical object y, the relation in (67b) denotes the set of events in which a template for physical objects **x** is designed such that y instantiates **x**.

4 Comparisons

In this section, I briefly contrast my proposal for verbs of creation with four previous ones due to Dowty (1979), Krifka (1989, 1992), von Stechow (2001), and McCready (2003a,b), respectively. My aim is not to provide an extended commentary on any of these approaches (which would take me far afield) but rather to highlight the ways in which theirs differ from mine and are arguably less satisfactory as accounts of verbs of creation.

4.1 Dowty (1979)

Dowty suggests in passing that verbs of creation are semantically decomposed with the help of the predicates CAUSE and BECOME, which are used for the analysis of accomplishments in his framework:

(68) John painted a picture.
[[*John paints*] CAUSE [BECOME [*a picture exists*]]] (Dowty 1979, (98), p. 91)

Without going into the technical question of how CAUSE and BECOME are interpreted, the intuitive meaning assigned to this representation is that John's painting activity causes a picture to come into existence.

As von Stechow (2001, sect. 4) points out in detail, the major flaw in Dowty's analysis in (68) is that the corresponding truth conditions prohibit any picture at all from existing at the beginning of the interval of painting, and yet this is clearly too strong, because there may well be (other) pictures that exist in the world at the beginning of this interval. Von Stechow also argues that this flaw is not so easy to fix in Dowty's framework.

But putting this difficulty aside, I point out that Dowty's treatment does not handle performance verbs of creation (see (2)) or those denoting the creation of an abstract individual (see (3))—at best it serves for verbs denoting the creation of a physical object. Interestingly, Dowty is aware of this shortcoming. For example, he is concerned (pp. 186–187) that *perform a sonata* cannot plausibly be analyzed as [CAUSE [BECOME [*a sonata exists*]]]. He then suggests that *John performs a sonata* might be treated as having the form [[*John acts*] CAUSE [TRANSPIRE(*a sonata*)]] but leaves this as 'a mere speculation'.

Fortunately, the verb phrase *perform a sonata* does not pose any special difficulty for the present approach. The verb *perform* is analyzed using the relation PERFORMANCE from (56), as in (69a),[19] the noun phrase *a sonata*$_m$ as a quantifier over sonata templates (which are templates for events), as in (69b), and the resulting event predicate for *perform a sonata*$_m$ is shown in (69c).

(69) (a) perform $\rightsquigarrow \lambda \mathbf{e} \lambda e[\mathsf{PERFORMANCE}(e, \mathbf{e})]$
(b) a sonata$_m$ $\rightsquigarrow \lambda S \lambda e[\exists \mathbf{e}[S(e, \mathbf{e}) \wedge \mathsf{SONATA}(\mathbf{e})]]$
(c) perform a sonata$_m$ $\rightsquigarrow \lambda e[\exists \mathbf{e}[\mathsf{PERFORMANCE}(e, \mathbf{e}) \wedge \mathsf{SONATA}(\mathbf{e})]]$

4.2 Krifka (1989, 1992)

Strictly speaking, Krifka does not offer a treatment of verbs of creation. His notion of *graduality* (Krifka 1992, p. 42), which characterizes thematic relations that satisfy the properties *uniqueness of objects*, *mapping to objects*, and *mapping to events* in his framework, does not distinguish between 'effected patients' and 'consumed patients'. However, even disregarding this, there is a significant difference between his approach and mine in the strength of the mapping properties appealed to, as I hinted at in section 2.2. In particular, his properties of mapping to objects and mapping to events are stronger than the properties of weak mapping to physical objects and weak mapping to events that I define in (32). For example, in the case of *build a house*, his mapping to events would

[19] Arguably, PERFORMANCE constitutes the sole descriptive content of *perform*, but an additional restriction on the events in its extension could be specified if necessary.

require every part of the house to be built in the building event, yet this is implausible as a general requirement, because many parts of the house (e.g., the doors and windows) may be prebuilt and therefore simply installed in the course of the building event. The property of weak mapping to events in (32b) allows for this, as I pointed out in section 2.2. His mapping to objects is also too strong, because it would require every subevent of the building event to be an event in which a part of the house is built.[20]

Krifka (1992, p. 46) notes in passing a possible extension of his approach for performance verbs of creation such as *play* in *play a sonata* (see also Krifka 1989, pp. 198–199). He suggests introducing a domain of *types* and a relation of *realization* between tokens and types so that *play* could describe the realization of a type. Since he does not spell out the details, it is hard to make specific comparisons, but the role of instantiation in my analysis of performance verbs of creation is clearly very much in this spirit. Nevertheless, he would still lack an analogue to the relation of representation that I use for the analysis of verbs denoting the creation of an abstract individual.

