Vacuous and Non-Vacuous Behaviors of the Present Tense in English[1]

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Abstract.
The present tense behaves vacuously when modifying nominals expressing intervals like "last Tuesday" but not when modifying nominals expressing individuals like "John." Under a presuppositional theory of tense, I show that if the present tense is vacuous then the difference in behavior can be reduced to a difference in the relative scopes of presupposition maximization and distributivity, and that in turn the scope difference can be explained by a general principle of utterance strength maximization.

1. Introduction

The presuppositions of the present tense in English appear to project above conjunction, pluralization, and universal quantification when subjects are individuals, but not when they are intervals:

(1) (John F. Kennedy is dead and Joe Kennedy is alive:) #John F. Kennedy and Joe Kennedy are tall.
(2) (Some of my uncles are dead and some are alive:) #My uncles are blond.
(3) (Some American presidents are dead and some are alive:) #All of the American presidents are male.
(4) (John is dead and Bill is alive:) #John and Bill are both very handsome. (Mittwoch, 2008)

(5) (Uttered in 2013): 2012 and 2016 are leap years.
(6) (Uttered in the middle of the week:) The even-numbered days this week are school days.
(7) (Uttered in the middle of the semester:) Every Friday this semester is a holiday.
(8) (Uttered in the middle of the month:) Every Tuesday this month I fast. (Sauerland, 2002)

Theories in which the present tense is not vacuous (e.g. Reichenbach, 1947; Ogihara, 1996; Abusch, 1997) account for (1-4) but not (5-8). Sauerland's (2002) vacuous present tense semantics, on the other hand, accounts for (5-8), but not for (1-4). In this paper I attempt to modify Sauerland's proposal to account for non-vacuous behaviors of the present tense. I suggest that the observed differential behavior of the present is predicted by scope ambiguity between covert presupposition maximization and distributivity, disambiguated systematically according to a specialized version of the Strongest Meaning Hypothesis (Dalrymple, et al., 1998; Winter, 2001; Chierchia, et al. 2008) sensitive to the difference between individuals and intervals.

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In Section 2 I provide some background, first presenting a basic semantics of tense (2.1), then discussing lifetime inference (2.2), which I will argue plays a crucial role in the disambiguation process. Next, I propose a formalization of the difference between individuals and intervals (2.3), and introduce presupposition maximization (2.4) and distributivity (2.5). In Section 3, I show how different scope relations between the two generate different projection behaviors of the present tense, and in Section 4 I explain how a general principle of utterance strength maximization forces the scope relations that result in precisely the two projection behaviors observed.

2. Background

2.1 Tense

I adopt a semantic ontology with three types: individuals, truth values, and intervals[2] [3] (cf. Montague, 1970; Hamblin, 1972; Partee, 1973; Kamp, 1979; Cresswell, 1985; Heim & Kratzer, 1998). Based on the pronoun-like behavior of the English tense morphemes (Partee, 1973), I analyze English tenses as temporal pronouns: partial identity functions over intervals which encode presuppositions (t_0 = utterance time).[4]

(9) $[\![\text{PRESENT}]\!] = \lambda t{:}t \supseteq t_0.t$ (To be revised)
(10) $[\![\text{PAST}]\!] = \lambda t{:}t < t_0.t$

The past and present tenses display presuppositions with singular subjects and conjoined individual subjects, but with conjoined interval subjects, the presupposition of the present tense seems to disappear:

(11) Christopher Columbus was/#is tall.
(12) Yesterday was/#is Tuesday.
(13) (In 2016:) 2012 and 2016 #were/**are** leap years.
(14) Christopher Columbus and Barack Obama #were/#are tall.

To account for this, Sauerland (2002) analyzes the present tense as semantically vacuous, i.e., as a total identity function over intervals with no presupposition:

(15) $[\![\text{PRESENT}]\!] = \lambda t\,.t$

On this analysis, sentences like (13) are felicitous with the present tense simply because the present

[2] An interval is a set of points in time with the property that any point that lies between two points in the set is also a member of the set. I assume that points in time form a set totally ordered with respect to a relation of temporal precedence.
[3] Worlds or situations are probably necessary to account for intensional phenomena; I abstract away from intensionality in the present paper.
[4] The account formulated here only addresses only the non-past aspects of the meaning of the present tense.

tense makes no presuppositions on the interval it modifies. Sauerland accounts for the infelicity of the present tense in basic sentences with singular non-present subjects like (11) and (12) by appealing to a presupposition exhaustification mechanism:

(16) Presupposition Exhaustification: For any utterance U with truth-conditionally equivalent alternatives ALT(U), the listener may negate the presuppositions of any members of ALT(U) whose presuppositions are stronger than those of U.

