Noughty Bits: The subatomic scope of negation
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A pas de deux, there is, between negation and quantification over times, places or events, in any clause prefixed with both (Partee 1973, Burge 1974):

(1) It didn’t rain.
(2) It isn’t sunny.

Given the density of space-time and its states and events, it would trivialize (1)-(2) for negation to follow quantification, as there is always somewhere rain or sunshine isn’t:

(3) * ∃e ¬rain(e)
(4) * ∃e ¬sunny(e)

Even where (1)-(2) are false, it is still too often that scattered among the rain or sunshine then and there, there is where it isn’t, again trivializing the translation of (1)-(2) that puts negation after quantification:

(5) * [∃e: then&there(e)](Past(e) & ¬rain(e))
(6) * [∃e: then&there(e)](Present(e) & ¬sunny(e))

Rather, negation must precede it— not as in (7)-(8), too global for the meaning of (1)-(2) — but to say of then and there that it is a sterile zone bereft of rain or sunshine, (9)-(10):

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1 For discussion sine qua non with Elena Herburger, Yael Sharvit and Anna Szabolcsi, much thanks.
As this is the only meaning for (1)-(2), it must be a fact of grammar that it regiments translation as in (9)-(10), fixing the relative scope of negation and quantification as shown.

To be more faithful to the syntax of English, taken since Chomsky 1957 to be Tense-Neg-VP, the canonical logical form for (1)-(2) refines (9)-(10) as (11)-(12):

(11) \[ [\exists E': then&there[E']] [\exists E: Past[E] & therein[E,E']] \neg [\exists e: Ee] rain(e)\]

(12) \[ [\exists E': then&there[E']] [\exists E: Present[E] & therein[E,E']] \neg [\exists e: Ee] sunny(e)\]

Canonical logical form for negation is thus divided between description of what there isn’t—rain or sun in (1)-(2)—from reference or description of the spatiotemporal region where there was none of it, then&there in (11)-(12).

The spatiotemporal restriction to then&there is often understood to be demonstrative in a context in which (1)-(2) is uttered (Partee 1973, Burge 1974). Yet, it may be explicitly disavowed as such:

(13) Once upon an unknown time and place in darkest rainforest, it didn’t rain.

(14) \[ [\exists E: once upon…[E']] [\exists E: Past[E] & therein[E,E']] \neg [\exists e: Ee] rain(e)\]

The spatiotemporal frame adverbial, once upon an unknown time and place..., describes the spatiotemporal region where what wasn’t—rain—wasn’t. When negation dances with spatiotemporal quantification, it is always about the existence of zones that are asserted to be sterile of what is described in the scope of negation, as in (9)-(10), whether then&there is salient in context or is itself subject to quantification in the expression of a general proposition as in (13) and in (15):

(15) George: Once upon a time—I don’t know when, don’t ask me—nothing happens.

Jerry: What do you mean “nothing happens”? Never, nothing happens. Always, something happens. You just might not know about it if you haven’t been invited.\(^3\)

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\(^2\) Or, equivalently, for present purposes:

(i) \[ [\exists E: then&there[E']] [\exists E: Past[E] & \neg [\exists e: Ee] rain(e)]\]

The text treats Tense itself as a restricted, definite description of spatiotemporal regions, events or states. All the logical forms to follow do the same but could be redone as in (i).

Despite the unknown whereabouts and George’s blind quantification over it, (15) still does not sink (nor does (13)) to the vacuous assertion (16) of time and place so confined that nothing noteworthy happens to happen within it. The existence of such is not what Jerry objects to. At issue is whether or not there be time and place long and large enough to be of current notice and worthy of television, within which nothing happens. Reference to time and place and to events and states therein never escapes an implicit standard for what is to count for current notice—for how to parse it all into times, places, events and states.\footnote{I cannot anticipate what commitments would arise in properly characterizing how a token of \textit{then\&there} denotes—whether a formal mereotopology (e.g., \cite{casati1999}) would suffice or it requires appeal to a full-throated theory of spatial perception and orientation, event segmentation and object perception (e.g., \cite{palmer1999, shipley2008, spelke1990}).}

\begin{equation}
\neg \exists T \neg \exists e: T e \Phi[e] \tag{16}
\end{equation}

Nothing happens$[e]$

Negation and spatiotemporal quantification in (17)-(18) conspire, as it were, as a compound modal or spatiotemporal operator quantifying over those times, places, events or states $e$ (rather than worlds $w$) that are noticeable (rather than accessible) according to an implicit standard (rather than modal base) \textit{then\&there}.\footnote{A Davidsonian surrendered to event talk everywhere would hold that negation never occurs except as a prefix to event quantification, in which case \textit{not} itself might as well be translated as an event quantifier \textit{⌜Not $e$: then\&there(e)⌝}.$[\Phi[e]]'$ v. §1.2.}

\begin{equation}
\neg \exists e: \textit{then\&there(e)} \Phi[e] \tag{17}
\end{equation} ; or,

\begin{equation}
\neg \exists e: \textit{then\&there(e)} \Phi[e] \tag{18}
\end{equation}

In §§1-2, the standards for parsing space-time loom large in the explanation of what negated sentences mean—yet, only the weakest, most banal and uncontroversial of standards. If the logical form of negation indeed distinguishes the $e$ that isn’t so-and-so from the $E$ wherein it isn’t, it is then a matter of syntax which phrases in a negated sentence denote $e$ and which $E$, provided that logical form offers both, as in (17)-(18). Whether the phrase pronounces a relation to events, \textit{underneath the clouds}, \textit{⌜the X: clouds(X)⌝}; or leaves it silent as in \textit{⌜the X: clouds(X)_theme(X)⌝}, the interaction between negation and plural or mass reference, \textit{the clouds} or \textit{the water vapor}, reduces in §2 to whether the phrase describes the framing events $E$ or the framed event $e$. If the logical form of negation distinguishes the framing and the framed, then for any negated sentence, definite reference may be thought of as grounded in the global frame of reference for the framing events $E$ or as dependent on the local frames of reference for the framed events $e$. Crucially, negation—as in (17)-(18)—is a context, attested elsewhere in natural language, for trans-frame-of-reference reference (§3), in which reference to the so-and-so of the global frame of reference for $E$ accumulates the so-and-so from across the local frames of reference for $e$. Given a syntax and semantics for quantifying-in and definite description (§§3-4) adapted for trans-frame-of-reference reference, the exceptional behavior of (in)definite descriptions pronounced superficially within the scope of negation reduces to their exportation in logical form to a position from which they quantify-in
trans-frame-of-reference. What has just been alluded to will be illustrated in examples the likes of (19)-(20):

(19) Around the clouds, it wasn’t calm underneath (them).
(20) The clouds weren’t calm underneath.

Much of what goes on under negation carries over mutatis mutandis to decreasing quantifiers (§5) like those in (21)-(22) and distinguishes them from their increasing counterparts in (23)-(24):

(21) Around no clouds was it calm underneath (them).
(22) No clouds were calm underneath.

(23) Around some clouds, it was calm underneath (them).
(24) Some clouds were calm underneath.

That is, it turns out that decreasing quantification is also a context for trans-frame-of-reference reference with all the behavior that preceding sections reduce to it, and increasing quantification is not such a context. As decreasing quantification imposes an upper bound on whatever its scope describes, its logical form includes a definite description of whatever is so described. The logical form for (22) includes, as it were, the definite description whatever events or states of calm there were underneath, of which it is asserted that no clouds participated in any such. The syntax and semantics internal to this definite description (§4) accumulates its reference to events or states of calm from across anywhere there is calm—trans-frame-of-reference reference. In contrast, the logical form for increasing quantification in (24) just says that there were some events or states of calm, in which some clouds participate, without reference or indication of any other such states let alone to the accumulation of them all. Thus, whatever emerges from trans-frame-of-reference reference under decreasing quantification is absent under increasing quantification.

The noughtiness of negation has its début in the pas de deux between negation and spatiotemporal segmentation and its canonical logical form (17)-(18). Already on stage in natural language is a syntax and semantics for trans-frame-of-reference reference and quantifying-in. If it is further supposed that the syntactic distribution of these contexts distinguishes the canonical logical forms for decreasing and increasing quantification, then all the noughtiness reduces to matters of logical syntax and the assignment of scope to (in)definite descriptions. In the literature since Fodor 1970,6 negation wears a Homogeneity Condition custom made for it and embroidered for decades, which is here discarded.

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1. Impersonal constructions.

The aforementioned syntax and semantics is at its plainest in impersonal sentences, with tense, negation and a frame adverbial that directs attention to the implicit standard, and not much else in the sentence:

(25) Over 5000m$^2$, it didn’t burn to ashes.
(26) Over 5000m$^2$, there didn’t flame (a) flame bright as day.
(27) Over 5000m$^2$, there wasn’t (a) fire.

(28) Underneath the clouds, it wasn’t calm/still/silent.
(29) Underneath the clouds, it didn’t calm (down)/become still/fall silent.
(30) Underneath the clouds, there wasn’t (a) calm/stillness/silence.

First (§1.0), a truth-conditional scope effect will demonstrate that the logical syntax is as in (11)-(12) and (14), dividing the sentence between description of what isn’t so—the sentence fragment after negation—and description of where not so—the fragment before it including frame adverbials. The following section (§1.1) then turns to the standards for parsing the spatiotemporal region where not so into the noticeable times, places, events or states that are each not so. Section §2 proceeds to negation in general, beyond impersonal constructions.

1.0. A study of forest fire conditions studied a prepared study area of 5000 hm$^2$, 500 hm N-S by 10 hm E-W, of which the southern 2500 hm$^2$ ignited and was aflame:

(31) ![Diagram of study area] (31)

In the impersonal sentences to follow, the predicate, burn, burn through(out), burn across, burn over, aflame, ablaze, consumed by fire, is chosen to express a dissective condition (Quine 1960), that is, one true of (almost) all of whatever it is true of. The southern 2500 hm$^2$ was aflame and all of it within it; but, there were not 5000 hm$^2$, the area of the entire forest, so consumed:

(32) It didn’t burn through(out)/across/over 5000 hm$^2$.
(33) It didn’t burn through(out)/across/over the entire area under study.
(34) It didn’t burn through(out)/across/over the entire forest.

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7 Cf. (German, p.c. Elena Herburger, 2014):

(i) Es brannte durch 5000 hm$^2$ durch.
(ii) Es hat durch 5000 hm$^2$ durchgebrannt.
There wasn’t (a) fire through(out)/across/over (the) 5000 hm².

There wasn’t (a) fire through(out)/across/over the area of the study.

There wasn’t (a) fire through(out)/across/over the entire forest.

There didn’t flame flame(s) through(out)/across/over (the) 5000 hm².

There didn’t flame flame(s) through(out)/across/over the area of the study.

There didn’t flame flame(s) through(out)/across/over the entire forest.

There didn’t burn (a) scorching fire through(out)/across/over (the) 5000 hm².

There didn’t burn (a) scorching fire through(out)/across/over the area of the study.

There didn’t burn (a) scorching fire through(out)/across/over the entire forest.

In contrast to the self-evident truths of (32)-(43), their counterparts that front their prepositional phrases are just as plainly not true:

Through(out)/across/over 5000 hm², it didn’t burn.

Through(out)/across/over the entire study area, it didn’t burn.

Through(out)/across/over the entire forest, it didn’t burn.

Through(out)/across/over (the) 5000 hm², there wasn’t (a) fire.

Through(out)/across/over the area of the study, there wasn’t (a) fire.

There wasn’t (a) fire through(out)/across/over the entire forest.

Through(out)/across/over (the) 5000 hm², there didn’t flame flame(s).

Through(out)/across/over the area of the study, there didn’t flame flame(s).

Through(out)/across/over the entire forest, there didn’t flame flame(s).

Through(out)/across/over (the) 5000 hm², there didn’t burn (a) scorching fire.

Through(out)/across/over the area of the study, there didn’t burn (a) scorching fire.

Through(out)/across/over the entire forest, there didn’t burn (a) scorching fire.

Any 5000 hm² in (31) is nothing less than (31) itself, and it or what occupies it is not a singular spatiotemporal region or event that burns throughout, verifying (32)-(43) and the logical form in (56):

\[ [1E: \text{then there}_{31}[E']] \]

\[ [1E: \text{Past}[E] \& \text{therein}[E,E']] \neg [\exists e: \text{Ee} (\text{burn}(e) \& \text{through } 5000 \text{ hm}^2(e))] \]

Yet, (31) is where within there are (uncountably) many spatiotemporal regions or events of burning throughout, the largest of which consumes its southern 2500 hm², rendering (44)-(55) and the logical form in (57) untrue:

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8 Also (31) is where within there are (uncountably) many spatiotemporal regions or events, including (31) itself, of not burning throughout.
(57)  \[\exists E': \text{through } 5000 \text{ hm}^2[E'] [E: \text{Past}[E] \& \text{therein}[E, E']] \neg [\exists e: Ee \text{ burn}(e)]\]

After all, the frame adverbials so-called that introduce sentences—framing them—frame the action therein described, as in (57), rather than describe it directly, in contrast to adverbs that belong to the action’s description, as in (56). This truth-bearing distinction, the result of logical form containing distinct variables to which the adverbs may be applied, ‘E’ and ‘e’ in (56)-(57), is lost to any logical form too impoverished to contain them:

\[
\neg [\exists e: \text{then&there}_{31}(e)] [\text{Past}(e) \& \text{burn}(e) \& \text{through } 5000 \text{ hm}^2(e)]
\]


(60)  In slow progression for several measures, every organ student struck a single note on the Wurlitzer.

(61)  # Every organ student struck a single note in slow progression for several measures on the Wurlitzer.

The students’ slow progression for several measures (60) is that within which a single note is not slow progression for several measures (61). Yet, with even less of a commitment than precedent to Davidsonian events, one arrives at the logical form in (56)-(57). It has been enough to concede that: i., there is natural language quantification over times and places; ii., given the density of time and space, negation must be construed as the denial that certain times and places exist within a zone then&there large enough for notice; and, iii., if reference to such zones is not all to be demonstrative, it includes its definite or indefinite description as the frame adverbials provide in (13), (15), (25)-(30) and (44)-(55).9

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9 As above, the frame adverbial outside the scope of negation in (i) and (ii) renders them untrue in (31):

(i)  Over (the) 5000 hm^2, there didn’t burn (a) scorching fire.
(ii) Over (the) 5000 hm^2, there wasn’t (a) scorching fire.

In contrast, it seems to me that (iii) and (iv) have salient readings true in (31) and equivalent to (v) and (vi):

(iii)  Covering (the) 5000 hm^2, there didn’t burn (a) scorching fire.
(iv)  Covering (the) 5000 hm^2, there wasn’t (a) scorching fire.

(v)  There didn’t burn (a) scorching fire covering (the) 5000 hm^2.
(vi)  There wasn’t (a) scorching fire covering (the) 5000 hm^2.

It is, I assume, that covering (the) 5000 hm^2 demands a subject and reconstructs in logical form to be predicated of (a) scorching fire so that (iii)-(iv) come to resemble (v)-(vi), unlike over (the) 5000 hm^2, a frame adverbial proper that remains and is interpreted in situ. Note that the argument in the text rests on the existence of the ambiguity and the logical forms to represent it. It could be that all the sentences, adverbs in sentence-initial position or not, are in fact ambiguous, pronounced one way or another merely to suggest a favored interpretation.
A Davidsonian analysis is not however to be forestalled for long if the scope ambiguity with respect to negation is to be represented in its fullest generality. The impersonal constructions (62)–(69), just like those in (32)–(43), are unambiguously true of (31):

(62) There weren’t 5000 hm$^2$ aflame/consumed in flames in a forest fire.
(63) There weren’t the 5000 hm$^2$ of an area under study aflame/consumed in flames in a forest fire.
(64) There wasn’t the entire area of a forest aflame/consumed in flames in a forest fire.
(65) There wasn’t the entire forest in a forest fire aflame/consumed in flames.

(66) There didn’t burn 5000 hm$^2$ in a forest fire.
(67) There didn’t burn the 5000 hm$^2$ of an area under study in a forest fire.
(68) There didn’t burn the entire area of a forest under study.
(69) There didn’t burn the entire forest in a study of forest fire conditions.

And, again, like (44)–(55), fronting to a position before negation delivers an interpretation that is not true of (31), because some of it did not burn:

(70) 5000 hm$^2$ weren’t aflame/consumed in flames in a forest fire.
(71) The 5000 hm$^2$ of an area under study weren’t aflame/consumed in flames in a forest fire.
(72) The entire area of a forest wasn’t aflame/consumed in flames in a forest fire.
(73) The entire forest in a forest fire wasn’t aflame/consumed in flames.

(74) 5000 hm$^2$ didn’t burn in a forest fire.
(75) The 5000 hm$^2$ of an area under study didn’t burn in a forest fire.
(76) The entire area of a forest under study didn’t burn.
(77) The entire forest didn’t burn in a study of forest fire conditions.