4.3 Von Stechow (2001)

Von Stechow begins with a critique of Dowty's account of verbs of creation and proceeds by proposing three possible theories to replace it with. Unfortunately, at least on my reading, he does not unambiguously reveal which of the three theories he is most committed to, but since the third theory is the most similar to a Krifka style approach, I will mention it. The idea is that the analysis of verbs of creation makes use of a thematic relation *I-Theme* for the internal argument, defined as follows (p. 310):

(70) $\textit{I-Theme} \stackrel{\text{def}}{=} \lambda w \lambda e \lambda x[\textsc{becoming}_{(w,e)}(\lambda w' \lambda t[\textit{exist}_{(w',t)}(x)]]$
(von Stechow 2001, (99), p. 310)

In light of von Stechow's definition of BECOMING (p. 290), this says that x is an I-Theme in w of e just in case x does not exist in w at the beginning of e, x exists in w at the end of e, and x is undefined for existence in w at any time properly between the beginning and end of e.[21]

[20] Krifka (1992, pp. 45–46) is aware of this problem and suggests a somewhat intricate solution for *build*, but I think that his mapping properties are unrealistically strong to begin with.

[21] Von Stechow adds (fn. 17, p. 310) that 'x is an I-Theme of e iff there is a bijection f, such that for any part e' of e: $f(e')$ is a part of x & $f(e')$ does exist [sic] at $\textsc{beg}(t(e'))$, but $f(e')$ exists at $\textsc{end}(t(e))$ [sic].' (There are two unfortunate typos here: the first should be corrected as 'does not exist', and the second, as '$\textsc{end}(t(e'))$'.) The condition on existence aside, this amounts to Krifka's thematic properties of uniqueness of objects, uniqueness of events, mapping to objects, and mapping to events, though von Stechow does not explicitly make this connection. However, it is also unclear how these added requirements are related to the putative *definition* of I-Theme in (70), which does not mention any such function f. If such an f is needed to characterize I-Theme (and something like it is needed, though I would advocate weaker mapping properties), then it should properly appear in the definition of I-Theme.

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As far as von Stechow's I-theme is concerned, I do not understand the motivation for saying that x is undefined for existence between the beginning and the end of e. Since undefinedness is both a conceptual and technical hassle, it should be strongly motivated. The relation created (see (34)) that I use does not appeal to undefinedness, and as I argued, the parts of the object created come into existence piecemeal in the course of the creation event but before coming into existence they do not exist.

A final point is that von Stechow's treatment covers only verbs denoting the creation of a physical object—he does not mention performance verbs of creation or verbs denoting the creation of an abstract individual, hence it is at best rather incomplete as an account of verbs of creation.[22]

4.4 McCready (2003a,b)

McCready focuses on the interaction between progressivized verbs of creation and anaphoric reference to partially created objects. He aims to account for contrasts such as the following:

(71) (a) John was painting a picture. #It was a masterpiece.
(McCready 2003b, (2a), p. 328)
(b) John was building a house. His brother designed it.
(McCready 2003b, (4a), p. 328)

McCready's idea is that *it* in (71a) cannot refer back to the partially completed picture that John was painting because the noun *masterpiece* may only apply to completed objects. In contrast, *it* in (71b) refers to an abstract object (namely, a house design) and not to the partially completed house that John was building.

For the analysis of verbs denoting the creation of a physical object (e.g., *paint* in (71a)), McCready basically employs von Stechow's I-Theme, but he takes its definition to be what is in von Stechow's fn. 17 (see my fn. 21), silently correcting the typos and discreetly discarding what appears in (70):[23]

(72) $\textit{I-Theme}(e,x) \stackrel{\text{def}}{=}$
$$\exists f \forall e'[e' \sqsubseteq e \rightarrow (f(e') \sqsubseteq x \wedge \neg \textit{exists}(\text{BEG}(e'), f(e')) \wedge \textit{exists}(\text{END}(e'), f(e')))]$$
(McCready 2003b, (9), p. 330)

In order to treat *build* in (71b), McCready (2003a, fn. 25, p. 37) takes verbs of creation "to be ambiguous between a reading in which the verb acts as a 'verb of realization,' which selects for a property complement, and a reading taking an

[22] Von Stechow's paper also touches upon many other topics loosely related to verbs of creation, something that I have not conveyed here. I have focused on the substance of the third theory that he presents.