The present tense is infelicitous when the interval or individual modified is past because the listener computes a negated presupposition, or antipresupposition, that the individual or interval is not past:

(17) a. U = "John is asleep."
b. "John was asleep." ∈ ALT(U)
c. "John is asleep." The presuppositions of "John was asleep" do not hold.

Meanwhile, since one of the subject referents in (13) does not satisfy the presuppositions of the past, the past is blocked; furthermore, since the present tense is vacuous, its presuppositions are trivially satisfied.

(13) (In 2016:) 2012 and 2016 #were/**are** leap years.

Without further modification, however, Sauerland's (2002) theory fails to account for the non-vacuous behavior of the present tense observed in sentences with plural, conjoined, or universally quantified individual subjects:

(1) #John F. Kennedy and Joe Kennedy are tall.
(2) (Some of my uncles are dead and some are alive:) #My uncles are blond.
(3) #All of the American presidents are male.
(4) (John is dead, Bill is alive:) #John and Bill are both very handsome. (Mittwoch, 2008)

In the following sections, I attempt to derive the differences in the behavior of the present tense with interval and individual subjects from a theory on which the present tense is vacuous by taking into account differences between the nature and amount of new information derivable from each type of sentence.

2.2 Lifetime Inference

Predicates expressing tendentially permanent properties (I-level predicates) behave differently from those expressing tendentially temporary properties (S-level predicates), both syntactically and semantically. For example, S-level but not I-level predicates co-occur with temporal adverbs (Chierchia, 1995), with existential "there" (Milsark, 1974), and in "when"-clauses (Kratzer, 1995), and I-level but not S-level predicates force generic interpretations of sentences with bare plural subjects (Carlson, 1977).

(18) I-Level Predicates: (be) blond, (be) tall, (be) intelligent, (be) a linguist
(19) S-Level Predicates: (be) asleep, (be) available, (be) drunk

The difference between predicates of the two classes with respect to permanence can be captured by a pair of rules expressing the typical duration of the properties they encode:

(20) $\forall I \in \{\text{I-level predicates}\}[\forall x(\exists t_1(I(x,t_1)) \rightarrow \forall t_2(Alive(x, t_2) \rightarrow I(x, t_2)))]$
(21) $\forall S \in \{\text{S-level predicates}\}[\forall x(\exists t_1(S(x,t_1)) \rightarrow \neg\forall t_2(Alive(x, t_2) \rightarrow S(x, t_2)))]$

In words, if the property expressed by an I-level predicate holds of an individual at any time, then it holds of that individual at every other time at which that individual is alive. A property expressed by an S-level predicate, however, if it holds of an individual at some time, does not hold of that individual at every every other time at which that individual is alive. This logical formalization of permanence/temporariness accounts for another important difference between I- and S-level predicates: I-level predicates give rise to *lifetime inferences* when predicated of individual subjects in the past tense (Musan, 1997; Mittwoch, 2008).

(22) John was blond. John is no longer alive.

I call inferences of this form *canonical lifetime inferences* in light of their central status in theories of temporal implicature (e.g., Musan, 1997; Mittwoch, 2008). Other inferences about individuals' lifetimes follow from other combinations of predicate type and tense:

(23) John is blonde. John is alive. (I-level predicate + present tense)
(24) John was asleep. John was alive at the time he was asleep. (S-level predicate + past tense)
(25) John is asleep. John is alive. (S-level predicate + present tense)

Any inference about when the individual denoted by the subject is or was alive, whether present-oriented (as in *x is alive* or *x is no longer alive*) or past-oriented (as in *x was alive at the time he was asleep*), I call a *general lifetime inference*. While the status of canonical lifetime inferences as entailments, presuppositions, or implicatures has been disputed (Kratzer, 1995; Musan, 1997; Mittwoch, 2008), I adopt a variant of Musan's (1997) implicature-based analysis because its lexical encoding of aliveness straightforwardly accounts for general lifetime inferences:

(26) $[\![\text{blond}]\!] = \lambda x \lambda t.x$ is blond at t and x is alive at t
(27) $[\![\text{asleep}]\!] = \lambda x \lambda t.x$ is asleep at t and x is alive at t[5]

[5] There are exceptions to the generalization that predicates expressing tendentially permanent properties license canonical lifetime inferences, e.g., "famous":

Thus any time an aliveness-encoding predicate is applied to an individual, it straightforwardly follows that the individual must be alive at the time the predicate holds. While canonical lifetime inferences remain implicatures on such an account, the other three types of general lifetime inference are simply entailments (t_0 = utterance time; following Sauerland (2008), I use fractional notation in which the assertory content of an utterance is in the numerator position and its presuppositions are in the denominator position): [6]

(28) ⟦John was asleep.⟧
$= [⟦\text{asleep}⟧(⟦\text{PAST}⟧)](⟦\text{John}⟧)$
$= \exists t[[[\lambda t.\lambda x.x \text{ is asleep at } t \wedge x \text{ is alive at } t]([\lambda t{:}t{<}t_0.t](t))](j)]$
$= \exists t \frac{[[\lambda t.\lambda x.x \text{ is asleep at } t \wedge x \text{ is alive at } t](t)](j)}{t < t_0}$
$= \exists t \frac{[\lambda x.x \text{ is asleep at } t \wedge x \text{ is alive at } t](j)}{t < t_0}$
$= \exists t \frac{j \text{ is asleep at } t \wedge j \text{ is alive at } t}{t < t_0}$
→ John was alive at the time he was asleep. (General Lifetime Inference)

(29) ⟦John was blond.⟧
$= [⟦\text{blond}⟧(⟦\text{PAST}⟧)](⟦\text{John}⟧)$
$= \exists t[[[\lambda t.\lambda x.x \text{ is blond at } t \wedge x \text{ is alive at } t]([\lambda t{:}t{<}t_0.t](t))](j)]$
$= \exists t \frac{[[\lambda t.\lambda x.x \text{ is blond at } t \wedge x \text{ is alive at } t](t)](j)}{t < t_0}$
$= \exists t \frac{[\lambda x.x \text{ is blond at } t \wedge x \text{ is alive at } t](j)}{t < t_0}$
$= \exists t \frac{j \text{ is blond at } t \wedge j \text{ is alive at } t}{t < t_0}$
→ John was alive at the time he was blond. □ John is no longer alive. (Canonical Lifetime Inference)

How does the listener get from the simple entailment that John was alive at the time he was blond in (29) to the canonical lifetime inference that he is no longer alive? The additional information provided by the permanence of the property expressed by the I-level predicate allows the listener to

(i) Marilyn Monroe is blond. → Marilyn Monroe is alive.
(ii) Marilyn Monroe is famous. ↛ Marilyn Monroe is alive.

This behavior can be explained by the absence of the aliveness clause in the lexical entries of exceptional predicates:

(iii) ⟦blond⟧ = λxλt.x is blond at t and x is alive at t
(iv) ⟦famous⟧ = λxλt.x is famous at t

[6] While I remain agnostic on the question of the ultimate status of tense as referential (Enc, 1986, 1987; Heim, 1994) or quantificational (Kusumoto, 1999), for the purpose of exposition I use a quantificational semantics on which existential quantification introduced by tense takes narrow scope with respect to distributivity. In principle, either approach should be compatible with the present analysis.

compute an implicature using a Gricean maxim of informativeness that John must no longer be alive (Musan, 1997):

(30) i. Listener hears speaker utter "John was blond."
ii. Listener knows that "John is blond" would have been more informative with respect to the duration of John's blondness, and thus that the speaker would have uttered it if he/she believed it to be true.
iii. Assuming speaker to be cooperative, listener assumes speaker must not believe "John is blond" is true.
iv. Assuming speaker to be opinionated, listener concludes that "John is blond" is false.
v. Listener reasons that since "blond" expresses a permanent property (a property which, if it holds of someone at any time it holds of them at every other time at which they are alive; cf. (20)), since it held of John in the past, it must hold of John for every time at which he is alive.
vi. Listener concludes that if John were alive at the time of utterance, he would be blond at the time of utterance.
vii. Listener concludes, by contraposition, that if John is not blond at the time of utterance, then he must not be alive at the time of utterance.