It is all the same on a Davidsonian analysis that sees little daylight between a thematic-relational phrase, e.g., ‘[$\exists X: 5000 \text{hm}^2(X)]\text{Theme}(e,X)$’, and any other prepositional phrase, ‘[$\exists X: 5000 \text{hm}^2(X)]\text{through}(e,X)$’, that may be fronted. Alongside (56)–(57), there is (78) for the impersonal constructions (62)–(69) with postverbal subjects, and (79) for (70)–(77) with fronting of the thematic relation and further raising of the DP into preverbal subject position:

(78) $[\iota E: \text{then & there}_{31}[E^*]]$

$[\iota E: \text{Past}[E] \& \text{therein}[E,E^*]] \neg [\exists e: Ee] (\text{burn}(e) \& [\exists X: 5000 \text{hm}^2(X)]\text{Theme}(e,X))$

(79) $[\exists X: 5000 \text{hm}^2(X)] [\iota E^*: \text{Theme}[E^*,X]]$

$[\iota E: \text{Past}[E] \& \text{therein}[E,E^*]] \neg [\exists e: Ee] \text{burn}(e)$

Crucial for the scope ambiguity is that the logical form for negation distinguish the $e$ that isn’t so-and-so from the $E$ wherein it isn’t. It is then a matter of syntax which phrases describe $e$ and which $E^*$, provided that logical form offers both. That the thematic relation associated with the subjects in (70)–(77) may, as much as an adverbal phrase in
preverbal position, describe events $E'$ in (79) separately from events $e$ that the verb and
the rest of the sentence describe is just another instance of thematic separation, argued for
2014 and Williams 2015. As above in (58)-(59), the difference in meaning is lost absent
the two variables $e$ and $E'$, even with thematic relations:

\[ (80) \neg [\exists e: then&there_{31}(e)] \left[ \text{Past}(e) \land \text{burn}(e) \land [\exists X: 5000 \text{ hm}^2(X)] \text{Theme}(e,X) \right] \]

\[ (81) \quad a. \quad \neg [\exists e: then&there_{31}(e)] \left[ \exists X: 5000 \text{ hm}^2(X) \left[ \text{Past}(e) \land \text{Theme}(e,X) \land \text{burn}(e) \right] \right] \]

\[ \quad b. \quad [\exists X: 5000 \text{ hm}^2(X)] \neg [\exists e: then&there_{31}(e)] \left[ \text{Past}(e) \land \text{Theme}(e,X) \land \text{burn}(e) \right] \]

\[ (82) \neg [\exists e: then&there_{31}(e)] \left[ \text{Past}(e) \land \text{burn}(e) \land [\exists X: 5000 \text{ hm}^2(X)] \text{Theme}(e,X) \right] \]

\[ (83) \quad a. \quad \neg [\exists e: then&there_{31}(e)] \left[ \exists X: 5000 \text{ hm}^2(X) \left[ \text{Past}(e) \land \text{Theme}(e,X) \land \text{burn}(e) \right] \right] \]

\[ \quad b. \quad [\exists X: 5000 \text{ hm}^2(X)] \neg [\exists e: then&there_{31}(e)] \left[ \text{Past}(e) \land \text{Theme}(e,X) \land \text{burn}(e) \right] \]

Whether referring to some 5000 hm$^2$ or the 5000 hm$^2$, the entirety of (31) is denoted, and
thus all of (80)-(83) are true of (31) without distinction. To impoverish logical form even
further and shoehorn it into the literature on negation and predication since Fodor 1970
renders it even more desolate of anything to tell apart the meaning of sentences with
postverbal subjects from those with preverbal subjects:

\[ (84) \neg [\exists X: 5000 \text{ hm}^2(X)] \text{burn}(X) \quad (cf., \ e.g., \ (66)) \]

\[ (85) \quad [\exists X: 5000 \text{ hm}^2(X)] \neg \text{burn}(X) \quad (cf., \ e.g., \ (74)) \]

\[ (86) \neg [\exists X: 5000 \text{ hm}^2(X)] \text{burn}(X) \quad (cf., \ e.g., \ (67)) \]

\[ (87) \quad [\exists X: 5000 \text{ hm}^2(X)] \neg \text{burn}(X) \quad (cf., \ e.g., \ (75)) \]

1.1. Event segmentation. If there is a *pas de deux* between negation and spatiotemporal
reference and thus warrant for logical form as in (11)-(12), (14) and (56)-(57)—whether or
not it extends via thematic separation to (78)-(79)—reference to time and place or to
events and states then & there never escapes an implicit standard for what is to count for
current notice—for how to parse it all into times, places, events and states. Out of the
blue, literally, there were clouds and one of (88)-(90) is uttered:

\[ (88) \quad \text{Underneath the clouds, it wasn’t calm/still/silent.} \]

\[ (89) \quad \text{Underneath the clouds, it didn’t calm (down)/become still/fall silent.} \]

\[ (90) \quad \text{Underneath the clouds, there wasn’t (a) calm/stillness/silence.} \]

\[ (91) \quad [tE': \text{under the clouds}[E']] [tE: \text{Past}[E] \land \text{therein}[E,E']] \quad \neg [\exists e: Ee] \text{calm}(e) \]

What are the events or states—the boundaries for the meteorological conditions—taken
to be underneath the clouds then and there and then judged calm/etc. or not? Suppose
that these clouds are all shapely pillows equal in dimension and uncloudy in their
number, so that the volume between cloud and ground level is also uncloudy. But, consider various conditions under which they are scattered and encountered by a narrator uttering (88)-(90). With the clouds scattered across Southern New England, none within 20 nautical miles of another, the pilot reports on a slow flight path through the airspace underneath them. It may even have been that these clouds were not contemporaries, having each formed shortly before the pilot enters its airspace and dissipated shortly thereafter. Or, perhaps a stationary observer on the ground has measured the winds underneath these clouds similarly spaced and passing overhead. Or perhaps, the weather station issuing (88)-(90) has received contemporaneous reports from scattered sensors underneath stationary scattered clouds, etc. Or, perhaps the scatter is all mental, the narrator’s memories underneath clouds in spatiotemporal locations absolute or relative that have been forgotten. The clouds’ scatter grounds several observations about the events or states then and there, that any utterance of (88)-(90) must intend if uttered under any of these conditions. First, for any cloud, the state of the volume underneath it for the duration of its observation and what occurrence is occupying it then constitute an event or state among the events or states parsed then and there for current notice. If so, given the above semantics, any of (88)-(90) is true only if for each cloud, there was turbulent air underneath it within the period of its observation—a necessary condition for the truth of (88)-(90). Underneath the scatter, it can hardly be imagined how it could be otherwise given any cognizance of event perception and segmentation. The necessary condition becomes sufficient with two further remarks, the first of which must also derive from event perception and segmentation alone, and the second, from a further semantic consideration. As a matter of event perception and segmentation, there are no gerrymandered events of current notice—not a one event that would, for example, be the fusion of what happens underneath one cloud in the first few minutes of its observation and what happens underneath another cloud 100 nautical miles away in the last few minutes of its observation 90 minutes later. There is no understanding (88)-(90) that entails that such an absurd event be discovered to contain air turbulence. Such an event is never among those parsed for current notice. Further reflection on the meaning of (88)-(90) prompts a further remark about their semantics. It is, after all, sufficient for (88)-(90) that pilot or observer encounter underneath each cloud, some air turbulence, an eddy here or there. It is not required that turbulence roil the entire air mass underneath the cloud. It must then be that this volume is not dense with sub-events or -states, each a fraction of that volume and enduring for a fraction of the period under observation. For, if such events or states were indeed among those then and there for current notice, it would roil the entire air mass. Rather, the events or states then and there for current notice are countable; the event quantification in (9)-(10), is count quantification over some events or states (Gillon 1990; Schwarzschild 1996: 82f., 92f.; Schein 2006: §29.2.2.2). In the contexts entertained for (88)-(90), the events or states within the volume underneath a cloud for the period of its observation amount to countable events or states only if the one event or state that occupies the entire volume for the entire period is the only one that counts. Then and only then, does it suffice for (88)-(90) that underneath each cloud, only some turbulence is encountered. So much holds of the events presented then and there for current notice when conditions scatter the clouds, none near any other. Under such conditions, one might even mistake (88)-(90) to express a condition that applies directly to the clouds, distributively. An honest mistake, since with deliberate malice, despite the variation in circumstances, I contrived that the clouds individuate equinumerous events
for current notice. Let me introduce the relation ‘$\sum[X,E]$’ for when the scatter of $X$ induces the parse or segmentation of scene, frame of reference or spatiotemporal region into equinumerous $E$ of events or states, scenes, frames of reference, or spatiotemporal regions. It is left open that the $X$ which induce segmentation may be either objects such as clouds or other events or states, etc. from a prior segmentation. Nothing more substantive or formal needs to be said except to name the obvious a principle of scattering, viz. that if $X$ frames and induces the segmentation of $E$, then zooming-in to a region $\alpha$ that isolates an $e$ from the other $E$ isolates an $x$ from the other $X$:

\[
\sum[X,E] \rightarrow, \quad (\text{SCATTER})
\]

\[
(\text{there}(\alpha, e) & ((Ee & \text{there}(\alpha, e')) \rightarrow e = e')) \rightarrow
\]

\[
((Xx & Xx' & Ee) \rightarrow (\text{there}(\alpha, x) & \text{there}(\alpha, x')) \rightarrow x = x'))
\]

Usually, in circumstances less contrived, clouds do not individuate equinumerous events. At the opposite end, it could have been that the clouds were all in a single cluster or blanket. Given what is known about the prevailing meteorological conditions underneath such a cluster, the clouds belong to a system and participate in a single meteorological event, generating a certain amount of air turbulence from their interaction, enough for the truth of (88)-(90), but hardly requiring from most clouds—let alone each—air turbulence within each volume underneath them. More likely in ordinary experience is that the clouds are scattered in clusters, and the observer’s encounters with those clusters are separated so that the events presented then and there for current notice coincide with the clusters, in which case it is necessary and sufficient for (88)-(90) that underneath each cluster, there is some air turbulence—a semi-distributivity down to clusters rather than clouds. Note that even as I move these clouds around the Southern New England sky, the clouds and the volumes underneath them remain the same throughout, despite the variation it induces in event segmentation and the events presented for current notice.10

In any example discussed so far, the description of the events said not to exist does not itself offer any cues for event segmentation, and it is left to the observer’s experience to present what events are intended for current notice. But, the description could otherwise indicate that larger events are at issue, perhaps even an event no smaller than the observer’s entire experience (examples adapted from Breheny 2005):

\[
\text{(93) } \text{Underneath the clouds, it wasn’t calm/still/silent for (any more than) twenty minutes.}
\]

10 Varying the parameters for (i) familiar from studies in gestalt perception,

\[
(\text{i) } \quad \square \square \quad \square \square \quad \square \quad \square
\]

e.g., ratio of enclosed area to interstitial area, ratio of the area of individual enclosures to area of aggregate enclosure, ratio of aggregate enclosed area to interstitial area, ratio of aggregate area to the number aggregate, absolute number aggregated, geometric regularity of individual enclosures, similarity and scaling, heterogeneity, symmetry and axial orientation and alignment, color, shading, (partial) occlusion, animation with rigid vs. elastic motion.
(94) Underneath the clouds, it didn’t calm (down)/become still/fall silent for (any more than) twenty minutes.

(95) Underneath the clouds, there wasn’t (a) calm/stillness/silence for (any more than) twenty minutes.

(96) Underneath the clouds, it wasn’t calm/still/silent across (all) Southern New England.

(97) Underneath the clouds, it didn’t calm (down)/become still/fall silent across (all) Southern New England.

(98) Underneath the clouds, there wasn’t (a) calm/stillness/silence across (all) Southern New England.

(99) Underneath the clouds, it wasn’t calm/still/silent by nightfall.

(100) Underneath the clouds, it didn’t calm (down)/become still/fall silent by nightfall.

(101) Underneath the clouds, there wasn’t (a) calm/stillness/silence by nightfall.

If there is at issue just the one event with a dimension across all Southern New England, then it suffices that it is not a calm, with some air turbulence anywhere—despite any cloud scatter, which is now not intended to individuate the events of current notice, in what is perhaps a comment on the entire regional weather system.

For an utterance of (102) that first presents as above the skeletal logical form in (103), it is to be asked what are the events or states—the boundaries for the meteorological conditions—taken to be underneath the clouds then and there and then judged calm/etc. or not?

(102) Underneath the clouds, it wasn’t calm.

(103) \[E': \text{under the clouds}[E']][tE: \text{Past}[E] \& \text{therein}[E,E']] \neg[\exists e: Ee \text{ calm}(e)]

Uttered out-of-the-blue, the thought might very well be that the clouds fix those boundaries:

(104) \[X: \text{clouds}[X]][E': \text{under}[E',X]]

\[tE: \sum[X,E]^{11} \& \text{Past}[E] \& \text{therein}[E,E']] \neg[\exists e: Ee \text{ calm}(e)]

But, that thought is vacuously true given SCATTER (92), if the utterance continues to elaborate the description of the individual \(e\) as in (96):

(105) \# \[X: \text{clouds}[X]][E': \text{under}[E',X]]

\[tE: \sum[X,E] \& \text{Past}[E] \& \text{therein}[E,E']] \neg[\exists e: Ee \text{ calm}(e) \& \text{across SNE}(e)]

No event within the airspace underneath a solitary cloud is an event across Southern New England. Retreating then to (106) for the thought the utterance intended, it must be that some other standard parses the events for current notice:

\[11\] The position of ‘\(\sum[X,E]\)’ within this logical form is arbitrary.
(106) \[1E': \text{under the clouds}[E']][1E: \text{Past}[E] \& \text{therein}[E,E']] \neg\exists e: Ee(\text{calm}(e) \& \text{across SNE}(e))

Given context and the shape of this particular utterance, salient are only those events spanning all Southern New England. It suffices then for (96) and (106) that there is some air turbulence anywhere. Here then is a persistent feature of the pas de deux between Φ-ing and Ψ-ing in (107):

(107) \[1E: \Phi[E] \& \text{Tense}[E] \& \text{therein}[E,E']] \neg\exists e: E\Psi(e)

For any given spatiotemporal region such as the airspace of Southern New England, the larger the e of Ψ-ing, the fewer the E Φ-ing. Now if an e’s not Ψ-ing implies some failure among its participants—the failure, say, of its clouds to overlook only calm—and if the participants in all the non-Ψ-ing are the participants in the Φ-ing—the clouds of Southern New England—then, the larger the individual e of Ψ-ing, the lower the failure rate needs to be among these participants for (107) to be true.

1.2. The logical syntax of ‘not’. If a sentence is tensed, and thus reference to (spatio-)temporal region uncontroversial, it is remiss—so it has been argued—to neglect the pas de deux that ensues between tense and negation in any negated sentence. As much leaves room to translate ‘not’ as logical negation, ‘not Φ’ as ‘¬Φ’, so long as spatiotemporal reference and quantification outside and inside its scope is as suggested above. But, if that is all there is to ‘not’, it leaves little room for not-many (‘Not many NP Φ’) and few (‘few NP Φ’) to diverge as they do in (108)-(119). The translation of ‘not’ as itself quantificational ‘[Not e: then&there(e)]Φ[e]’, or at least cue to an adjacent token of then&there as in ‘not [1E': then&there (E')] Φ’, provides the occasion and yet another locus for subatomic scope effects to shine through.

(108) a. Not many square miles were flooded.
    b. There were not many square miles flooded.
(109) a. # Few square miles were flooded.
    b. #There were few square miles flooded.
(110) a. Not many feet are left before we strike bedrock.
    b. There are not many feet left before we strike bedrock.
(111) a. # Few feet are left before we strike bedrock.
    b. # There are few feet left before we strike bedrock.
(112) a. Not many rows and columns are in the table in fig. 18.
    b. There are not many rows and columns in the table in fig.18.
(113) a. # Few rows and columns are in the table in fig. 18.
    b. # There are few rows and columns in the table in fig. 18.
Wine stains; but, since it was not served at tables set with this heirloom tablecloth—

(114) a. Not many spills stained it.
   b. Not many stains stain it.
   c. There were not many spills staining it.
   d. There are not many stains staining it.

(115) a. # Few spills stained it.
   b. # Few stains stain it.
   c. # There were few spills staining it. (Cf. There were few spills to stain it.)
   d. # There are few stains staining it.

(116) a. Not many ties were on campus in the sixties.
   b. There were not many ties on campus in the sixties.

(117) a. # Few ties were on campus in the sixties.
   b. ? There were few ties on campus in the sixties.

(118) a. Not many protesters were arrested in violent clashes with the police last year.
   b. Not many violent protesters were arrested at non-violent demonstrations last year.
   c. There were not many protesters arrested in violent clashes with the police last year.
   d. There were not many violent protesters arrested at non-violent demonstrations last year.

(119) a. Few protesters were arrested in violent clashes with the police last year.
   b. Few violent protesters were arrested at non-violent demonstrations last year.
   c. There were few protesters arrested in violent clashes with the police last year.
   d. There were few violent protesters arrested at non-violent demonstrations last year.

The sentences "...few NP Φ" are interpreted, it seems, as if the NP anchor a frame of reference to host the things and events that Φ describes. Thus, it is odd when the NP are units of measure, square miles or feet, in (109) and (111), unless the units of measure are reified as real estate. Similarly, it is odd in (113) to anchor a frame of reference on rows and columns, as if they were independent landmarks, some of which might then be found in the given table and some not. It is odd in (115) to anchor a frame of reference on stains or spills under a bias that they do not exist. If (116) is neutral report of campus fashion in the sixties, (117) seems rather to belong to a droll history of the secret life of ties. The not-many sentences of (118) are reports of largely peaceful events, marked by the absence of violent protest; but, (119) seem rather to be about lax enforcement against the protesters. The arithmetic of being few is being not many, and the not many are the few. It is difficult for not many and few in (108)-(119) to diverge if their logical form is identical, "[Q NP] Φ", except for the prefix of logical negation. If instead ‘not’ is itself quantificational as in (120), or otherwise indicates a token of then&there as in (121), it can
be said that whatever anchors a frame of reference for what is \textit{then&there} is antecedently given and independent of the NP, which are referred to only within the description of \(e\), properly within the scope of ‘not’:

\begin{align*}
(120) & \quad \text{[Not } e: \text{then&there}(e)] [1E: \text{Past}[E] \& \text{therein}[E,e]] \quad [\text{Many NP} \ \Phi[e] ] \\
(121) & \quad \text{not}[1E^\prime: \text{then&there}(E')] [1E: \text{Past}[E] \& \text{therein}[E,E']].[\exists e: E] \quad [\text{Many NP} \ \Phi[e] ]^12 \\
\end{align*}

There is no burden on the NP to fix a frame of reference for the sentence and no burden for reference to the NP to be coherent for such. It then suffices that reference to units of measurement in (108) and (110) is coherent only within events of measurement, and similarly for the other sentences. In contrast, the NP of ‘Few NP \(\Phi\)’ anchors \textit{then&there}:

\begin{align*}
(122) & \quad \text{[Few NP] } [1X: \text{NP}][1E: \text{then&there}(E,\lambda X)][1E: \text{Past}[E] \& \text{therein}[E,E']].[\exists e: E] \ \Phi[e] \\
\end{align*}

There otherwise seems to be no account of the contrast between \textit{not-many} and \textit{few} without a syntax that provides reference to both \textit{then&there} \(E\) and the local events \(e\) within.\(^13\)

In (123)-(125), the intervening reference to the framing events \(E\) is overtly pronounced in sentences equivalent in meaning to (88)-(90):

(123) Not underneath the clouds was it (ever) calm/still/silent.
(124) Not underneath the clouds did it (ever) calm (down)/become still/fall silent.
(125) Not underneath the clouds was there (ever) a calm/stillness/silence.

(126) \quad \text{[Not } e: [1E: \text{underneath the clouds}[E',E]e][1E: \text{Past}[E] \& \text{therein}[E,e]] \ \text{calm}(e) \\
(127) \quad \text{not}[1E^\prime: \text{underneath the clouds}[E']][1E: \text{Past}[E] \& \text{therein}[E,E']][\exists e: E] \ \text{calm}(e)^14

\(^{12}\) And other variations.

\(^{13}\) The scope effect and contrast between (120)-(121) and (122) derives from a trifle clausal syntax. In (122), absent ‘not’ at the left edge, Few NP raises to a position from which it commands the interpretation of \textit{then&there}. Presumably, if the sentences with few in (108)-(119) are to register as odd, this movement is obligatory. In (120)-(121), the presence of ‘not’ at the left-edge allows ‘many NP’ to remain \textit{in situ}, where it can be sensibly interpreted.

\(^{14}\) Treating \textit{not} as a distributive event quantifier as in (126) deprives \textit{ever} of its existential force, which may be grounds enough to favor the structure in (127).

Note that Subject-Auxiliary Inversion is obligatory for \textit{not} to include within its scope the entire sentence (Liberman 1974). Otherwise, it is interpreted internal to an adverbial phrase:

(i) * Not underneath the clouds it was ever calm/still/silent.
(ii) * Not underneath the clouds it ever calmed (down)/became still/fell silent.
(iii) * Not underneath the clouds there was ever a calm/stillness/silence.