[23] McCready remarks that '[t]his definition states that x is an I-Theme of e iff there is a bijection that maps every subevent of the creation to a subpart of its object, and, until the completion of each subevent, its corresponding object subpart does not exist.' I simply note that, strictly speaking, the definition in (72) says nothing about whether or not x exists between the beginning and the end of e.

actual object, which describes an actual creation event." The reading of *build* in (71b) is the one on which it takes a property complement. McCready represents the nonprogressivized version of the first sentence in (71b) as the following event predicate, which serves as the input to the progressive operator:[24]

(73) John build- a house: $\lambda e[build(john, \lambda x[house(x)])]$

McCready's approach is congenial to mine in its attempt to cover a wider range of verbs of creation than the other approaches discussed above (though it does not address performance verbs of creation). However, his conception also differs from mine in that he takes the abstract objects of verbs of creation to be properties (extensionally, sets) and not bona fide first order individuals, albeit abstract.[25] Yet consider (e.g.) *Sarah designed a house*: it would be incorrect to say that Sarah designed the property of being a house—certainly she did not manage to do that. To get around this, McCready could say that she designed a subproperty of the property of being a house, which would extensionally amount to a subset of the set of houses. But if no one ever built the house that she designed, then she would have effectively designed the empty set, which is a very counterintuitive result. He could then try to get around this by intensionalizing the property complement that *design* takes (e.g., by construing it as a function from possible worlds to sets of individuals), but this move would lack independent support in that *design* otherwise behaves like an extensional verb (unlike *seek*, for example). But even putting this problem aside, McCready still has to clarify more explicitly the connection between (e.g.) *build* as a verb that takes a property complement (see (73)) and *build* as a verb that takes an individual argument, because from the formula in (73) it does not follow that a physical house is built (and the addition of a simple tense operator will not guarantee this either).

The present approach does not face these difficulties. The internal argument of *design* denotes a template for physical objects that is created (in the sense of CREATED; see (53b)). If such a template is created, it is represented, but it may or may not be instantiated. Templates are first order individuals, albeit abstract, and behave as individuals for the purposes of quantification, anaphoric reference, and the like. Finally, the two senses of *build* that McCready is concerned with are analyzed in (36a) and (60), being explicitly related with the help of the sort shifter SSH-1 in (59).

4.5 Conclusion

Verbs of creation come in three sorts: verbs that denote the creation of a physical object (e.g., *build*), performance verbs of creation (e.g., *sing*), and those that

[24] Unfortunately, since McCready does not present detailed derivations, the formula in (73) is the result of a bit of extrapolation, based on what he does present.

[25] Recall my remarks in connection with Dölling (2001) in section 3.1.

denote the creation of an abstract individual (e.g., *design*). I have presented a new analysis of verbs of creation that does equal justice to each of these sorts. The new analysis presupposes a model structure that has an *existence* predicate and distinguishes between *physical objects*, *events*, *times*, and three kinds of *templates* (templates for physical objects, templates for events, and templates for times). Templates are abstract (first order) individuals that are existentially anchored to physical objects with the help of a relation of *representation* and which may also be connected to concrete individuals by means of a relation of *instantiation*. For example, a house template (a house design) may be represented by a blueprint, whereas it may be instantiated by a physical house. This framework offers straightforward treatments of the three sorts of verbs of creation. Furthermore, the new analysis provides a set of *sort shifters* that serve to capture systematic ambiguity among verbs of creation (e.g., the distinction between *build* as a verb denoting the creation of a physical object and *build* as a verb denoting the instantiation of a template). Finally, I have argued that the new approach fares better than the competition as a general account of verbs of creation.

References

Dölling, J. (2001): Ontological domains, semantic sorts, and systematic ambiguity. In: Systematische Bedeutungsvariationen: Semantische Form und kontextuelle Interpretation (= Linguistische Arbeitsberichte 78). 71–92. Institut für Linguistik, Universität Leipzig.

Dowty, D. (1979): Word meaning and Montague grammar. Dordrecht: D. Reidel.

Gamut, L. T. F. (1991): Logic, language, and meaning. Vol. 1: Introduction to logic. The University of Chicago Press.

Kratzer, A. (1996): Severing the external argument from its verb. In: J. Rooryck and L. Zaring (eds): Phrase structure and the lexicon. 109–137. Dordrecht: Kluwer.

Krifka, M. (1989): Nominalreferenz und Zeitkonstitution: Zur Semantik von Massentermen, Pluraltermen und Aspektklassen. Munich: Wilhelm Fink Verlag.

Krifka, M. (1992): Thematic relations as links between nominal reference and temporal constitution. In: I. Sag and A. Szabolcsi (eds): Lexical matters. 29–53. Stanford: CSLI Publications.

Levin, B. (1993): English verb classes and alternations: A preliminary investigation. University of Chicago Press.

Levy, D. M. and K. R. Olson (1992): Types, tokens and templates. Report No. CSLI-92-168. Stanford: CSLI Publications.

McCready, E. (2003a): Discourse anaphora, verbs of creation, and the progressive. Qualifying paper, Department of Linguistics. University of Texas at Austin.

McCready, E. (2003b): Anaphora and (un)finished objects. In: G, Garding and M. Tsujimura (eds): WCCFL 22 Proceedings. 328–341. Somerville, MA: Cascadilla Press.

von Stechow, A. (2001): Temporally opaque arguments in verbs of creation. In: C. Cecchetto, G. Chierchia, and M. Guasti (eds.): Semantic interfaces: Studies offered to Andrea Bonomi on the occasion of his sixtieth birthday. 278–319. Stanford: CSLI Publications.