(iv) Not underneath the clouds, it was calm/still/silent.
(v) Not underneath the clouds, it calmed (down)/became still/fell silent.
(vi) Not underneath the clouds, there was a calm/stillness/silence.
2. **Negation and polyadicity.**

Impersonal constructions present at a minimum the logical apparatus that must be present in any clause that contains both negation and quantification over times or places, an apparatus that remains in place in sentences elaborated beyond impersonal constructions. Given the density of space and time, there is no escape from the question of what times, places, or events or states *then* and *there* are to count for current notice:

128. The mirrors weren’t smooth.
129. The mirrors’ glass wasn’t smooth.

When and where must there be an absence of smoothness and a flaw present? As with the clouds, given a scatter of mirrors referred to without a shared frame of reference for them in mind, what counts for current notice is at least as numerous as the mirrors themselves, including those spatiotemporal regions, events or states each of which is coincident with a mirror for the period at issue if not for its lifetime. If so, (128) and (129) are true only if each mirror is flawed. As with the sentences about clouds, (128) and (129) are indeed so understood uttered out of the blue. Note that this holds of (129) despite reference to the glass *en masse*. For it to be otherwise, one would have to imagine that the glass is somehow organized, arranged or divided among spatiotemporal regions, events or states individuated by an implicit standard that does not coincide with the mirrors—which would be what, given what little is known other than that there were the mirrors? In contrast, suppose that it is known that the mirrors referred to are the mosaic components of a large, mountaintop reflector telescope. All of a sudden made salient is a single spatiotemporal region, event or state, coincident with the entire surface of the reflector and perhaps now the only one worthy of current notice. Then, it suffices for the truth of (128) and (129) that any flaw anywhere disturb its parabolic perfection and disrupt the perfection of the telescope’s imaging. Correlatively, suppose instead discussion of several such reflector telescopes scattered among the world’s mountaintop observatories:

130. The telescopes’ mirrors weren’t smooth.
131. The telescopes’ mirrors’ glass wasn’t smooth.

Then, (128)-(131) are true semidistributively—like the above about clouds in clusters—only if each telescope has a flaw. Such examples are freely multiplied. What is to be understood about defective rivets at large and out of the box in the attribution of a causal disposition toward catastrophe, except that each rivet suffers from it?

132. The defective rivets are not safe.
133. The defective rivets are not a safe risk.

Unless they are saliently located in the same bridge,

134. The defective rivets in the George Washington Bridge are not safe.
135. The defective rivets in the George Washington Bridge are not a safe risk.
in which case it suffices that the risk is in their number, while fewer of them might not have put the public at risk. Yet, again, semidistributively, (136)-(137) entail that the spatiotemporal regions that the bridges define are each not one of safety:

(136) The defective rivets in the city’s bridges are not safe.
(137) The defective rivets in the city’s bridges are not a safe risk.

Sometimes, reference out-of-the-blue comes with some self-organizing principle that excuses one from reference to spatiotemporal regions, events or states as numerous as what is referred to:

(138) The days of your life are not over.
(139) The best days of your life are not over.

The truth of (138) does not require it to be addressed only to the unborn and newborn, nor must (139) be addressed to only those who have not seen past glories. Yet, again, semidistributively, (140) is infelicitous if members of the audience have died of boredom prior to its utterance, nor is (141) true if several in the audience had peaked in high school.

(140) The days of your lives are not over.
(141) The best days of your lives are not over.

Also, again as in (93)-(101), the description of what isn’t may itself cue what out there and then is an event of current notice (examples adapted from Breheny 2005, v. (93)-(101)):

(142) The mirrors weren’t smooth after polishing.
(143) The mirrors’ glass wasn’t smooth after polishing.

(144) The defective rivets were not safe by the mandated deadline.

The meaning of (142)-(143) is contingent on the number of polishings. It suffices that each such polishing left behind some defects in the lot, without implying defect in every mirror. Similarly, it suffices for (144) that there remained only as many defective rivets as there were deadlines. In referring to a single city contract to repair all the defective rivets in the city’s bridges, (144) reports merely a breach of that contract.15

15 Breheny (2005) remarks that (i) can be understood to deny that John did any walking toward the store, rather than to deny only the final destination. Similarly, (ii) can be understood to deny that John read any of the book rather than to deny only its completion:

(i) John didn’t walk to the store.
(ii) John didn’t read the book.

The judgments are somewhat obscure but not uncongenial to my point of view. Anything that qualifies the event description may affect event segmentation. Perfective verbal morphology, spoken or not, would construe a singular completed event, the walk to the store or the book read, the denial of which denies its completion. Imperfective morphology derives a nonsortal description of events true of any amount of
In parsing the density then and there into the regions, events or states intended for current notice, one accepts navigational guidance from whatever landmarks are mentioned—clouds, mirrors, glass, telescopes, rivets, bridges, days, lives, etc. If logical form is to host the pas de deux between negation and quantification over times, places, events or states, and if it is to generalize beyond impersonal constructions, it must—pity—take on the commitment to Davidsonian analysis already on display in (78)-(79) to represent the difference in meaning between pre- and post-verbal subjects:

(145) [The: X: mirrors[X]] [hE': Theme[E',X]]

The Davidsonian logical form in (145) is important to (128) in two respects. First, if the mirrors are scattered among several spatiotemporal regions, events or states—as in the condition where they are on their own or belong to several telescopes—each of which is said not to be a smoothness, it had better be that the description of such a smoothness not imply the presence and participation of all the mirrors X at the singular smoothness e:

(146) a. * [The: X: mirrors[X]]… ¬[∃e: Ee] (smooth(e) & Theme(e,X))
   b. * [The: X: mirrors[X]]… ¬[∃e: Ee] (smooth(e,X))

Even if the mirrors and the several telescopes were all perfect and (128) therefore false, a logical form including (146) would be vacuously true in that no one mirror and no one telescope is itself a smoothness of all the mirrors. The parallel applies to the interpretation of the frame adverbial underneath the clouds in contexts where the clouds are scattered. Once underneath the clouds frames the spatiotemporal E then&there in (91) it quits the description of the e therein, as obviously whatever calm or lack thereof is found in any one such e cannot be underneath the entire cloud scatter. So too is it that the participation of the mirrors as Themes in (145) describes the E' and not any e in the logical form for (128), just another poster child for thematic separation (Schein op cit., Lohndal 2014, Williams 2015). Corroborating thematic separation and its interaction with the logical syntax of negation—the pas de deux—is the asymmetry of identity statements (Schein 2012, forthcoming):

(147) Venus wasn’t Hesperus the winter of 1892.
(148) Venus wasn’t the evening star the winter of 1892.

(149) #Hesperus wasn’t Venus the winter of 1892.
(150) #The evening star wasn’t Venus the winter of 1892.

Hesperus, the evening star, and Phosphorus, the morning star, are alternating appearances of Venus, the omnipresent planet. That is, within Venus’ presence, there was walking in walking to the store or any amount of reading in reading the book. If so, Breheny (2005) reports understanding the sentences as if marked imperfective.
not an event or state of being Hesperus, the evening star, the winter of 1892. But, it is incoherent that within Hesperus’, the evening star’s appearance, there was not an event or state of being Venus the winter of 1892.

The second respect in which Davidsonian logical form matters for the meaning of (128) and the like is in the robustness of its monadic concepts translating verbs and other predicates, ‘calm(e)’, ‘burn(e)’, ‘smooth(e)’, ‘safe(e)’, ‘over(e)’, which denote what they denote independently of what else is related to the e denoted—a point engrained in the impersonal constructions and in those languages more liberal in their use. Thus, it is that the surface of a telescope’s parabolic reflector is judged a smoothness or not independent of any cognizance of the number or shapes of its component mirrors, as seamless as it may be. Most telling of this autonomous denotation is where the component mirrors have been manufactured to perfection, but their installation is misaligned at some seams. Then, again (128) is true. Although the mirrors are each a perfect smoothness, the smoothness of current notice that coincides with the reflector’s surface isn’t. A more down-to-earth example of the same—my complaint in (151) to the contractor and demand to redo it is not a comment on the quality or manufacture of any of the tiles:

(151) The bathroom tiles are not smooth.
      The bathroom tiles are not flat.

The same univocal, monadic concept, ‘smooth(e)’ or ‘flat(e)’, is tokened throughout invoking the same geometry of surfaces. It would be fair paraphrase of (128) or (151) in this context to have said instead that:

(152) The mirrors are in such a state that there is not a telescope-sized smoothness.
      The mirrors are where there is not a telescope-sized smoothness.
      The mirrors are not a telescope-sized smoothness.

(153) The bathroom tiles are in such a state that there is not a bathroom-sized flatness.
      The bathroom tiles are where there is not a bathroom-sized flatness.
      The bathroom tiles are not a bathroom-sized flatness.

In the semidistributive context:

(154) The mirrors are not telescope-sized smoothnesses.

In the out-of-the-blue, fully distributive context:

(155) The mirrors are not mirror-sized smoothnesses.

When telescope refractors or bathroom walls are the surfaces of current notice, note that the smoothness of every mirror or bathroom tile is not sufficient for (156) nor is a flaw in any mirror or bathroom tile necessary for (157):

(156) The mirrors are smooth.
      The bathroom tiles are smooth.

(157) The mirrors are not smooth.
      The bathroom tiles are not flat.

When telescope refractors or bathroom walls are the surfaces of current notice, note that the smoothness of every mirror or bathroom tile is not sufficient for (156) nor is a flaw in any mirror or bathroom tile necessary for (157):
The mirrors are not smooth.
The bathroom tiles are not smooth.

Yoon (1996) and Krifka (1996) discuss dual contexts for (158) and (159):

(158) a.  The doors are open.
    b.  The doors are not closed.

(159) a.  The doors are not open.
    b.  The doors are closed.

In the first, concentric chambers guard a vault that requires for entry passage through a series of doors. In the second a courtyard is defended by a single-walled perimeter, which may be breached at any of its doors. For (158), all the doors to the vault must be open, but it suffices that any door to the courtyard is. For (159), the doors to the courtyard must all be closed; but, it suffices that any door to the vault is. There is no equivocation in understanding these sentences in these contexts. The very same univocal concept ‘open(e)’, or ‘closed(e)’, is in play throughout. There is an opening at vault or courtyard just in case there is a breach, a way from outside in, with implications for the doors contingent on the geometry of their arrangement, as in “Through the doors, there is an opening.” In these authors’ discussion, the logical form entertained is not more than ‘open(D)’ and ‘not open(D)’, and there is no fixed meaning to open that entails that the vault’s doors must all be open and yet only some of the courtyard’s need be, rather than the exact reverse. The examples of a tiled surface—telescope refractor or bathroom—exacerbate the representational dead end. As just noted in (156)-(157), its smoothness is not reducible to the smoothness of its components, whether all or any (or a fraction thereof). Worse yet is the semidistributive context, with several refractors or bathrooms, in which ‘not smooth(M)’ is to prompt the understanding that at each telescope, its mirrors are not a smoothness, while allowing that each mirror might itself be one.

3.  **Trans-frame-of-reference reference: definite description in the scope of negation.**

With no change in the weather from (88)-(90), the expected air turbulence given the cloud scatter is the same for (160)-(162), except that the turbulence may be above or to the side as well as underneath:

(160) Around the clouds, it wasn’t calm/still/silent.
(161) Around the clouds, it didn’t calm (down)/become still/fall silent.
(162) Around the clouds, there wasn’t (a) calm/stillness/silence.

As far as I can tell, weather identical to (88)-(90) is in turn described if (160)-(162) is elaborated:

(163) Around the clouds, it wasn’t calm/still/silent underneath.
(164) Around the clouds, it didn’t calm (down)/become still/fall silent underneath.
(165) Around the clouds, there wasn’t (a) calm/stillness/silence underneath.
(166) Around the clouds, it wasn’t calm/still/silent underneath them.
(167) Around the clouds, it didn’t calm (down)/become still/fall silent underneath them.
(168) Around the clouds, there wasn’t (a) calm/stillness/silence underneath them.

There is again no change in the weather if a preverbal subject displaces the impersonal construction altogether:

(169) The clouds weren’t calm/still/silent underneath (them).
(170) The clouds didn’t calm (down)/become still/fall silent underneath (them).
(171) The clouds weren’t (a) calm/stillness/silence underneath (them).

The remarks that follow rest on the frame adverbial construction in (163)-(168) and extend with scant amendment to (169)-(171) if an unspoken thematic relation, e.g., ‘Theme’, replaces around as it does in the Davidsonian logical forms above with thematic separation. The frame adverbials in (163)-(171) describe the events \( E \) then&there wherein there was not an \( e \) the description of which now includes underneath. The null or overt pronoun—underneath pro; or underneath them— is anaphoric to the clouds without referring to the clouds of Southern New England. It refers to the clouds of Southern New England at \( e \):

\[
\begin{align*}
(172) & \, [i:E': \text{around the clouds}[E]] \land [i:E: \text{Past}[E] \land \text{therein}[E, E']] \\
& \quad \land \neg [\exists e: \text{calm}(e) \land [i: \text{clouds}[i] \land \text{there}[e, i]] \text{under}(e, i)] \\
\text{Or,} \\
(173) & \, \lnot [\exists e: \text{calm}(e) \land [i: \text{clouds}[i] \land \text{there}[e, i]] \text{under}(e, i)] \end{align*}
\]

Or,

\[
\begin{align*}
(174) & \, \lnot [\text{calm}(e) \land [\forall y: \text{clouds}[y] \land \text{there}[e, y]] \text{under}(e, y)] \\
\text{It would be self-defeating to have the clouds of Southern New England frame the weather across Southern New England and then to demand the presence of them all at each local weather event therein. Consonant with the suggestion that negation is in effect a modal operator quantifying over those times, places, events or states \( e \) noticeable then&there, it is unsurprising to relativize the definite descriptions within its scope to the parameter \( e \). This is a remark about definite descriptions rather than anaphoric pronouns in particular:} \\
(175) & \, \text{It wasn’t calm/still/silent underneath the clouds of Southern New England.} \\
(176) & \, \text{It didn’t calm (down)/become still/fall silent underneath the clouds of Southern New England.} \\
(177) & \, \text{There wasn’t (a) calm/stillness/silence underneath the clouds of Southern New England.} \\
\text{Again no change in the weather. The experience then&there that the speaker has in mind for her report segments that experience into those events not a one of which was a calm undisturbed by some air turbulence. If a pilot has in mind a flight across Southern New} \\
\end{align*}
\]
England and the clouds are scattered among intermittent clusters and each event therein is a transit beneath a cluster—the semidistributive condition—it suffices for (174)-(175) that there be some turbulence in the airspace beneath the cluster, without turbulence under every one of its clouds:

\[
(177) \ [\exists E': \text{then&there}(E')][\exists E: \text{Past}[E] \& \text{therein}[E,E']]
\]
\[
[\exists X: \text{clouds of SNE}[X] \& \text{there}[E,X]]
\]
\[
\neg[\exists e: E e](\text{calm}(e) \& [\forall y: I y]Xy \& \text{there}[e,Y]) \under(e,Y)
\]

If all DPs are addressed to a frame of reference (Schein forthcoming), or if, at least, incomplete definite descriptions are completed that way—the clouds of Southern New England there—and this parameter is locally bound, then the definite description in (176) is exported somewhere outside the scope of negation, in order to refer to the clouds across the entire frame of reference for the flight across Southern New England rather than those on location at any one event \(e\), as in (177) and (178):

\[
(178) \ [\exists X: \text{clouds of SNE}[X] \& \text{there}[E,X]] \ldots
\]
\[
\neg[\exists e: E e](\ldots[\forall y: I y]Xy \& \text{there}[e,Y]) \ldots)
\]

\[
(179) \ast \ldots[\exists X: \text{clouds of SNE}[X] \& \text{there}[E,X]] \ldots \neg[\exists e: E e](\ldots X \ldots)
\]

That is, Quantifier Raising leaves behind not a bare variable ‘\(X\)’ ((179)) but a full-blooded definite description, relativized to the local \(e\), “those \(X\) that are at \(e\)” (178). The same is to be said about indefinite descriptions:

(180) It wasn’t calm/still/silent underneath 6130 clouds across the Southern New England sky.

(181) It didn’t calm (down)/become still/fall silent underneath 6130 clouds across the Southern New England sky.

(182) There wasn’t (a) calm/stillness/silence underneath 6130 clouds across the Southern New England sky.

(183) \[
[\exists E': \text{then&there}(E')][\exists E: \text{Past}[E] \& \text{therein}[E,E']]
\]
\[
[\exists X: \text{6130}[X] \& \text{clouds of SNE}[X] \& \text{there}[E,X]]
\]
\[
\neg[\exists e: E e](\text{calm}(e) \& [\forall y: I y]Xy \& \text{there}[e,Y]) \under(e,Y)
\]

\[\text{16} \]

Magri (2013) notes that plural morphemes, just like the definite article \(the\), seem to lose their force when they occur in the scope of negation and urges a common treatment. Let it be remarked that like definite description, the conditions for plural reference that the plural morpheme expresses, whether arithmetic or about countability, are contingent for their satisfaction on a scene or frame of reference (Schein 2012: 289f; forthcoming: Chapter 1 §6.3, Chapter 4 §§0.2.1, 1, 1.4.2, 3.1, 4.). Counting one or two greens is dependent on the scene in (i) being narrow or wide and the resulting presentation of what is green:

(\[\text{i}])
3.1. **Quantifying into plural attitudes.** This usage is attested elsewhere, where the cumulative reference of the (in)definite description across several local ε is uncontroversial. Suppose a federal investigation of underage gambling has launched several operations that over the course of the investigation flood the targeted casinos scattered across several states with undercover underage gamblers so that during the surveillance, the only casino patrons are the undercover agents. The casinos all neglect to check IDs and thus never know and never discover that any of their patrons are underage gamblers. Suppose also that the $100 admission price includes $95 in casino chips for games with a minimum stake of $10 at which there is always a winner, and casino admission also includes a lottery ticket for a $100,000 jackpot drawing a number that often does not draw a winner. Every patron who enters a casino exits a loser or winner of at least $5. The casino operators seclude themselves in offices without the means to observe the patrons or the gaming floor, a task left to security. They thus entertain no singular thoughts about the patrons, only the general thoughts that:

(ii) Two greens flank white.
(iii) * Two greens surround white.
(iv) One green surrounds white.

If so, for the plural reference of *towering storm clouds* in (v)-(vii) to be intended and recognized as such in the speaker’s global frame of reference, at least the NP is exported as in (viii):

(v) It wasn’t calm/still/silent underneath towering storm clouds.
(vi) It didn’t calm (down)/become still/fall silent underneath towering storm clouds.
(vii) There wasn’t (a) calm/stillness/silence underneath towering storm clouds.

(viii) ... [NP: towering storm clouds](X) & there[E, X]... ¬[∃e: Ee]... [∃F: [∀y: Fy]Xy & there[e, F]]...

As what remains within the scope of negation in (viii) contains no plural morphology, (v)-(vii), in contrast to (ix)-(xi), deny the calm underneath the individual cloud:

(ix) It wasn’t calm/still/silent underneath (at least) two (or more) towering storm clouds.
(x) It didn’t calm (down)/become still/fall silent underneath (at least) two (or more) towering storm clouds.
(xi) There wasn’t (a) calm/stillness/silence underneath (at least) two (or more) towering storm clouds.

Note, importantly, that in understanding these sentences, what counts as countable towering storm clouds and their count is fixed for the framing condition *then&there* and is consistent across the Southern New England sky. It may very well be that from the local perspective and resolution scaled to the individual event *en route*, the single cloud resolves into several, so that the sum of clouds so enumerated and counted *en route* differs and is greater than the clouds that the global frame of reference resolves and counts. But, if it is understood that the clouds are just so many from the global perspective, why should they, zooming in to any given location, still be that many there too, reasoning as above in the text? Suppose it is made explicit that the meteorological conditions were so stormy that whether or not there is unbroken cloud cover or this or that number of clouds is a swirl in constant flux. The conditions satisfying plural morphology are satisfied only at the moment if at all, and it seems then that (v)-(vii) only make claims about when they are satisfied, when clouds—plural—are in plain sight. The meaning of plural morphology itself is also dependent on scope to fix its parameter for a frame of reference.
a. The patrons with the winning lottery number will share the $100,000 jackpot.

b. Whatever patrons there are if any who hold the winning lottery number will share the $100,000 jackpot.

The patrons (tonight) must some of them win and some of them lose.

Note that (185) is true only if the definite description is understood to describe all the session’s patrons, as any fewer risks omitting the session’s only winners. Anyone with knowledge of the federal investigation can endorse the following attitude reports (after Bricker 1989) that quantify a plural NP into a descriptive definite description in the attribution of general thoughts to the casino operators, in which the plural NP is not itself a component de dicto of the attributed thoughts:

The casino operators knew that the underage gamblers with the winning lottery number will share the $100,000 jackpot.

The casino operators knew that the undercover agents (then in the casino) must some of them win and some of them lose.

To underline that the plural NP is cumulative across the casinos, suppose that the total federal budget for the undercover agents was $613,000:

The casino operators knew that the undercover agents paid $613,000 who hold the winning lottery number will share the $100,000 jackpot.

The casino operators knew that the undercover agents paid $613,000 then in the casino must some of them win and some of them lose.

These sentences are paraphrased:

Those underage gamblers that the feds sent in— the casino operators knew that those with the winning lottery number will share the $100,000 jackpot.

The undercover agents— the casino operators knew that those then in the casino must some of them win and some of them lose.

The undercover agents paid $613,000— the casino operators knew that those who hold the winning lottery number will share the $100,000 jackpot.

The undercover agents paid $613,000— the casino operators knew that those then in the casino must some of them win and some of them lose.

Given what little the casino operators know or think about the patrons in their casinos, the thought attributed to them must include a descriptive definite description quantified into, as paraphrased. The casino operators’ descriptive thought—“patrons” (whoever they may be) in (184)-(185)— is supplemented and replaced in the attitude reports with the reporter’s knowledge of who the patrons are unknown to the casino operators:
crime or of cons
Suppose Biblical law demands sworn testimony from (at least) two eyewitnesses for conviction of a capital

17

17 In fact, the logical resources for trans-frame-of-reference reference argued for in the text strictly enlarge the expressive power of the logical language, which as the following example shows must be able to overcome relativization to the local event e to convey the usual meaning of quantifying-in de re.

Suppose Biblical law demands sworn testimony from (at least) two eyewitnesses for conviction of a capital crime or of conspiracy to commit one:

(i) Two eyewitnesses testified in succession that (the) twelve spies from the House of David conspired against Saul, resulting in the grand jury’s indictment.

(ii) \[
\# \left[ E' \colon \text{then}\&\text{there}(E') \right] \left[ E \colon \text{Past}[E] \& \text{therein}[E,E'] \right] \\
\exists X \colon \text{undercover agents paid } 613,000[X] \& \text{there}[E,X] \\
\text{The casino operators knew}[E] \& \left[ \forall e \colon E[e] \text{ knew}(e) \right] \text{ that} \\
\left[ 1 \colon \left[ \forall y \colon I[y] \exists y \& \text{with the winning number}[e,y] \right] \text{ Y will share}(e) \text{ the } 100,000. \right]
\]

(iii) \[
\left[ E' \colon \text{then}\&\text{there}(E') \right] \left[ E \colon \text{Past}[E] \& \text{therein}[E,E'] \right] \\
\exists X \colon 12[X] \& \text{spies from the House of David}[X] \& \text{there}[E,X] \\
\text{Two eyewitnesses testified}[E] \& \left[ \forall e \colon E[e] \text{ testified}(e) \right] \text{ that} \\
\left[ 1 \colon \left[ \forall y \colon I[y] \exists y \& \text{there}[e,y] \right] \text{ Y conspired against Saul.} \right]
\]
A detail of syntax in the contrast between (196) and (197) corroborates the analysis:

(196) The casino operators knew that the members of a crime family of 613 that held the winning number would share the $100,000 jackpot.

(197) The casino operators knew that the 613 members of a crime family that held the winning number would share the $100,000 jackpot.

Sentence (196), as above, allows that the crime family is scattered across the casinos and the casinos unaware of its gamblers’ criminal background. In contrast, (197) implies that those at the individual casino holding the winning number are themselves 613, which comports with the observation (Schein 2006: §29.2.2; Schein 2015) that pre-nominal cardinals in definite descriptions are, in fact, appositive modifiers—*the members of a crime family that held the winning number, who were 613*. In the scope of negation, it has also been observed (Breheny 2005, Spector 2013) that a prenominal cardinal suffices to disrupt the implication of air turbulence underneath every cloud, even in the fully distributive condition where 20 nautical miles separate every cloud from every other, in what could be equinumerous events *then* & *there*:

(198) It wasn’t calm/still/silent underneath the 6130 clouds across the Southern New England sky.
(199) It didn’t calm (down)/become still/fall silent underneath the 6130 clouds across the Southern New England sky.
(200) There wasn’t (a) calm/stillness/silence underneath the 6130 clouds across the Southern New England sky.

It suffices for (198)-(200) that the pilot encounter air turbulence somewhere on the flight path. Now, if the unspoken relativization to local $e$ is literally something along the lines of “the 6130 clouds across the Southern New England sky *that are here at $e$*, then, as in (197),

| It does the prosecution no service if one eyewitness testified against six of the spies and the other eyewitness against the other six, as (ii) allows. The reporter intends it to be understood that each testimony was against all twelve, as in (iii). |

As far as the logical syntax is concerned, it seems that there is a formal ambiguity in what the exportation of an (in)definite description may leave behind: either ‘$[ι Y: Y = X & there[e, Y]]$’ as argued for above or ‘$[ι Y: Y = X & there[e, Y]]$’ as in (iii), which, equivalent in effect to a bare variable ‘$X$’, effectively nullifies relativization to the local event $e$. The ambiguity is resolved subject to the following considerations. Note that in the attitude reports, the exported (in)definite descriptions, *the undercover agents paid $613K* and *twelve spies from the House of David*, play no role in the individuation or segmentation of the thoughts or testimony, the frames of reference they quantify into. These are individuated by casino operator or eyewitness. If one is unaware of the formal ambiguity in understanding these sentences, some practical reasoning has intervened: why would one casino operator be held to know anything about who is gambling at other casinos beyond his ken, and what would be the point of two eyewitness reports that were not of the same suspects? In the weather sentences, uttered out-of-the-blue, *the clouds of Southern New England frame the global E* and individuate the events or states therein. It defies what is known about spatiotemporal perception itself to imagine that the landmarks delimiting a frame of reference $E$ could then all be located at a small location $e$ within it.
it is implied that the 6130 are at every $e$. This is absurd (again, the non-local squeezed local) unless the speaker intends that what is then&there be parsed despite the cloud scatter as a single event $e$, the entire flight itself. If so understood, it indeed suffices for (198)-(200) that some air turbulence disturb this single event $e$ anywhere along it. This anomaly about cardinals in definite descriptions in the scope of negation is a spin-off of the internal syntax of definite descriptions and their implicit relativization to a frame of reference parameter.\textsuperscript{18}

It cannot be overestimated, the ease and glibness with which global definite descriptions accommodate the local frame of reference:

(201) The medieval dioceses married the peasants in the dioceses in the local parish church.

\textsuperscript{18} For the contrast between (196) and (197) to be derived as explained in the text, the derivation of logical form must be revised. It is not, as first presented in the text, that Quantifier Raising displaces the entire DP definite description, which in turn quantifies into a silent definite description left behind in situ (v. (178)):

(i) $\ldots [\text{DP}\ X : \text{members of crime family}[X] \ & \text{there}[E, X] \ldots$
\hspace{1cm} $\ldots [\forall y : (I_y X_y \ & \text{there}[e, I]) \ldots ]$

Were it so, it isn’t clear why QR wouldn’t take along with it all the definite descriptions modifiers, appositive or not. Rather, it is another instance of quantifying in NP, into a structure in which the prenominal and appositive modifiers are peripheral to the NP and thus remain in situ with the effect on meaning noted in the text:

(ii) $\ldots [\text{NP} \ 1X : \text{members of crime family}[X] \ & \text{there}[E, X] \ldots$
\hspace{1cm} $\ldots [\text{DP}\ X : 613(I) \ & \text{there}[e, I]) \ldots ]$

Note that (iii), with an indefinite description, does not imply that each casino operator knew about 613:

(iii) The casino operators knew that 613 members of a crime family that held the winning number would share the $100,000 jackpot.

And, correlatively, (iv)-(vi), do imply, distributively (v. Breheny 2005), that there was turbulence beneath the clouds in each event of passing underneath, as numerous as 6130 when the clouds are separated at a long distance:

(iv) It wasn’t calm/still/silent underneath 6130 clouds across the Southern New England sky.
(v) It didn’t calm (down)/become still/fall silent underneath 6130 clouds across the Southern New England sky.
(vi) There wasn’t (a) calm/stillness/silence underneath 6130 clouds across the Southern New England sky.

It must be that the prenominal cardinal in an indefinite is not in appositive position and is not eligible to remain in situ:

(vii) $\ldots [\exists X : 613(X) \ & \text{members of crime family}[X] \ & \text{there}[E, X] \ldots$
\hspace{1cm} $\ldots [\forall y : (I_y X_y \ & \text{there}[e, I]) \ldots ]$
Sentence (201) obviously reports plural events $E$, marriages, not all in the same one church, but rather each of which is in the local parish:$^{19}$

(202) \(\ldots \& [\forall e: Ee][\text{The } x: \text{local}(e, x) \& \text{church}(x)] \text{ in}(e, x)\ldots \)

(203) The medieval dioceses married the peasants in the dioceses in their local parish church.

Whether the antecedent for their is the medieval dioceses or the peasants in the dioceses, there isn’t the thought that the local parish church is local for all the dioceses or all the peasants:

(204) \(\ldots \& [\exists X: \text{their}(X)] [\forall e: Ee] \text{ in}(e, x)\ldots \)

It suffices for (204) that the one church hosting a marriage is local to its diocese or to the parishioners then and therein married. As above, if the nobles in the dioceses is definite reference in the framing $E$ spread across the ages and Christendom, quantifying into the scope of negation and its description of the local $e$ restricts reference accordingly when denying that any a noble marriage is in the local parish:

(205) The medieval dioceses did not marry the nobles in the dioceses in their local parish church.

(206) \(\exists E': \text{then}&\text{there}(E')][\forall e: Ee] \text{ in}(e, x)\ldots \)

Of course, quantifying into the scope of negation does not preclude that the definite description itself falls within the scope of quantification quantifying into it:

(207) Every medieval diocese did not marry its nobles in their local parish church.

(208) \(\exists E': \text{then}&\text{there}(E')][\forall e: Ee] \text{ in}(e, x)\ldots \)

In support of the proposal, the argument has strayed into casinos and the medieval Church in search of precedents elsewhere in natural language. The polemical exercise should not obscure a very general warrant. I pilot several hours one summer afternoon from Lawrence Municipal Airport to Westchester County Airport, logging my visual

\[19\text{ There is }\text{ little to the Davidsonian design unless its foundation is plural quantification over events (Schein 1993: 107ff, 126ff; Schein 2002 §1.2).}\]
observation of the weather conditions *en route*. In the pilot’s lounge, I later review the satellite imagery of the cloud cover for my route, from which I learn much about the cloud scatter and infer that I must have flown underneath all the clouds in the Southern New England sky that afternoon. Out of that mix recalling direct observation *en route*, satellite imagery and inference, I report that:

(209) Underneath the clouds of Southern New England, it was/wasn’t calm.

(210) Around the clouds of Southern New England, it was/wasn’t calm underneath (them).

(211) The clouds of Southern New England were/weren’t calm underneath (them).

(212) It was/ wasn’t calm underneath the clouds of Southern New England.

Given that the scale and perspective of the satellite imagery and the same for my visual observation *en route* are incommensurate, I have no singular *de re* thoughts to correlate cloud in the Southern New England sky with a moment in my flight path and visual observation thereof. I entertain only the general thoughts that whatever of the clouds of Southern New England that were then and there at any given moment of the flight, it was or wasn’t observed to be calm underneath. Describing the framing conditions for my flight, definite reference in a global frame of reference to the clouds of Southern New England joins a point-wise description in the local frame of reference for the flight *en route*, for which the clouds have been waypoints along the way. It is an ordinary epistemic condition to find that one knows of a certain such-and-such that they are the participants scattered across certain events about each of which something can be said, without knowing which of the such-and-such it happens to, except to remark that it happens to those of the such-and-such then there. This is trans-frame-of-reference reference, in which global reference culls its referents across local frames of reference. The syntax and semantics for definite descriptions and Quantifier Raising is designed to provide an economy of expression for reports issued under such epistemic conditions. So much characterizes the sentences (209)-(212) whether or not negation is included. What an essay on negation needs to point out is that given the *pas de deux*, negation—any token of ‘not’— is always occasion for trans-frame-of-reference reference between the frame of reference for the framing conditions $E$ *then&there* and the local frames of reference for the events $e$ that are not *then&there*.

3.2. *Definite description by abstraction trans-frame-of-reference.* Like Quantifier Raising out of attitude reports, abstraction in the formation of definite description also quantifies-in trans-frame-of-reference. The definite descriptions (213) and (215) accumulate their referents from across the attitudes of many. Thus abstraction on ‘$X$’ in the logical forms (214) and (216) relates it to a full definite description relativized to the local event $e$:

(213) the undercover agents (paid $613,000) that/of whom the casino operators knew
   that those who hold the winning lottery number will share the $100,000 jackpot

(214) [tX: undercover agents paid $613,000][X] &

   $\forall E$[The casino operators knew[E] & [$\forall e: Ee$] knew(e) that

   [$tY: [\forall y: Yy]Xy & with the winning number[e,Y] ] Y will share(e) the $100K]]$
(215) the undercover agents (paid $613,000) that/of whom the casino operators knew that those then in the casino must some of them win and some of them lose

(216) \[i X: \text{undercover agents paid $613,000}[X] \&
\exists E: \text{The casino operators knew}[E] \& [\forall e: Ex] \text{knew(e) that}
[1 Y: [\forall y: Yy]Xy \& \text{in the casino}[e,Y]] Y \text{ must}[some Z: Z of } Y \text{ win(e)\ldots.}]]

Casting a net wider than attitude reports, trans-frame-of-reference reference is also plain within the definite descriptions in (217)-(218), which cull handprints from kindergartners and papers from sealed envelopes—rather than from sealed thoughts:

(217) John made a (six-foot) pile out of the papers that the students each turned in in a sealed envelope.
John made a pile out of what(ever) papers each student turned in in a sealed envelope. (Schein 1993: 263)

(218) The kindergarten teacher made a collage for National Brotherhood Week out of the unique handprints that each pupil inked onto a paper doily.

Examples of abstraction trans-frame-of-reference are pervasive, including descriptive anaphora (Schein 1993: 183-193; 206-214; 344£). Suppose farmers feed donkeys one-pound bags of oats as depicted in (219), verifying (220)-(221):

(219) \[
\begin{align*}
d_1 & \quad f_1 < b_1 \quad -10 \text{ min} \\
d_2 & \quad f_1 \quad b_2 \quad -10 \text{ min} \\
d_3 & \quad f_2 < b_3 \quad -10 \text{ min}
\end{align*}
\]

(220) a. Exactly two farmers each fed two donkeys one bag of oats. The oats weighed two pounds, and the donkeys ate for twenty minutes.
b. Exactly two farmers each fed two donkeys one bag of oats. They were two pounds of rolled grain, and they ate for twenty minutes.

(221) a. Exactly two farmers each fed two donkeys one bag of oats, in 20 minutes.
b. Exactly two farmers each fed two donkeys one bag of oats. It took 20 minutes.

Anaphoric reference to the events described by the antecedent sentence and to the farmers, donkeys and oats therein omits the last two, solitary events in (219). The descriptive anaphora in (220)-(221) are examples of trans-frame-of-reference reference that cull donkeys or bags of oats from across events of a farmer each giving two donkeys one bag of oats and from no other events:

(222) \[i \exists Z: \text{bags of oats}[Z] \& [\text{Exactly 2x: farmer(x)}]
\exists e: \text{Agent}(e, x) \& \text{feed}(e) \& [\exists Y: 2 \text{donkeys}[Y] \text{To}(e, Y) \&
[1 W: [\forall z: Wz]Zz \& \text{there}(e, W)\] Theme(e, W))\]
The anaphora in (220)-(221) referring to oats refers to the two bags $b_1$ and $b_3$. Similarly, in interpreting the other descriptive anaphors in (220)-(221), it affords reference to just donkeys $d_1$, $d_2$ and $d_3$ and what they do in just the 20 minutes of the first two events.\footnote{20 Note that more casual descriptions fashioned from antecedent content, e.g., the bags of oats that (the) farmers fed (the) donkeys, the donkeys that (the) farmers fed (the) bags of oats, etc. fail either in being too inclusive, including the oats or donkeys fed anywhere in (219) or too restrictive if understood to require of the individual donkey or bag of oats that it relate to both farmers. The bags of oats each of which a farmer fed two donkeys refers as desired to just $b_1$ and $b_3$, but without a principled derivation of its content from the antecedent sentence. In (193), I defined recursively a semantic relation render, parallel to satisfaction, so that anaphoric reference to the bags of oats refers to the bags of oats $\exists z$ in (219) that render ‘Exactly two farmers each fed two donkeys one bag of oats($z$)’.

Describing the weather again, abstraction trans-frame-of-reference in (223) culls reference to times or places across Southern New England. But, these definite descriptions are further subject to all that has been said in §1.1 about how the variable arrangement of the clouds frames the segmentation of the times or places referred to:

\begin{enumerate}
\item the times/places it wasn’t calm underneath the clouds of Southern New England.
\item the times/places underneath the clouds of Southern New England it wasn’t calm.
\item the times/places the clouds of Southern New England weren’t calm underneath.
\end{enumerate}


As pervasive as trans-frame-of-reference reference may be, I will continue to accept guidance for its syntax and semantics from its uncontroversial instances, quantifying into attitude reports and across the attitudes of scattered casino operators. If Quantifier Raising and abstraction in definite descriptions, as argued, leave behind a full-blooded definite description, relativized to the local $e$, “those $X$ that are at $e’$, the syntax and semantics of Quantifier Raising and definite description themselves face revision.

Surely all the sentences about casinos are false, if a plural de re (in)definite description refers to 613, undercover agents or crime family members, and yet only a tenth of them present themselves at the casinos, the others engaged in investigations or criminal activity elsewhere. Yet, the logical forms (194)-(195) and the like are true in that those among the 613 at each casino did as reported, although amounting to only a tenth of those allegedly involved. The logical forms are too weak as written to imply that the in-gathering of undercover agents or criminals from across the local frames of reference amounts to the 613 or those paid $613,000 referred to in the global frame of reference. This worry also concerns the logical form of definite descriptions that effect trans-frame-of-reference reference, accumulating their referents from across the attitudes of many. The logical forms for (213)-(215) alleged in (214)-(216) in fact fail as such. They still refer to the undercover agents paid $613,000 even if only a tenth of them were at the casinos:\footnote{21 Definite description defined as in (236) (Sharvy 1980).}
The failure of (214)-(216) is catastrophic, which is obscured with specific undercover agents in mind. If it turns out that certain agents were indeed those about whom the casino operators entertained their general thoughts about patrons, surely the definite descriptions in (224)-(225) refer to the same as do (213)-(215):

(224) whoever/those of whom/the patrons that the casino operators knew that those who hold the winning lottery number will share the $100,000 jackpot
(225) whoever/those of whom/the patrons that the casino operators knew that those then in the casino must some of them win and some of them lose.

Omitting mention of the agents in (226)-(227) results rather in reference to all there is, as these agents are indeed those among all there is who are the subjects of the casino operators’ attitudes:

(226) \[\text{The casino operators knew}[E] \& [\forall e: E e] \text{ knew}(e) \text{ that } [1Y: [\forall y: 1y] Xy \& with the winning number}[e, Y]] \text{ Y will share}(e) \text{ the $100K}]
(227) \[\text{The casino operators knew}[E] \& [\forall e: E e] \text{ knew}(e) \text{ that } [1Y: [\forall y: 1y] Xy \& in the casino}[e, Y]] \text{ Y must } [\text{some } Z: Z \text{ of } Y] \text{ Z win}(e)\ldots.\]

Trans-frame-of-reference reference cannot be denied—the conclusion of §3—when quantifying into the attitude reports in (194)-(195) or within the definite descriptions (213)-(215), (217)-(218), (220)-(221) and (223)-(225). Yet, here too all are at risk and must avoid reference to more undercover agents, papers, handprints, oats, donkeys, times or places than those described. Thus some correction is to be made in what has been shown must be the logical form for Quantifier Raising and definite description. An appendix offers one alternative. What follows relies on the syntax and semantics of definite description in Schein 2015, which urges an amendment for an independent reason, in order to join under a common meaning nonsortal and sortal definite descriptions—nonsortal the stained, the stained cotton, the stained part(s) of the sheet and sortal the stained sheet(s). The amendments to definite description are proven in application to the present problem, exploiting an analogy between certain nonsortal definite descriptions and trans-frame-of-reference definite description. Again, what explains a noughty bit of negation draws on resources attested and justified elsewhere.

4.1. Amendment to definite description. Fitted for trans-frame-of-reference reference, Quantifier Raising and natural language definite descriptions exploit an amended definition of the iota-operator that is independently necessary for the semantics of nonsortal definite descriptions (Schein 2015).

Consider a cotton sheet, of which the lower half is saturated in blood and the upper half sterile:
It is stained in virtue of the presence of blood on some of it, and so is anything coincident with all of it:

(229) The sheet (228) is stained.
   The sheet’s fabric is stained.
   The sheet’s area is stained.
   The sheet’s threads are stained.
   The sheet’s thread is stained.

Yet, nonsortal definite descriptions that describe what is stained in (228) without reference to the sheet’s full dimensions shrink their reference to the stain itself:

(230) a. The blood-stained is the lower half of the sheet.
   b. The blood-stained covers only its lower half.
   c. The blood-stained is (a) square.
(231) a. What is stained is half the sheet.
   b. What is stained covers only its lower half.
   c. What is stained is (a) square.
(232) a. The stained area of the sheet is its lower half.
   b. The stained area of the sheet covers only its lower half.
   c. The stained area of the sheet is (a) square.
(233) a. The stained parts of the sheet are its lower half.
   b. The stained parts of the sheet cover only its lower half.
   c. The stained parts of the sheet are (a) square.
(234) a. The stained cotton is the lower half of the sheet.
   b. The stained cotton covers only the sheet’s lower half.
   c. The stained cotton is (a) square.
(235) a. The thread that is stained with blood is the lower half of the sheet.
   b. The thread that is stained with blood covers only its lower half.
   c. The thread that is stained with blood is (a) square.

If anything is stained just in case some of it is, what nonsortal definite description accomplishes is reference to just that which is sine qua non for its stained condition, the stain itself—the witness to the existence of stain. Yet, its interpretation according to Sharvy’s (1980) classic definition derives reference to only the whole of (228). Stained as it is ((229)), it must according to (236) be included in the reference of any of the definite descriptions (230)-(235).
Nonsortal definite description prompts then an amended definition (237)-(238) (Schein 2015), according to which the stained ((230)-(235)) refers to the least of (228) that overlaps any and all of (228) that is stained, i.e., the stain itself:

(237) \( \text{Overlap}[T,X] \leftarrow_{\text{def}} \exists x(Yx \lor Xx) \rightarrow \exists x(Yx & Xx) \)

(238) \( [X: \Phi] \Psi \leftarrow_{\text{def}} [\exists X: \Phi & \forall Y[\Phi[X/Y]] \rightarrow \forall x(Yx \rightarrow Zx)] \rightarrow \forall x(Xx \rightarrow Zx)]]] \Psi^{23} \)

---

22 As in Sharvy (1980), modified so that the \( \tau \)-operator is quantificational rather than term-forming.

23 See Schein 2015 for justification that (237)-(238) is adequate for sortal and nonsortal definite descriptions alike.

Sharvy’s original definition (236) and its amendment (238) agree that reference for the \( \Phi \) be fixed by a universal sampling of what is \( \Phi \) so that:

(i) Anything \( \Phi \) be part of the \( \Phi \text{ } \tau \) (v. (236)); or,

(ii) Anything \( \Phi \) overlap the \( \Phi \text{ } \tau \) (v. (238)).

In a further amendment (Schein 2015), a perspectival turn moves from universal sampling to a universal scan or survey:

(iii) Anywhere there be \( \Phi \), the \( \Phi \text{ } \tau \) overlap the \( \Phi \).

As before, definite reference is to the least such \( \Phi \) overlapping what \( \Phi \) there is in the given spatiotemporal context THERE:

(iv) “The \( \Phi \text{ THERE} \) are

some \( \Phi \text{ THERE: } X \) such that anywhere \( \text{ THERE} \) there be \( \Phi \), the \( \Phi \text{ there overlap } X \), and for any \( \zeta \) that also be such, the \( X \) be \( \zeta \)”

(v) Within\( [V:\alpha] \leftarrow_{\text{def}} \forall W[V \rightarrow \text{within}(V,\alpha)] \)

\[ [X: \text{ there}] \Psi \leftarrow_{\text{def}} \]

\[ [\exists X: \exists a: \text{there}(\alpha)] \Phi \text{ & within}(X, \alpha) \] &

\[ \forall [\alpha] \forall Y[\Phi[X/\zeta] \text{ & within}(\zeta, \alpha)] = \forall [\Phi[X/\zeta] \text{ & within}(\zeta, \alpha)] = Y \rightarrow \text{Overlap}[Y, X] \] &

\[ \forall W[\forall [\alpha] \forall [\Phi[X/\zeta] \text{ & within}(\zeta, \alpha)] = Y \rightarrow \text{Overlap}[Y, W] \rightarrow \forall X(Xx \rightarrow Wx)]]]] \Psi \]

In effect, definite description culls its referents not from a universal quantification over arbitrary samples of \( \Phi \) but only over samples that are all the \( \Phi \) that fill some spatiotemporal region or some region of the perceptual field. Natural language definite description is an act of reference with more to it than strict translation as the iota-operator in (236) or (238) would make it out to be. What is plain in the meaning of this/these and that/those, reference to a space or frame of reference, here with a metric to distinguish proximal and distal reference, is latent in the meaning of the and any other natural language definite description, where reference, like the cognitive act itself, is always perspectival. The further amendment in (v) is immaterial to the discussion in the text except for the important endorsement that reference is always in a frame of reference even if latent.
4.2. The semantics of definite description trans-frame-of-reference. Interpreting (239) in context (219) according to Sharvy’s unamended definite description (236) derives reference to the four bags of oats weighing 4 lbs., contra (240).

\)

\exists e \text{Agent}(e, x) \& \text{feed}(e) \& [\exists Y: 2 \text{donkeys}[Y]] \text{To}(e, Y) \& [\exists W: [\forall z: Wz] z \& \text{there}(e, W)] \text{Theme}(e, W)]

(240) a. Exactly two farmers each fed two donkeys one bag of oats. The oats weighed two pounds, and the donkeys ate for twenty minutes.
b. Exactly two farmers each fed two donkeys one bag of oats. They were two pounds of rolled grain, and they ate for twenty minutes.

(241) a. Exactly two farmers each fed two donkeys one bag of oats, in 20 minutes.
b. Exactly two farmers each fed two donkeys one bag of oats. It took 20 minutes.

Interpreting (239) according to (237)-(238) derives instead the desired reference to the two bags \( b_1 \) and \( b_3 \). Among these two bags of oats are all the oats fed in any event of a farmer feeding two donkeys, and these two bags are the fewest to both include all such oats and to overlap any other of the bags among which are all such oats. That is, the amended definite description affords reference to just the bags of oats that witness the existence condition. Similarly, in interpreting the other descriptive anaphors in (240)-(241), it affords reference to just donkeys \( d_1 \), \( d_2 \) and \( d_3 \) and what they do in just the 20 minutes of the first two events.

The definite descriptions (242)-(243) refer to only those undercover agents about whom the casino operators know something:

(242) those that the casino operators knew that those then in the casino must some of them win and some of them lose
(243) those that the casino operators knew that those who hold the winning lottery number will share the $100,000 jackpot

As desired, the amended meaning of the \( \iota \)-operator cinches reference to just the instantiating undercover agents: 24

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24 N.B. If the natural language definite description in (i) is translated as in (ii), it fails to imply that all those on the $613,000 payroll are involved:

(i) the undercover agents paid $613,000 that the casino operators knew that those then in the casino must some of the win and some of them lose
(ii) \[ \exists X: \text{undercover agents paid \$613,000[X] & \exists Y: \text{The casino operators knew}[Y] \& [\forall e: Ee] \text{ knew}(e) \text{ that} \]

\[ [\exists Y: [\forall y: Yy] Y \& \text{then in the casino}[e, Y]] Y \text{ must } [\exists z: z \text{ of } Y] z \text{ win}(e)\ldots ] \]

(iii) \[ \exists X: \text{undercover agents paid \$613,000[X] &} \]

\[ [\exists Z: [\forall z: zZ] Xz \& \exists E: \text{The casino operators knew}[E] \& [\forall e: Ee] \text{ knew}(e) \text{ that} \]
(244) \[ \exists X: \exists E \{ \text{The casino operators knew}[E] & [\forall e: E e] \text{ knew}(e) \text{ that} \]
\[ \forall Y: \exists X: \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists 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\exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exists \exist...
(251) *(NP-Quantifier Raising)*\(^{26}\) 
\[\Phi \ldots [\forall e: E' \epsilon] \ldots [\exists\exists some/\exists the X: NP] \ldots \Phi \] \Rightarrow  
\[\exists X: NP\]  
\[\exists Z: [\forall Z: \exists Z X Z \& \]  
\[\Phi \ldots [\forall e: E' \epsilon] \ldots [\exists\exists some/\exists the Y: Y Y \exists Y \& \therefore [e, Y] \ldots \ldots \Phi \] \] \(X = Z\)

Note that abstraction on the scope of Quantifier Raising derives a definite description \([1Z: \Phi]\) that refers just like (242)-(243) above to only those undercover agents about whom the casino operators know something:

(252) \([1X: \exists E']\) The casino operators knew \([E] \& [\forall e: E e']\) knew(e) that 
\[\exists Y: [\forall y: Y Y] X y \& \therefore [e, Y] \] \(Y\) will share(e) the $100K]

(253) \([1X: \exists E']\) The casino operators knew \([E] \& [\forall e: E e']\) knew(e) that 
\[\exists Y: [\forall y: Y Y] X y \& \therefore [e, Y] \] \(Y\) must [some \(Z: Z\) of \(Y\) \(Z\) win(e)\ldots\)]

But, note that nothing in the meaning of the abstracted definite description itself says that these include all the agents paid a total of $613,000 rather than some fewer among them. The identity between those that \([1Z: \Phi]\) describes and the undercover agents paid $613,000 is the burden of the clefting structure of Quantifier Raising in (250)-(251). The logical syntax of Quantifier Raising is thus in two parts: abstraction of a definite description over its scope, and an identity between the reference of this definite description and what the raised quantifier quantifies over.

If trans-frame-of-reference quantifying in requires a definite description restricted to the local frame of reference as in (254), the cumulative, global reference to just those culled from the local frames of reference has required some further intervention to exclude spurious referents:

(254) \([\exists e: E e] \ldots [1 Y: [\forall y: Y Y] X y \& \therefore [e, Y] \ldots\) 

It suffices to accept the amended iota-operator (Schein 2015) for spurious referents to be excluded and then to suppose that Quantifier Raising derives a clefting structure—an identity statement one term of which is the amended definite description derived by abstraction on the scope of Quantifier Raising.\(^{27}\)

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\(^{26}\) E. n. 18. Note that the clefting, the introduction of the covert-definite description ‘\([1Z: \ldots]\)’, abstracting over the entire sentence, allows a wide-scope or specific indefinite to leave its determiner *some in situ*, exporting only its NP-restriction, as urged in n. 18.

\(^{27}\) Alternatively, in the Appendix, it is entertained that the intervening clause structure could be counted on to assert as in (i) that those \(Y\) culled at the local frame of reference are culled from those \(X\) who are the participants in the \(E\) of the global frame of reference, from which it is inferred, since these \(X\) are all participants, that each of the \(X\) is among the \(Y\) of at least one \(e\):

\[(i)\] 
\[a. \ [\exists e: E e] \ldots [\exists\exists E, X] \& [1 Y: [\forall y: Y Y] X y \& \therefore [e, Y] \ldots\] 
\[b. \ [\exists e: E e] \ldots [\exists\exists E, X] \& [1 Y: [\forall y: Y Y] X y \& \therefore [e, Y] \ldots\] \] 

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Barry Schein, “Noughty Bits”. 8 May 2015. schein@usc.edu
4.4. **Nonsortal definite descriptions of events.** A definite description is a syntactic domain within which is represented the trans-frame-of-reference reference of the definite descriptions contained within it. This observation developed below is essential to §5, where the trans-frame-of-reference reference of the pronounced definite descriptions betrays the unspoken presence of a definite description of events containing them.

The weather never changing, the nonsortal definite descriptions in (255)-(257) refer to the spatiotemporal region or regions $E$ bereft of calm, frames *within which* there is not a calm, *i.e., within which* there is rather some air turbulence:

(255)  

a. when/where(ever) it wasn’t calm underneath the clouds of Southern New England.

b. when/where(ever) underneath the clouds of Southern New England it wasn’t calm.

c. when/where(ever) the clouds of Southern New England weren’t calm underneath.

(256)  

a. the airspace(s)/air mass(es)/area(s) where it wasn’t calm underneath the clouds of Southern New England.

b. the airspace(s)/air mass(es)/area(s) where underneath the clouds of Southern New England it wasn’t calm.

b. the airspace(s)/air mass(es)/area(s) where the clouds of Southern New England weren’t calm underneath.

(257)  

a. the flight time(s)/duration aloft when it wasn’t calm underneath the clouds of Southern New England.

b. the flight time(s)/duration aloft when underneath the clouds of Southern New England it wasn’t calm.

c. the flight time(s)/duration aloft when the clouds of Southern New England weren’t calm underneath.

Likewise, the nonsortal definite descriptions (258)-(260) refer to the spatiotemporal region(s) where there is calm:

(258)  

a. when/where(ever) it was calm underneath the clouds of Southern New England.

b. when/where(ever) underneath the clouds of Southern New England it was calm.

c. when/where(ever) the clouds of Southern New England were calm underneath.

(259)  

a. the airspace(s)/air mass(es)/area(s) where it was calm underneath the clouds of Southern New England.
b. the airspace(s)/air mass(es)/area(s) where underneath the clouds of Southern New England it was calm.

b. the airspace(s)/air mass(es)/area(s) where the clouds of Southern New England were calm underneath.

(260) a. the flight time(s)/duration aloft when it was calm underneath the clouds of Southern New England.

b. the flight time(s)/duration aloft when underneath the clouds of Southern New England it was calm.

c. the flight time(s)/duration aloft when the clouds of Southern New England were calm underneath.

The definite descriptions (255)-(257) do not refer to the entire flight across Southern New England, despite the scattered turbulence that disturbs its calm, nor do (258)-(260) refer to the entire flight, as the calm was intermittent. In accord with the amended meaning in (238), the definite descriptions (255)-(260) manage instead to cinch reference to just those portions of the flight that witness turbulence or calm accordingly:

(261) \[ \forall E : [\forall E : \text{then} & \text{there}(E')] \forall E' : \text{Past}(E') & \text{there}(E', X) \]
\[ \text{[The } X: \text{clouds of SNE}[X] & \text{there}(E', X)] \]
\[ \neg [\exists e : E_e \text{calm}(e) & [\forall Y : Y_e \text{Xy} & \text{there}[e, Y]] \text{under}(e, Y)] \]

(262) \[ \forall E : [\forall E : \text{then} & \text{there}(E')] \forall E' : \text{Past}(E') & \text{there}(E', X) \]
\[ \forall E' : \text{Past}(E') & \text{there}(E', X)] \]
\[ \neg [\exists e : E_e \& \text{there}(E', X) \text{calm}(e) & [\forall Y : Y_e \text{Xy} & \text{there}[e, Y]] \text{under}(e, Y)] \]

As above, reference to the clouds of Southern New England is reference trans-frame-of-reference, now internal to a definite description that contains mention of both framing \( E \) and framed \( e \). In (261)-(262), the definite description abstracts on the framing \( E \). These logical forms look to resemble the definite descriptions above with the definite article the, suppressing the lexical head nouns, rather than those that begin when/where(ever). In these logical forms, the universal quantification essential to the meaning of definite description is revealed only in its lexical definition as in (236), (238) or (v) in n. 23. Alternatively, the logical form in (263) seems to voice (255) and (258) where a universal distributive quantifier, where(ever)or when(ever), is pronounced and the definite article goes silent:

(263) \[ \forall E : [\forall E : \text{then} & \text{there}(E')] \forall E' : \text{Past}(E') & \text{there}(E', X) \]
\[ \text{[The } X: \text{clouds of SNE}[X] & \text{there}(E', X)] \]
\[ \forall \text{ever} e : [\forall E' : \text{Past}(E') & \text{there}(E', X)] \text{Ee} & \]
\[ \neg (\text{calm}(e) & [\forall Y : Y_e \text{Xy} & \text{there}[e, Y]] \text{under}(e, Y)] \text{Ez} \]

Here too the global definite description the clouds of Southern New England grounded in the frame of reference for the framing \( E \) finds position still inside the definite description and yet peripheral to the description of the framed \( e \), which it quantifies into trans-frame-of-reference. Either way, a representation of the trans-frame-of-reference reference exemplified in (255)-(260) is achieved internally, without extraction of the clouds of Southern
New England, and, either way, the amended definition of the iota-operator cinches reference to just the relevant portion(s) of the flight. One way or another, if there is anything to be said about trans-frame-of-reference reference, then definite description of the so-and-so, the meaning of which must survey anywhere there is so-and-so, is occasion to say whatever is to be said about trans-frame-of-reference reference.

4.5. Event segmentation inside definite description. The amended definite description can be counted on to cinch reference to just those spatiotemporal regions \( E \) bereft of calm in the interpretation of (264)-(273):  

\[
(264) \quad \text{when/where(ever) it wasn’t calm underneath the clouds of Southern New England.}
\]

\[
(265) \quad [\text{\( [E: [E': \text{then\&there}(E')] \)] The } X: \text{SNE clouds}[X] \& \text{there}[E',X]]
\]
\[
[\text{\( [E': \text{Past}[E'] \& \text{there}[E',E'']] \)]
\]
\[
\neg [\exists e: \text{Ee } \& \text{there}[E'',E]](\text{calm}(e) \& [\text{\( [I: [\forall y: Iy],Xy \& \text{there}][e,I]] \) under(e,I)]]
\]

\[
(266) \quad \text{when/where(ever) underneath the clouds of Southern New England it wasn’t calm.}
\]

\[
(267) \quad [\text{\( [E: [E': \text{then\&there}(E')] \)] The } X: \text{SNE clouds}[X] \& \text{there}[E',X]]
\]
\[
[\text{\( [E'': \text{under}[E'',X] \& \text{there}[E'',E'']] \)]
\]
\[
[\text{\( [E'': \text{Past}[E''] \& \text{there}[E'',E'']]] \neg [\exists e: \text{Ee } \& \text{there}[E'',E]](\text{calm}(e) \& [\text{\( [I: [\forall y: Iy],Xy \& \text{there}][e,I]] \) under(e,I)]]
\]

\[
(268) \quad \text{when/where(ever) the clouds of Southern New England weren’t calm underneath.}
\]

\[
(269) \quad [\text{\( [E: [E': \text{then\&there}(E')] \)]}
\]
\[
[\text{\( [\text{\( [E'': \text{Theme}[E'',X] \& \text{there}[E'',E'']] \)]}
\]
\[
[\text{\( [E'': \text{Past}[E''] \& \text{there}[E'',E'']]] \neg [\exists e: \text{Ee } \& \text{there}[E'',E]](\text{calm}(e) \& [\text{\( [I: [\forall y: Iy],Xy \& \text{there}][e,I]] \) under(e,I)]]
\]

\[
(270) \quad \text{the airspace(s)/air mass(es)/area(s) where it wasn’t calm underneath the clouds of Southern New England}
\]

---

28 N.B. In culling those spatiotemporal regions of turbulence or calm from underneath the clouds across the Southern New England sky, nothing in the meaning of (255)-(260) implies that the clouds all participate in such regions. The definite descriptions referring to such spatiotemporal region(s) do not imply that turbulence or calm be found underneath every cloud. Absent, the particular syntax of clefting (\( e. \text{ 0-249} \)), this is what the logical forms (261)-(265) deliver.

29 For reasons of space, I omit the alternative logical forms modeled on (263).

30 N.B. The logical forms (265),(267),(269) and (275) all illustrate a definite description grounded in the global frame of reference then\&there migrating to peripheral position outside the scope of the local frame of reference of the framed events \( e \). In the impersonal construction (265), the prepositional phrase related to the exported definite description remains within the description of the local events \( e \). In (267) is the logical form for a fronted prepositional phrase. In personal constructions (§2), (269) and (275), the unspoken thematic relation associated with the subject replaces the fronted prepositional phrase. The preposition underneath in situ within the description of the local event in (265), (269) and (275) is in turn anaphorically related to the exported definite description trans-frame-of-reference (§3).
the airspace(s)/air mass(es)/area(s) where the clouds of Southern New England weren’t calm underneath.

the flight time(s)/duration aloft when it wasn’t calm underneath the clouds of Southern New England

the flight time(s)/duration aloft when the clouds of Southern New England weren’t calm underneath.

the Southern New England clouds that weren’t calm underneath.

\[1E: \text{then}&there\[E’\]\[[\text{NP SNE clouds}\[X\] \& there\[E’,X\]\]]

\[1E’’’: \text{Theme}[E’’,X] \& there\[E’’,E’’’\]\]

\[1E’’’’': \text{_theme}[E’’’’,X] \& there\[E’’’’,E’’’’’’\]\]

\[\sum[\exists E, X, E’’’’’’] \& there\[E’’’’,E’’’’’’\]\]

\[-[\exists e: E e \& there\[E’’’’,E\]](\text{calm}(e) \& \, \, [1Y: \, \, \forall y: \, \, \exists y \, \, (X y \& there\[e, Y\]) \, \text{under}(e,Y)])\]

Yet, as in §1.1, it remains that on any occasion of use it must be decided how the framing \(E\) segment the time or space, events or states therein into what \(e\) is to count for current notice and be judged calm or turbulent. In the logical form (269) for (264)-(273), the clouds of Southern New England is exported outside the description of the individual \(e\), and in (274)-(275), Southern New England clouds originates in the peripheral position from is expressed some relation to the framing \(E\). As before, uttered out-of-the-blue against a Southern New England sky that scatters the clouds no one any closer than 20km to any other, the reference of (264)-(273) includes the airspace underneath a cloud or the flight time through its airspace only if some turbulence is encountered underneath that cloud. That is to say that one has explicitly understood the thoughts to be:

\[1E: \text{then}&there\[E’\]\[[The \, \, \text{X: clouds of SNE}\[X\] \& there\[E’,X\]\]]

\[1E’’’: \text{Theme}[E’’,X] \& there\[E’’,E’’’\]\]

\[1E’’’’’’’: \text{_theme}[E’’’’,X] \& there\[E’’’’,E’’’’’’’\]\]

\[\sum[\exists E, X, E’’’’’’’] \& there\[E’’’’,E’’’’’’’\]\]

\[-[\exists e: E e \& there\[E’’’’,E\]](\text{calm}(e) \& \, \, [1Y: \, \, \forall y: \, \, \exists y \, \, (X y \& there\[e, Y\]) \, \text{under}(e,Y)])\]

If instead the clouds are clustered into local weather systems, it suffices to encounter air turbulence in flight through such a weather system for its airspace or the flight time through it to be included in the reference of (264)-(272) despite the calm that may prevail under many a cloud within the cluster. Reference to the clouds themselves follows the same practice according to how the events they participate in are segmented. Similarly, if the mirrors or tiles are scattered, a mirror, its glass, a tile or its ceramic is included in the reference of the definite descriptions (278)-(281) only if it is flawed:

the mirrors that aren’t smooth

the mirrors’ glass that isn’t smooth

the tiles that aren’t flat

the ceramic that isn’t flat
On the other hand, in telescopes or on kitchen walls, it suffices for mirror, glass, tile or ceramic to be included if there is a flaw or misalignment in the telescope or kitchen wall it belongs to. Also, as in §1.1, description of the individual event or state \( e \) may itself cue segmentation into events or states fewer than the clouds, mirrors or tiles and larger than their individual surroundings:

(282) when\( (\text{ever}) \) underneath the Southern New England clouds calm did not shroud the entire coastline in silence

(283) \#\{\[E: \exists [E: \text{then&there}(E)] \text{[The } X: \text{SNE clouds}[X] \& \text{there}[E”,X]] \}[E”: \text{under } [E’,X]]

\( [E”’: \sum [X,E”’] \& \text{Past}[E”’] \& \text{there}[E”,E”’]] \)

\( \neg[\exists: E \& \text{there}[E”’,E]]\text{shroud the entire coastline in silence}[e] \]

(284) \[1E: [E: \text{then&there}(E)] \text{[The } X: \text{SNE clouds}[X] \& \text{there}[E’,X]] \[1E”: \text{under } [E”,X]]

\( [1E”’ : \text{Past}[E”’] \& \text{there}[E”,E”’]] \)

\( \neg[\exists: E \& \text{there}[E”’,E]]\text{shroud the entire coastline in silence}[e] \]

(285) the mirrors that aren’t smooth to the contour of a perfect parabola

(286) the tiles that aren’t flat end-to-end

(287) \# \{\[1Y: [1E: \text{then&there}(E)] \text{[[NP tiles}[X] \& \text{there}[E’,X]] \& \[1E”: \text{Theme}[E”,X] \& \text{there}[E’,E”’]]

\( [1E”’: \sum [X,E”’] \& \text{Present}[E”’] \& \text{there}[E”,E”’]] \)

\( \neg[\exists: E \& \text{there}[E”’,E]](\text{flat}(e) \& [1Y: [\forall: Y\exists: X \& \text{there}[e,Y]] \text{ Theme}(e,Y) \& \text{end-to-end}(e)]) \}

(288) \[1X: [1E: \text{then&there}(E)] \text{[[NP tiles}[X] \& \text{there}[E’,X]] \& \[1E”: \text{Theme}[E”,X] \& \text{there}[E’,E”’]]

\( [1E”’: \text{Present}[E”’] \& \text{there}[E”,E”’]] \)

\( \neg[\exists: E \& \text{there}[E”’,E]](\text{flat}(e) \& [1Y: [\forall: Y\exists: X \& \text{there}[e,Y]] \text{ Theme}(e,Y) \& \text{end-to-end}(e)]) \}

The logical form (287) is vacuous, given scatter (92): no event around a solitary tile can also be an event of tiles end-to-end. Instead, a single flatness is at issue and salient, that of the kitchen wall, for which a failure rate of one suffices for (288) to refer to all the tiles on the wall, with one misaligned. Similarly, the event description (283) is vacuous: no event confined to the airspace underneath the solitary cloud can possibly shroud the entire Southern New England coastline. Here too, given the scale of such a shroud, a single event is at issue. Provided that at any moment in flight, there is air turbulence anywhere along the coastline under any of its clouds, the definite description (282)/(284) refers to the entire flight time.\(^{31}\)

\(^{31}\) Note that omitting \textit{entire} from (282) affords construal of the \textit{coastline} as “the coastline in view”, which in turn allows the shrouding \( e \) to be contained within the airspace beneath the solitary cloud and allows (279) minus \textit{entire} to refer to just those flight segments flown through turbulence.
Examples (264)-(269) exemplify non-sortal event description by abstraction on the framing events. The logical forms shown fall under schema (289) and otherwise under (290) if modeled on the alternative (263), both schemas dividing the lexical content between description of the framing $E^\Phi$-ing and the framed $e\Psi$-ing. Trans-frame-of-reference anaphora to the NP from within $\Psi$ is as in (291):

(289) $[tE: [tE': \text{then&there}(E')] [\text{The } X: \text{NP}[X] \& \text{there}[E, X]] \ldots \Phi[E']\ldots$

$[tE'': \sum[X,E''] \& \text{Tense}[E'''] \& \text{there}[[...,E''']]) \neg[\exists e: Ee \& \text{there}[E'''',E]] \Psi[e]]$

(290) $[tE: [tE': \text{then&there}(E')] [\text{The } X: \text{NP}[X] \& \text{there}[E, X]] \ldots \Phi[E']\ldots$

$[\text{When-\text{ever } e}: [tE'': \sum[X,E''] \& \text{Tense}[E'''] \& \text{there}[[...,E''']])E''e \& \neg \Psi[e]]Ee$

(291) $\Psi = \ldots \forall y [\forall y: \text{NP}[y, y] \& \text{there}[[...,y]] \ldots \Psi'][e]$

The schemas represent the fundamental relationship between $\Phi$-ing and $\Psi$-ing, and therefore, between those phrases on the left edge parsed to describe the framing $E$ and those to the right describing the framed $e$. As remarked in §1.1, for any given spatiotemporal region such as the airspace of Southern New England, the larger the $e$ of $\Psi$-ing, the fewer the $E \Phi$-ing. In the fully distributive condition ‘$\sum[X,E'']’’, the events $E$ are as numerous as the $X$ that the NP refers to, which is incompatible with many a $\Phi$ describing events $e$ too large for the confining neighborhood of a solitary $x$ among the $X$. If not the fully distributive condition, how else to segment the events—how large and how many-- is still informed by how $\Psi$ describes them:

(292) when/\text{where\text{ever}} the clouds of Southern New England weren’t calm underneath after colliding.

The reference of (292) is contingent on the number of collisions (\textit{v.} (142)-(143) above). In the semidistributive condition, there are many, and the reference of (292) is determined by the conditions underneath the colliding clouds at each collision. But, these—\textit{fully distributive, semidistributive, singular collective}--- just map the way in a fluid, continuous relationship between the $\Phi$-ing $E$ and the $e$ among them that $\Psi$: the larger the grain that one infers from $\Psi$-ing, the fewer the $E$ are.

The schemas (289)-(291) also directly represent the fate of definite descriptions captured within definite description. Grounded in the global frame of reference, they migrate to a peripheral position from which they quantify-in trans-frame-of-reference into the description of the local $e$. This holds no matter where the definite description is overtly pronounced (\textit{v.} (264) \textit{vs.} (266) and (268)), in contrast to an indefinite description where interpretation \textit{in situ} allows for the contrast between (293) and (294):

(293) whenever a pair of clouds of Southern New England weren’t calm underneath

(294) whenever it wasn’t calm underneath a pair of clouds of Southern New England
But, this is only to discover yet another syntactic context in natural language where definite descriptions move overtly or covertly to positions more peripheral than those reserved for indefinites, bare plurals or bare NPs. The interest of (289)-(291) is that there exists within the event definite description the peripheral position to which the contained the NP migrates to join description of the framing $E$ rather than the framed $e$. None of this works—just to remind—unless the iota-operator itself is amended as in §4.1 to cinch reference to just that spatiotemporalia the event definite descriptions in fact describe.

What (289)-(291) represent now belongs to the semanticist’s tool kit, a device of event abstraction and definite description. It remains an empirical question what constructions of natural language it best translates—where in natural language are found overtly or covertly nonsortal event definite descriptions. Perhaps it is the canonical structure for focus (cf. Herburger 2000) or for dependent cumulative quantification (Schein 1993: 255ff.) for (295) to be rendered along the lines of (296):

(295) Few SCANDINAVIANS won the 613 Nobel Prizes of the early 20th century.
(296) What winning there was of the 613 Nobel Prizes of the early 20th century, few Scandinavians were winners in it.

5. In the scope of non-increasing quantification.

The *pas de deux* (§§0-2) between negation and event segmentation and the eccentricity of definite description within the scope of negation (§3) carry over *mutatis mutandis* when decreasing quantification replaces negation. No moonlight between them tells apart (297)-(300) from (301)-(304):

(297) No liquid mercury smooths (over) the mirrors (under its spin).
(298) No liquid mercury perfects/calibrates the mirrors (under its spin).
(299) Under the spin of no liquid mercury are the mirrors smooth(ed over).
(300) Under the spin of no liquid mercury are the mirrors perfect/calibrated.
(301) Liquid mercury doesn’t smooth (over) the mirrors (under its spin).
(302) Liquid mercury doesn’t perfect/calibrate the mirrors (under its spin).
(303) Under the spin of liquid mercury, the mirrors aren’t smooth(ed over).
(304) Under the spin of liquid mercury, the mirrors aren’t perfect/calibrated.

Suppose for (297)-(304) that spinning liquid mercury surfaces all mirrors. As earlier, if, out-of-the-blue, a scatter of mirrors is referred to without a shared frame of reference, what counts for current notice are those events each coincident with a mirror for the period at issue and thus equinumerous with the mirrors themselves (the fully distributive condition $\sum [X,E]$). If so, (297)-(304) are true only if each mirror is flawed. If, instead, the mirrors are the components of a single reflector telescope (the fully collective condition), it suffices that any flaw disturb the reflector’s parabolic perfection, including a misalignment at the seams of mirrors otherwise perfect. If, again, the mirrors are
scattered among several reflector telescopes (the semidistributive condition), it becomes necessary for each telescope to have a flaw anywhere in or between its mirrors.

In the above examples, the description of the events said not to exist does not itself offer any cues for event segmentation, and it is left to observation of how the mirrors are arranged to grasp what events are intended for current notice. But, the description could otherwise indicate that larger events are at issue (Breheny 2005). The above presumed that the liquid mercury spins in a vortex centered on the individual mirror’s center with a diameter equal to it. Imagine instead that different amounts of liquid mercury with a more chaotic dynamics cover arbitrary numbers of mirrors:

(305) No liquid mercury smooths (over) the mirrors under its span.
(306) No liquid mercury perfects/calibrates the mirrors under its span.

(307) Under a span of no liquid mercury are the mirrors smooth(ed over).
(308) Under a span of no liquid mercury are the mirrors perfect/calibrated.

(309) Liquid mercury doesn’t smooth (over) the mirrors under its span.
(310) Liquid mercury doesn’t perfect/calibrate the mirrors under its span.

(311) Under a span of liquid mercury, the mirrors aren’t smooth(ed over).
(312) Under a span of liquid mercury, the mirrors aren’t perfect/calibrated.

A relevant event now coincides with a liquid mercury storm, and it suffices for (305)-(312) that none of these, chaotic as they are, manages to smooth over the mirrors under its span, for which it again suffices that under each such storm, there is a flaw anywhere in or between its mirrors. In the event that one large liquid mercury storm flows over all the mirrors, then a single imperfection will do to verify (305)-(312).

(313) No liquid mercury smoothed (over) the mirrors until it reached 6130 rpm.
(314) The liquid mercury didn’t smooth (over) the mirrors until it reached 6130 rpm.

(315) No liquid mercury smoothed (over) the mirrors in 613 ms.
(316) The liquid mercury didn’t smooth (over) the mirrors in 613 ms.

Likewise, an event for (313)-(316) is a spin that starts and runs until it reaches 6130 rpm or 613ms. Such an event never reaches a smoothness, flawed by imperfection in or between any of its mirrors.

The logical resources deployed in earlier sections for negation and its pas de deux with event segmentation and definite description will carry over to decreasing quantification; but, it must not be carried so far that it undermines increasing quantification:

(317) No liquid mercury smooths (over) the mirrors.
(318) No liquid mercury vortex smooths (over) the mirrors.
(319) Liquid mercury doesn’t smooth (over) the mirrors.
(320) Liquid mercury vortices don’t smooth (over) the mirrors.
Consider the fully distributive condition where the mirrors are scattered and none joins any other inside a refractor telescope. As above, (317)-(320) imply that none is smooth—that under any vortex of liquid mercury, it is not so that some of the mirrors are smooth. In contrast, it does not suffice for (321)-(324) that some of the mirrors are. It is implied that all are. Whatever is to be said about decreasing quantification that renders (318) equivalent to (325) (depleting the force of the definite description in its scope), it must leave (322)'s equivalence to (326) intact, without compromise as (327):³², ³³

(325) [No x: liquid mercury vortex(x)] [∃y: [ιY: mirrors(Y)Iy] E smooths(E, x, y)]
(326) [Every x: liquid mercury vortex(x)] [∃y: [ιY: mirrors(Y)Iy] E smooths(E, x, y)]
(327) *[Every x: liquid mercury vortex(x)] [∃y: [ιY: mirrors(Y)Iy] E smooths(E, x, y)]

Decreasing and increasing quantification are different.

The literature on generalized quantifiers (e.g., Barwise 1979, Keenan 1987, Lindstrom 1966, Sher 1990, Westerståhl 1987) proposes various normal forms in the metalanguage for translation of natural language quantification. The syntax of quantification in the natural language object language may look like first-order, restricted quantification in (328); but, the metalanguage for the semantics translates it into second-order logic and reveals different schemas for increasing, decreasing, and exact quantification, adapted and simplified from Westerståhl 1987:

(328) [dp Qv : NP(v)] [TP v are connected]
(329) (At least) two dots are connected.
   \[∃∃∀(2, X) & X ⊆ (ιZ)(dots(Z)) & Y = (ιZ)(connected(Z)) & X ⊆ Y\]
(330) No more than two dots are connected.
   \[∃∀∃(2, X) & X ⊆ (ιZ)(dots(Z)) & Y = (ιZ)(connected(Z)) & Y ⊆ X\]
(331) Exactly two dots are connected.
   \[∃∀∃(2, X) & X ⊆ (ιZ)(dots(Z)) & Y = (ιZ)(connected(Z)) & Y = X\]

Increasing quantification asserts a lower bound on the extension of the matrix predicate, decreasing quantification, an upper bound, and exact quantification lower and upper bound. If the logical form of natural language is identified with its translation into a normal form, classification is reflected in the logical syntax itself as shown in (329)-(332).

³² Obviously, with the mirrors all scattered in the fully distributive condition, no one vortex can smooth them all. (322) is false, asserting a physical impossibility.

³³ The contrast between (317)-(320) and (321)-(324) rehearses a staple of the literature on the Homogeneity Condition, v. citations in n. 6, p. 4.
Alternatively, if the classification is held to be strictly lexical (v., e.g., Larson & Segal 1995), such equivalences as (329)-(332) are derived from a lexicon (333)-(335) that conceals the classification underneath a logical syntax that concedes no distinction between increasing and decreasing quantification:34

\[
(333) \text{(at-least-)}\text{two}\langle X, Y \rangle \leftrightarrow \text{def} \ 2(X) \& X \subseteq Y
\]
\[
(334) \text{no-more-than-}\text{two}\langle X, Y \rangle \leftrightarrow \text{def} \ 2(X) \& Y \subseteq X
\]
\[
(335) \text{exactly}\text{two}\langle X, Y \rangle \leftrightarrow \text{def} \ 2(X) \& X = Y
\]

The extent to which the classification finds reflection in the logical syntax is an empirical question. It is not as if different quantifiers do not correlate with different syntactic positions (Szabolcsi 1997, 2010) or that such differences of syntax cannot be writ large across the clausal structure. In English declarative sentences, Subject-Aux Inversion requires in first position a phrase containing a decreasing quantifier interpreted with scope over the entire sentence (Liberman 1974):

(336) With no neighbor nearby, a drummer is a welcome guest.
(337) With no neighbor nearby is a drummer a welcome guest.

(338) With neighbors nearby, a drummer is an unwelcome guest.
(339) *With neighbors nearby is a drummer an unwelcome guest.

With inversion, (337) is unambiguous that no neighbor’s being nearby is occasion to welcome a drummer; without inversion, (336) means only that the absence of neighbors is the occasion for drummer guests. Absent decreasing quantification, the inversion in (339) is ungrammatical. Plainly, decreasing quantification may have a syntax different from that of increasing quantification.

Relevant presently is the contrast between decreasing and increasing quantification in supplying antecedents for descriptive anaphora:35

(340) A few men came to the office today. They tried to sell encyclopedias. Perhaps there were even others who did the same.
(341) # Few men came to the office today. They tried to sell encyclopedias. Perhaps there were even others who did the same.

If descriptive anaphora depends for its descriptive content on the antecedent clauses in (340)-(341), then the nonmaximal reference afforded the one in (340) and denied the other in (341) fingers more than an article a(n) inserted between decreasing and increasing

---

34 Or, in some formal semantics, for lexica of type \(<<et><et><t>\),

\[
\begin{align*}
\text{[at-least-]}\text{two} & = \lambda \alpha \lambda \gamma . \ 2(\alpha) \& \alpha \subseteq \gamma \\
\text{[no-more-than-]}\text{two} & = \lambda \alpha \lambda \gamma . \ 2(\alpha) \& \gamma \subseteq \alpha \\
\text{[exactly]}\text{two} & = \lambda \alpha \lambda \gamma . \ 2(\alpha) \& \alpha = \gamma
\end{align*}
\]

quantification. If nonmaximal reference in (340) derives from a selective perspective as paraphrased in (342) (Schein op cit. n. 35), something thwarts it in (341):

(342) A few men now en scene came to the office today. They [= the few men now en scene who came to the office today] tried to sell encyclopedias. Perhaps there were even others who did the same.

As in the pas de deux between negation and spatiotemporal quantification, a selective perspective threatens to trivialize decreasing quantification, as there is always some scene at the office narrow or brief enough to be bereft of men selling encyclopedias. On these grounds, one might suggest that by rule of grammar or pragmatic inference, now en scene and any other perspectival vocabulary is never tokened within the scope of decreasing quantification:

(343) # Few men now en scene came to the office today. They [= the few men now en scene who came to the office today] tried to sell encyclopedias. Perhaps there were even others who did the same.

Yet, if there is a vocabulary for tacit reference to the current scene, can’t the speaker be taken to have in mind definite reference to a current scene large enough to be worthy of current notice for comment about the encyclopedia trade that does or does not occur within it? If so, nonmaximal reference will be mistakenly derived for (341), provided the speaker has in mind a scene large enough for current notice but small enough not to observe all the men coming to the office today. Something else must enforce the contrast between (340) and (341).

In imposing an upper bound, decreasing quantification, in contrast to increasing quantification, refers to all that which must be comprehended and submitted to an upper bound—to whatever if anything there was of men coming to the office today—of which it is said that few men were in any of it. Moreover, it is a definite description with a certain counterfactual flavor—or, to coin are more accurate term, a counter-haecctic flavor—whatever if anything there is now en scene and beyond of men coming to the office today. It may very well include tacit reference to the current scene in order to be explicit that it widens the purview of reference to include what is outside it. In a language rich enough for navigational guidance and spatial orientation, some narration is concurrent report of the visual scene and scene analysis, i.e., the inverse projection of the streaming incoming scene onto an egocentric frame of reference for the ambient environment. Other narration reports the result of path integration, the translation of the egocentric frame of reference and features perceived therein to allocentric frames of reference, in which transient observations end in a map of the environment that is invariant to perspective and the conditions of observation. In a language explicit about such parameters, one

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36 Schein (forthcoming) Chapter 4 §1 Cinerama Semantics.
37 “The reader may have had the experience of emerging from a subway station or movie theater in a grid city like Manhattan 180° misoriented. One walks with this unwitting misorientation until one fails to find some expected building or street at the spot one takes oneself to have arrived at. There follows a hard-to-describe sense of something rotating inside one’s head to produce the proper alignment between the perceived city and one’s cognitive map.” (Gallistel 1990: 193).
could enrich the gloss as *whatever if anything there is in the frame of reference to which the scene now en scene is path-integrated* of men coming to the office today. The first sentence of (341) means that what is going on throughout the frame of reference to which this narration and the scenes it narrates are integrated scene-by-scene involves few men coming to the office today.38 These remarks point to a beguiling setting and broader justification for the basic formal point about logical syntax at issue here. The insight that decreasing quantification imposes an upper bound, which increasing quantification does not, is not consigned to the lexicon. It is cashed out in a logical syntax in which the logical form of decreasing quantification includes a definite description of events, which the logical form of increasing quantification does not. Suppressing the perspectival vocabulary, increasing quantification in the first sentence of (340) has the skeletal logical form in (344):

\[(\exists X: \text{few}(X) \& \text{men}[X]) [tE: \text{Past}[E] \& \text{then}&\text{there}(E)] \]
\[\exists E': \text{there}[E',E'] \] (Theme[$E',X$] & come to the office[$E'$])

“A few men are such that for some past events then and there, they participated in these comings to the office.”

But, the decreasing quantification in (341) introduces a definite description of whatever comings to the office there were. In (345), it copies the form of those in (261)-(262) §4.3 abstracting on the framing $E$. The alternative in (346) copies (263) which pronounces *whatever* the universal quantification embedded in all definite description:

\[(\exists X: \text{few}(X) \& \text{men}[X]) \]
\[tE: [tE': \text{then}&\text{there}(E') \& \text{Past}[E']] [\exists e: \text{Ee} \& \text{there}[E',E]] \text{come to the office}[e] \]
\[\text{Theme}[E,X] \]
\[(\exists X: \text{few}(X) \& \text{men}[X]) \]
\[tE: [tE': \text{then}&\text{there}(E') \& \text{Past}[E']] [\text{Wh-}ever \ e: E'e \ & \text{come to the office}[e]]Ee \]
\[\text{Theme}[E,X] \]

“Some few men are such that whatever if any past events then & there there were of comings to the office, these events’ participants were them.”

Now, if the quantification includes within its scope a definite description, the publisher’s titles in (347)-(348), in the scope of decreasing quantification, the definite description finds itself inside an unspoken definite description of events—*whatever there was of the publisher’s titles being discounted*—in (350)-(351):

(347) A few booksellers discounted the publisher’s titles.

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38 (Aloimonos 1997, Gallistel 1990, Golledge 1999, Redish 1999) Loomis et al. (1999) remark that “path integration is the inclusive term referring to the updating of position on the basis of velocity and acceleration information, i.e., without position-fixing. Authors broaden path integration to include navigation with restricted ‘viewpoint’ as when navigating medieval alleys…. To generalize, path integration is the process of navigation by which the traveler’s local translations and rotations, whether continuous or discrete, are integrated to provide a current estimate of position and orientation with a larger spatial framework. Gallistel (1990) path integration allows the traveler to gradually integrate the isolated perspective views encountered into an internal representation (cognitive map) suitable for subsequent piloting.”
Few booksellers discounted the publisher’s titles.

\[ (349) \quad [A(n) \ X: \text{few}(X) & \text{booksellers}[X]] \]
\[ [1E: \text{Past}(E) & \text{then} \& \text{there}(E)] \]
\[ [\exists E': \text{there}(E,E')] \] Agent[E',X] & discount[E'] &
\[ \text{[The } I: \text{publisher’s titles}[I] \& \text{there}(E,I)] \] Patient[E', I]
\"A few men are such that for some past events then and there, they were these events’ agents, these events were discountings, and the publisher’s titles were the discounted in these events.\"

\[ (350) \quad [\exists X: \text{few}(X) \& \text{booksellers}[X]] \]
\[ [1E: [1E': \text{then} \& \text{there}(E') & \text{Past}(E')][\text{The } I: \text{publisher’s titles}[I] \& \text{there}(E,I)] \]
\[ [\exists e: \text{there}(E,E') \] discount(e) & [\forall z: \text{Z}(z) \] Patient(e,z)[1E'] \]
\[ \text{Agent}[E,X] \]
\"Some few booksellers are such that whatever there was of the publisher’s titles being discounted, the discounting agents were them.\"

Like the nonsortal definite descriptions (§4.4) where/when(ever) it was calm underneath the clouds of Southern New England and the airspace(s) where it was calm, culling the calm airspace from anywhere underneath the clouds it may be found, the definite descriptions in (349)-(351) cinch reference to whatever discounting there was of any of the publisher’s titles, jointly or severally, whether or not all the titles are discounted. True to the meaning of (348), (350)-(351) in turn entail that few are the booksellers who discount any of the publisher’s titles. In contrast, under increasing quantification, (347) and (349), the publisher’s titles is not embedded inside a definite description of events. Absent the syntax and semantics of trans-frame-of-reference reference, the ‘flat’ logical form (349) does entail, as (349) requires, that the publisher’s titles are all discounted, and their discounters are a few booksellers.

Concerning the interpretation of a definite description such as the publisher’s titles within the scope of increasing and decreasing quantification, the contrast between them, (347) vs. (348), reduces to logical syntax and scope—to the distribution of tacit definite descriptions of events within which the publisher’s titles occupies a position from which it quantifies in trans-frame-of-reference, whether as in (350) or in (351). Note that the account leaves the definite description at issue within the scope of the decreasing or increasing quantifier, as it must for those dependent on a distributive quantifier (Breheny 2005):

\[ (352) \quad \text{Every bookseller discounted its titles.} \]
\[ (353) \quad \text{No bookseller discounted its titles.} \]
The logical form of (353) is (354) or (355), adapting (350) and (351) to the distributive quantification:

(354) \[ \text{No } x: \text{bookseller}(x) \]

\[
[1E: [1E': \text{then} & \text{there}(E') \& \text{Past}(E')]][\text{The } Y: X's \text{titles} & \text{there}(E,Y)]
\]

\[
[\exists e: Ee & \text{there}(E,Y)][\text{discount}(e) \& [1Z: [\forall z: Ee & \text{there}(e,Z)]\text{Patient}(e, Z)]
\]

\[
[\exists e: Ee]\text{Agent}(e,x)
\]

(355) \[ \text{No } x: \text{bookseller}(x) \]

\[
[1E: [1E': \text{then} & \text{there}(E') \& \text{Past}(E')]][\text{The } Y: X's \text{titles} & \text{there}(E,Y)]
\]

\[
[\exists e: Ee & \text{discount}(e) \& [1Z: [\forall z: \text{there}(e,Z)]\text{Patient}(e, Z)]Ee
\]

\[
[\exists e: Ee]\text{Agent}(e,x)
\]

“No bookseller is such that whatever there was of its titles being discounted, it was the agent in any of it.”

---

39 Distributive quantification is concurrent event quantification over those events or parts of events in which the solitary participant participates solo (Schein 1993). Hence, ‘[\exists e: Ee]\text{Agent}(e,x)’ in (354)-(355), where I imagine that the VP raises to form the definite description quantifying-in ‘E’: ‘…[\exists e: \text{VP}]Ee]\text{Agent}(e,x)’. But, this is proxy for a family of logical forms contingent on the basic clausal structure assumed—the number of thematic relations that a DP-argument may control or raise through, the inventory of aspectual relations and of relations between events such as ‘Cause(e,e)’, etc. For any such clausal structure, e.g., Tense-Aspect-Participant- (Qua-)Agent-Cause-Participant-(Qua-)Theme-V, it is an empirical question whether, say, AspectP, AgentP, CauseP, or VP, is the phrase forming the definite description of events argued for in the text. In (354)-(355), for the sake of brevity, I assume that the frontal phrase is a VP omitting ‘Agent’. It could be a larger phrase that includes it, leaving behind a copy in ‘[\exists e: Ee]\text{Agent}(e,x)’ or, instead, quantifying into a ‘higher’ thematic relation, ‘[\exists e: Ee]\text{Participant}(e,x)’. See Schein (forthcoming).

40 Natural language that falls under (i) and (ii) exemplifies a covariation between the reference of the plural definite description and the antecedent quantifier:

(i) Every bookseller,… its titles…

(ii) No bookseller,… its titles…

Whatever is its correct treatment, the argument in the text is that it may imported as-is into the current proposal, illustrated in (354)-(355) in the common coin, an antecedent quantifier that is distributive, singular and first-order, ‘[\text{No } x: \text{bookseller}(x)]’, cf. ‘[\text{Every } x: \text{bookseller}(x)]’. The proper representation of distributivity and the co-variation it induces in definite descriptions might be otherwise. The question is how closely the distributive and decreasing \textit{few booksellers} and the plural (in)definites \textit{a few booksellers}, \textit{the few booksellers} ought to resemble each other offering logical forms in which the same morpheme \textit{few} occurs with the same meaning. (Similarly, for the distributive \textit{many booksellers} and the plural (in)definites \textit{some many booksellers} and \textit{the many booksellers}.) With this in mind, I chose to translate \textit{a few booksellers} and \textit{few booksellers} in (347)-(348) as ‘[\text{\exists X: few\{X\} & booksellers\{X\}]}’ and ‘[\text{\exists X: few\{X\} & booksellers\{X\}]}’ respectively in (349) and (350)-(351) rather than as ‘[\text{\exists X: few\{X\} & booksellers\{X\}]}’ and ‘[\text{few } : \text{bookseller}(x)]’, which forfeits what a distributive, first-order quantifier \textit{few} could have in common with the cardinal adjective \textit{few}. Conveniently, (347)-(348) did not contain a co-variant definite description, unlike (1)-(2):

(1) A few booksellers discounted their titles.

(2) Few booksellers discounted their titles.

If, in (2), ‘[\text{\exists X: few\{X\} & booksellers\{X\}}]’ rather than ‘[\text{few } : \text{bookseller}(x)]’ were the antecedent, \textit{their titles} could not be ‘x’s titles’ with a bare, singular variable ‘x’ as the translation of the pronoun \textit{their}. This
5.1. *In the scope of exact quantification.* The pronoun *they* in (356) refers unequivocally to two and no more than two:

(356) Two men came to the office today. They tried to sell encyclopedias.
(357) Two men *now en scene* came to the office today. They [= the two men *now en scene who came to the office today*] tried to sell encyclopedias.

There are no others *now en scene*. As the second clauses of (358)-(359) are informative, they do not assert what is already known, viz., that there are no others in the current scene:

(358) Two men came to the office today, and no others.
(359) Two men came to the office today, and no others did.

(360) Two men came to the office today, and no other men came to the office today.

Rather, (358)-(359) are interpreted like (360) and all other decreasing quantification to say something about the events described by a counter-haecctic definite description, *whatever if anything there was now en scene and outside it of men coming to the office today*. But, if so, the anaphoric relation found in (358)-(359) between the predicate of the second sentence and that of the first is ‘sloppy’, neglecting to impose a strict morpheme-by-morpheme identity. The anaphora is to antecedent lexical content out of which the second clause constructs from the borrowed content the structures canonical for decreasing quantification. So it happens that (361)-(362) are synonymous with (363):\(^{41}\)

pronoun would itself be descriptive, assimilating the pronoun to transparently descriptive counterparts such (3)-(8):

(3) A few booksellers discounted the local celebrity author’s titles.
(4) Few booksellers discounted the local celebrity author’s titles.
(5) A few booksellers discounted the *(local)* discounter’s titles.
(6) Few booksellers discounted the *(local)* discounter’s titles.
(7) A few booksellers discounted the *(local)* Agent’s titles.
(8) Few booksellers discounted the *(local)* Agent’s titles.

For these examples, suppose that the booksellers are scattered across several locales so that singular reference to the local celebrity author, the local discounter, or the local Agent is good only within the individual locale. The analysis should duplicate that of the *local parish church* in (201) discussed in §3.1, p. 25ff. For more about (semi-)distributivity and about *few booksellers* vs. a *few booksellers/the few booksellers* and *many booksellers vs. some many booksellers/the many booksellers*, v. Schein (forthcoming) Chapter 4 §4.3; §5, and references cited therein.

\(^{41}\) Similarly for (i)-(iii),

(i) Two booksellers discounted their titles, and no others.
(ii) Two booksellers discounted their titles, and no others did.
(iii) Two booksellers discounted their titles, and no other booksellers discounted their titles.
(361) Two booksellers discounted the publisher’s titles, and no others.
(362) Two booksellers discounted the publisher’s titles, and no others did.
(363) Two booksellers discounted the publisher’s titles, and no other booksellers
discounted the publisher’s titles.

The first clauses of all of (361)-(363) imply that all the publisher’s titles are discounted,
and the second clauses, that no other bookseller discounts any of them, as expected for
definite descriptions variously in the scope of increasing and decreasing quantification.
But, such is also the meaning of (364)-(365):42

(364) Two and no other booksellers discounted the publisher’s titles.
(365) Two and no more than two booksellers discounted the publisher’s titles.

Under sentential and ellipsis (Schein 2006, 2012, forthcoming), I assume the
predicative anaphora in (364)-(365) is as ‘sloppy’ so that the anaphor in the first conjunct
is freely interpreted as it would be within the scope of increasing quantification, anaphoric
or not, while its antecedent content in the second clause submits to decreasing
quantification:

(366) Two booksellers discounted the publisher’s titles and no more than two booksellers
discounted the publisher’s titles.

Less transparent are observations (Magri 2013, Spector 2013) that the most natural
[sic] interpretations of (367)-(368) are also equivalent to (363):

(367) Exactly two booksellers discounted the publisher’s titles.
(368) Only two booksellers discounted the publisher’s titles.

The less natural interpretations, I suppose, would include those that imposed their upper
and lower bounds on the very same predicate or event description, equivalent to (369) or
(370):

(369) Two booksellers each discounted the publisher’s titles, and no other bookseller each
discounted the publisher’s titles.
(370) Two booksellers each discounted some of the publisher’s titles, and no other
booksellers discounted any of them.

---

42 Similarly,

(i) Two and no other booksellers discounted their titles.
(ii) Two and no more than two booksellers discounted their titles.
The adverbs *exactly* and *only* in (367)-(368) join those in (371)-(377)—intentional, epistemic adverbs that comment on the accuracy of their prejacent and seem thus to be interest- and scalar-dependent and focus-affected, which is to say, altogether above my pay grade:

(371) Precisely (—as of this moment—), two booksellers discounted the publisher’s titles.
(372) Approximately, (—according to the best current estimate—), two booksellers
discounted the publisher’s titles.
(373) Minimally (—…—), two booksellers discounted the publisher’s titles.
(374) Maximally (—…—), two booksellers discounted the publisher’s titles.
(375) Minimally and maximally (—…—), two booksellers discounted the publisher’s
titles.
(376) At best (—…—), two booksellers discounted the publisher’s titles.
(377) At worst(—…—), two booksellers discounted the publisher’s titles.

So a few desultory prospective remarks. In (373), *minimally* entails that the publisher’s titles were all discounted. In contrast, *maximally* in (374) readily admits the interpretation that imposes an upper bound on whatever discounting there was of any of the publisher’s titles, leaving it open that the two might have discounted only some of them. As above, (375) is interpreted as if it were the conjunction of (373) and (374), each adverb interpreting the shared prejacent according to its druthers. Note further that (378) is ambiguous and dependent on focus to sort out whether its upper bound is imposed on *whatever discounting two booksellers did* or on *what discounting of twenty of the publisher’s titles was done* (v. Herburger 2000):

(378) Maximally (—…—), two booksellers discounted twenty of the publisher’s titles.

These observations carry over to (379)-(380), where the tokens of *so* have the same antecedent and yet interpreted as fits increasing or decreasing quantification:

(379) Two booksellers discounted the publisher’s titles, so (it was) and no more so.
(380) Two booksellers discounted the publisher’s titles, so (it was) exactly.

A further ambiguity arises in (381) with an *each* at what could be the left edge of an event description, disambiguated when such is overtly fronted in (382)-(383):

(381) Two booksellers each discounted the publisher’s titles, so (it was) and no more so.
(382) (As for) each discounting the publisher’s titles, two booksellers did so and no more so.
(383) (As for) discounting the publisher’s titles, two booksellers each did so and no more so.

Sentence (382) imposes an upper bound only on what there was of the solitary bookseller discounting all the publisher’s titles. In contrast, (383) imposes on whatever discounting there was of any of the publisher’s titles, and says of the only two involved that they each discounted those titles. To the extent that *exactly two booksellers* in (367) is distributive, surely its distributivity does not incorporate with the predicate phrase. In this respect,
(367) resembles (383) rather than (382). At loose ends is how exactly so comes to mean minimally so and maximally so. If the lexical semantics for such an adverb constructs and lists from the prejacent what it asserts and what it presupposes, then as much may be stipulated with the proviso that the prejacent so is interpreted variously, in the scope of increasing minimally and in the scope of decreasing maximally.

As remarked at the end of §4.5, the distribution in natural language of covert nonsortal definite descriptions of events is an empirical question and recognizing as much may resolve further puzzles. Spector (2013) reports the meaning of (384) and (385) as unclear or ambiguous:

(384) Whenever my friends visit me, I’m happy.
(385) Whenever my children play, they are happy.

Whenever is distributive. If the adverbial clause describes the individual e (v. (386)), the sentences concern an event e only if it is a visit from all my friends or an event of all my children at play:

(386) \[\text{Whenever } e : \Phi[e] \text{ } [\exists e' : R(e,e')] \Psi[e']\]
(387) \[\text{i} E : \Phi] [\text{Whenever } e : E[e] \text{ } [\exists e' : R(e,e')] \Psi[e']\]

On the other hand, a definite description of events—what events there were of my friends visits to me or what events there were of my children in play sessions (v. (387))—culls visits with any of my friends or play sessions with any of my children, and accordingly (384) and (385) are understood to find happiness in each of these. That is, my friends visit me and my children play may describe the framing E or the framed e, for which logical form must be rich enough to entertain both variables.

6. Conclusion

When negation dances with spatiotemporal quantification, it is about the existence of zones that are asserted to be sterile of what is described in the scope of negation:

(388) \[\text{i} E' : \text{then&there}[E']][\text{i} E : \Phi[E] & \text{Tense}[E] & \text{therein}[E,E'] \neg[\exists e : E[e] \Psi(e)]\]

If the logical form of negation, even at its briefest, distinguishes the e that isn’t so-and-so from the E wherein it isn’t, it is then a matter of syntax which phrases in a negated sentence describe e and which E, provided that logical form offers both, as in (388). Impersonal sentences (§1) demonstrate as much in deriving truth-conditional variation from whether the same phrase describes the framing E or the framed e, for which logical form must be rich enough to entertain both variables.

Reference to a spatiotemporal zone and to times, spaces, events and states therein never escapes an implicit standard for what is to count for current notice—for how to parse then&there into times, places, events and states therein. In distinguishing the framed e that
isn’t so-and-so from the framing $E$ wherein it isn’t, logical form sets up a *pas de deux* between description $⌜Ψ⌝$ of the framed $e$ and description $⌜Φ⌝$ of the framing $E$. For any given spatiotemporal zone, the larger $⌜Ψ⌝$ presupposes the events $e$ there to be, the fewer the $E$ there that $⌜Φ⌝$ describes. Out of the blue and upon the void, with little else to go on other than the participants scattered *then&there*—clouds, mirrors or tiles— they are often taken to be the landmarks for equinumerous $E$, the fully distributive condition ($⌜\Sigma [x,E]⌝$ (92)); but, then any $⌜Ψ⌝$ is infelicitous that presupposes events $e$ larger than what they participate in alone. Negation in (388) is about not-$Ψ$-ing—at a certain rate of $Ψ$-failure, as many failures to $Ψ$ as there are framing $E$. In the fully distributive condition, the failures are as numerous as the participants at large. But, if the content of $⌜Ψ⌝$ precludes it or the salient framing events are fewer, the failure rate that (388) implies decreases accordingly. In the limit—the mirrors lining a single reflector telescope or the tiles on a kitchen wall—a solitary defect suffices for the failure of the only event at issue, the smoothness $e$ (‘smooth($e$)’) of the reflector’s surface or of the kitchen wall, even as every individual participant, mirror or tile, is itself smooth to perfection (§2).

If sentences so often divide their phrases between description of the framing $E$ and description of the framed $e$, it is an ordinary epistemic condition to find that one knows that the such-and-such are scattered across the framing events $E$ without knowing for any one such-and-such which framed $e$ it is in, except to remark that in $e$ are those of the such-and-such that are in it. This is trans-frame-of-reference reference, in which global reference culls its referents across local frames of reference, pervasive in natural language in sentences with and without negation. The syntax and semantics for definite descriptions and Quantifier Raising is designed to provide an economy of expression for assertions under such epistemic conditions(§§3,4).

What the canonical logical form (388) for negation discovers is that any token of ‘not’ is occasion for trans-frame-of-reference reference between the frame of reference for the framing events $E$ *then&there* and the local frames of reference for the events $e$ that are therein. In this respect, negated sentences joins attitude reports and the internal structure of definite descriptions, all of which divide their content between description of the global framing $E$ and the local framed $e$. What is observed in all these contexts is that a definite description the NP understood to be definite in their reference and grounded in the frame of reference for the framing $E$ occurs with the content that describes the framing $E$ and quantifies-in into the description of the framed $e$ (§4), from which it follows, given the syntax & semantics for trans-frame-of-reference reference, that only some of the NP need be involved in any one of the local $e$.

Almost all of what goes on in sentences with negation carries over *mutatis mutandis* to decreasing quantification (§5) and distinguishes it from increasing quantification:

(389) No bookseller discounted the discontinued titles on its shelves.  
(390) Every bookseller discounted the discontinued titles on its shelves.
Decreasing quantification, it turns out, is a context for trans-frame-of-reference reference with all that derives from it, and increasing quantification is not. As decreasing quantification imposes an upper bound on whatever its scope describes, its logical form includes a definite description of whatever is so described:

(391) No bookseller, in whatever events there were of the discontinued titles on its shelves being discounted, was the discounter in any of them.

(392) Every bookseller, in some events, was the discounter in them and the discontinued titles on its shelves were discounted in them.

The logical form for (389) includes, as it were, the definite description whatever events there were of the discontinued titles on its shelves being discounted. It is the syntax and semantics internal to this event definite description (§4) that is context for reference trans-frame-of-reference. In contrast, the logical form for increasing quantification in (390) just says that there were some events in which the bookseller and its titles participate, without reference to any other such events let alone reference to them all. Thus, whatever derives from reference trans-frame-of-reference under decreasing quantification is absent under increasing quantification, deriving the contrasts canvassed in §5 between (389) and (390).

What an essay on negation has remarked upon is that there is a pas de deux between negation and spatiotemporal quantification recognized since Partee 1973 and Burge 1974 in which consideration for the density of space and time requires the canonical logical form for negation to be that in (388). And, to explain what joins negation and decreasing quantification, it must also be recognized that natural language contains tacit nonsortal definite descriptions of events, the distribution of which distinguishes decreasing from increasing quantification. Whatever noughtiness then ensues derives only from these two aspects of logical form special to it, from their interaction with the syntax and semantics of definite description and trans-frame-of-reference reference, justified elsewhere, and from practical knowledge about spatiotemporal reference and event segmentation, without which there is nary a thought.

Since Fodor 1970,43 negation has worn a Homogeneity Condition custom made for it to the effect that homogeneous predicates (e.g., (393), (394)) denote pluralities and masses homogeneously—all (393) or nothing (394)—to characterize the meaning of (393)-(394) when uttered out-of-the blue, in contrast to (395)-(396):

(393) The mirrors are smooth.
    The mirrors’ glass is smooth.
(394) The mirrors are not smooth.
    The mirrors’ glass is not smooth.

(395) The mirrors circle the telescope’s reflector.  
The mirrors’ glass circles the telescope’s reflector.  
(396) The mirrors do not circle the telescope’s reflector.  
The mirrors’ glass does not circle the telescope’s reflector.

What a problem it is for philosophical logic and for the semantics of natural language that (397)-(398) could and do defy the Principle of Excluded Middle and mysteriously (399)-(400) do not!—

(397) Smooth(m)  
(398) ¬Smooth(m)

(399) Circle(m)  
(400) ¬Circle(m)

The unquestioned presumption that (397)-(400) distills (393)-(396) has been occasion for a history—Boolean algebra, lexical presuppositions, Strongest Meaning Hypothesis, trivalence, supervaluation, double strengthening, etc.—ingenious in its evasion of the syntax and semantics of natural language.
Appendix: Quantifier Raising via successive cyclic movement to functional projections expressing relations to frames of reference.

As remarked above, the received syntax and semantics for Quantifier Raising and definite description is too weak in the interpretation of (194)-(195), repeated (i)-(ii), to entail that the casino operators’ attitudes include attitudes about all the undercover agents referred to filling a payroll of $613,000:

(i) \[ \{E; \text{then \\& therein}(E')\} \{E; \ \text{Past}(E) \ \& \ \text{therein}(E',X)\} \]
\[ \exists X: \ \text{undercover agents paid $613,000}[X] \ \& \ \text{there}[E',X] \]

The casino operators knew that
\[ \{I; [\forall y: Y_y]X_y \ \& \ \text{with the winning number}[e,I]\} \ Y \ \text{will share(e) the $100,000}. \]

(ii) \[ \{E; \text{then \\& therein}(E')\} \{E; \ \text{Past}(E) \ \& \ \text{therein}(E',X)\} \]
\[ \exists X: \ \text{undercover agents paid $613,000}[X] \ \& \ \text{there}[E',X] \]

The casino operators knew that
\[ \{I; [\forall y: Y_y]X_y \ \& \ \text{then in the casino}[e,I]\} \ Y \ \text{must [some } Z \ \text{of } Y \ \text{win(e)…}] \]

Likewise, the same defect undermines the definite descriptions below when paired with the logical forms shown:

(iii) the undercover agents (paid $613,000) that/of whom the casino operators knew that those who hold the winning lottery number will share the $100,000 jackpot
(iv) \[ \{X: \ \text{undercover agents paid $613,000}[X] \ \& \ \exists E; \ \text{The casino operators knew}[E] \ \& \ [\forall e: E_e] \ \text{knew(e)} \ \text{that} \]
\[ \{I; [\forall y: Y_y]X_y \ \& \ \text{with the winning number}[e,I]\} \ Y \ \text{will share(e) the $100K}" \]

(v) the undercover agents (paid $613,000) that/of whom the casino operators knew that those then in the casino must some of them win and some of them lose.
(vi) \[ \{X: \ \text{undercover agents paid $613,000}[X] \ \& \ \exists E; \ \text{The casino operators knew}[E] \ \& \ [\forall e: E_e] \ \text{knew(e)} \ \text{that} \]
\[ \{I; [\forall y: Y_y]X_y \ \& \ \text{then in the casino}[e,I]\} \ Y \ \text{must [some } Z \ \text{of } Y \ \text{win(e)…}] \]

(vii) whoever/those of whom/the patrons that the casino operators knew that those who hold the winning lottery number will share the $100,000 jackpot
(viii) \[ \{X: \ \exists E; \ \text{The casino operators knew}[E] \ \& \ [\forall e: E_e] \ \text{knew(e)} \ \text{that} \]
\[ \{I; [\forall y: Y_y]X_y \ \& \ \text{with the winning number}[e,I]\} \ Y \ \text{will share(e) the $100K}" \]

(ix) whoever/those of whom/the patrons that the casino operators knew that those then in the casino must some of them win and some of them lose.
(x) \[ \{X: \ \exists E; \ \text{The casino operators knew}[E] \ \& \ [\forall e: E_e] \ \text{knew(e)} \ \text{that} \]
\[ \{I; [\forall y: Y_y]X_y \ \& \ \text{then in the casino}[e,I]\} \ Y \ \text{must [some } Z \ \text{of } Y \ \text{win(e)…}] \]
Starting with the definite descriptions, instead of (viii) and (x), let the logical forms for (vii) and (ix) be something like (xi)-(xii), in which I have in mind to exploit the idiom to know of them that they...:

(xi) \[1X: \exists E[\forall y. E(y) \land \text{ casino operators}(y) \land \text{ knew}(E, y)] \land O[f(E, x) \land \forall e. E(e) \land \text{ knew}(e)] \text{ that} \]
\[1\forall: [\forall y. Y(y) \land \text{ with the winning number}(e, Y)] \forall \text{ will share}(e) \text{ the } 100K] \]

(xii) \[1X: \exists E[\forall y. E(y) \land \text{ casino operators}(y) \land \text{ knew}(E, y)] \land O[f(E, x) \land \forall e. E(e) \land \text{ knew}(e)] \text{ that} \]
\[1\forall: [\forall y. Y(y) \land \text{ with the winning number}(e, Y)] \forall \text{ must } [\exists z. E(y) \land \text{ win}(e,...)] \]

The inclusion of the relation ‘O[f(E, x)’ excludes spurious reference to things that do not enter into the casino operators’ attitudes. More generally, the logical syntax of quantifying in demands some relation to all the frames of reference quantified past so that what is quantified in to a local frame of reference is always and only of that established and referred to in the global frame of reference from which one zooms in:

(xiii) \[1X: \exists E[\text{there}(E, X)] \land [\text{The casino operators knew}(E) \land \forall e. E(e) \land \text{ knew}(e)] \text{ that} \]
\[1\forall: [\forall y. Y(y) \land \text{ with the winning number}(e, Y)] \forall \text{ will share}(e) \text{ the } 100K] \]

(xiv) \[1X: \exists E[\text{there}(E, X)] \land \text{The casino operators knew}(E) \land \forall e. E(e) \land \text{ knew}(e)] \text{ that} \]
\[1\forall: [\forall y. Y(y) \land \text{ in the casino}(e, Y)] \forall \text{ must } [\exists z. E(y) \land \text{ win}(e,...)] \]

Whether the translation of the definite description is emended to include either ‘O[f(E, x)’ or ‘there(E, x)’, the result refers snugly to just those whom the casino operators know about, and they are in turn the undercover agents paid $613,000 if one says as much:

44 The problem and its repair recall the interaction of thematic separation and distributive quantification (Schein 1993):

(i) 613 fabric swatches covered over two sewing tables each with two quilts.

(ii) *\[\exists X: \text{ fabric swatches}(X) \land \text{ Theme}(E, X) \land \text{ covered}(E) \land \text{ over}(E, y) \land \text{ covered}(E) \land \text{ with two quilts}(e)] \]

(iii) *\[\exists X: \text{ fabric swatches}(X) \land \text{ Theme}(E, X) \land \text{ covered}(E) \land \text{ over}(E, y) \land \text{ covered}(E) \land \text{ with two quilts}(e)] \]

Suppose 613 fabric swatches scattered among the many sewing tables on the factory floor have been cut and sewn into many quilts. The two quilts covering any two sewing tables are fabric cut from far fewer than the 613 swatches of the entire production, so that (i) is false. In representing only the distributivity condition, what happens to each sewing table, (ii) is mistakenly true. To represent (i) as false, it requires the explicit relation in (iii) of two sewing tables to the plural events $E$. 

Barry Schein, “Noughty Bits”. 8 May 2015. schein@usc.edu
\[(xv)\] \[\exists E\langle there|E,X\rangle \& \langle \text{The casino operators knew}[E] \& \langle \forall e: Ee\rangle \text{ knew}(e) \text{ that} \]
\[\langle 1\rangle: \langle \forall y: Yy\rangle Xy \& \text{ with the winning number}[e,Y]\] \[\langle 1\rangle \text{ will share}(e) \text{ the } \$100K]\]

\[(xvi)\] \[\exists E\langle there|E,X\rangle \& \langle \text{The casino operators knew}[E] \& \langle \forall e: Ee\rangle \text{ knew}(e) \text{ that} \]
\[\langle 1\rangle: \langle \forall y: Yy\rangle Xy \& \text{ with the winning number}[e,Y]\] \[\langle 1\rangle \text{ will share}(e) \text{ the } \$100K]\]

Similarly, quantifying in a NP \textit{de re} into an attitude report (\textit{v}. (186)-(193)) demands a relation between the NP and intervening \(E\):

\[(xvii)\] \[\exists E\langle then\&there|E\rangle \langle \text{Past}[E] \& \text{ therein}[E,E]\rangle \]
\[\exists E\langle there|E,X\rangle \& \langle \text{The casino operators knew}[E] \& \langle \forall e: Ee\rangle \text{ knew}(e) \text{ that} \]
\[\langle 1\rangle: \langle \forall y: Yy\rangle Xy \& \text{ with the winning number}[e,Y]\] \[\langle 1\rangle \text{ will share}(e) \text{ the } \$100K,000\).

\[(xviii)\] \[\exists E\langle then\&there|E\rangle \langle \text{Past}[E] \& \text{ therein}[E,E]\rangle \]
\[\exists E\langle there|E,X\rangle \& \langle \text{The casino operators knew}[E] \& \langle \forall e: Ee\rangle \text{ knew}(e) \text{ that} \]
\[\langle 1\rangle: \langle \forall y: Yy\rangle Xy \& \text{ then in the casino}[e,Y]\] \[\langle 1\rangle \text{ must } \text{some } Z \text{ of } Y \text{ win}(e)\).

\textbf{References}