In sum, general lifetime inferences are computable from any combination of I- or S-level predicate and past or present tense, and relate an individual's lifetime either to the utterance time, the time of the property holding, or both. General lifetime inferences are entailments; canonical lifetime inferences (e.g. "John was blond" □ John is no longer alive) are derived using Gricean reasoning in conjunction with the permanence of the property expressed by the I-level predicate.

2.3 Individuals vs. Intervals

Individuals and intervals differ with respect to the kind of information they carry: Individuals are atemporal entities, but they can be temporally modified with information derived from speech about their lifetimes (e.g. via lifetime inference). Intervals, on the other hand, are inherently temporally-specified, and in turn do not allow such temporal modification. Based on this intuition, I suggest that individuals have parameters which encode their lifetimes (or restrictions thereon), which I call *individual lifetime parameters* (denoted by subscripts)[7]:

[7] Inanimate individuals (e.g. buildings and television shows) also participate in lifetime inference, and pattern with animate individuals in the individual/interval split with respect to the behavior of the present tense:

(i) "Breaking Bad was an excellent show." □ Breaking Bad is no longer airing.
(ii) "The new World Trade Center building and the old World Trade Center building both #had/?#have over 100 floors."

(31) (Bill is alive) ⟦Bill⟧ = b_t, where $t \supseteq t_0$
(32) (John has died) ⟦John⟧ = j_t, where $t < t_0$

Individual lifetime parameters may be updated based on information asserted by an utterance, or by the presuppositions or implicatures of an utterance, e.g. lifetime inferences:

(33) ⟦Mildred Manning⟧ = $m_{t,}$ ⟦Betty White⟧ = b_u, ⟦John⟧ = j_v
(34) "Mildred Manning served as a nurse in World War Two." → $t \supseteq$ WWII
(35) "Betty White is blond." → $u \supseteq t_0$
(36) "John was handsome." □ John is no longer alive → $v < t_0$

In sum, I suggest that individuals crucially differ from intervals in that the former have lifetime parameters which may be updated with information derived from speech, while the latter are inherently fully temporally specified and lack such parameters.

2.4 Maximize Presupposition

In general, when two utterances have the same truth conditions but differ in presuppositional strength, there is pressure for speakers to choose the utterance with the strongest presupposition:

(37) The/#a sun is shining. (Hawkins, 1991)
(38) Both/#all of John's eyes are blue. (Percus, 2006)
(39) John knows/#thinks that Paris is in France. (Singh, 2011)

A pragmatic quantity principle stating roughly "make your contribution presuppose as much as possible" (Heim, 1991), called Maximize Presupposition (MP), has been proposed to explain these data (Percus, 2006; Sauerland, 2008; Singh, 2011; Schlenker, 2012; i.a.). MP was originally proposed as a principle operative at the level of the speech act, but there is evidence that it sometimes operates with respect to local contexts (Percus, 2006; Singh, 2011):

(40) Everyone with exactly two students assigned the same exercise to both/#all of his students.
(41) If John has exactly two students and he assigned the same exercise to both/#all of them, then I'm sure he'll be happy.
(42) Mary believes that John has exactly two students and that he assigned the same exercise to both/#all of them.

The question of the locality of MP can be seen as parallel to the question of the locality of the exhaustification operation responsible for scalar implicatures: Chierchia (2006), Fox (2007), and

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Based on these facts I conclude that all individuals, animate or not, have individual lifetime parameters, though in the case of inanimate individuals they might more appropriately be called *individual existence time parameters*.

Chierchia, et al. (2008), among others, in arguing for a grammatical theory of scalar implicatures, have proposed a covert exhaustification operator in the syntax which may take a variety of scopes and interact with other scopal elements. It may be that covert grammatical exhaustification and MP, an analogous operation differing only in that exhaustification is relative to presuppositions rather than assertions, result from the same underlying mechanism. Following the treatment of exhaustivity in Chierchia, et al. (2008), I formalize MP as a covert exhaustification operator over presuppositions computable with respect to an alternative set.[8]

(43) Maximize Presupposition (MP): $MP_{ALT} = \left(\frac{[_S \ldots X \ldots]}{P([_S \ldots X \ldots])} \right) = \frac{[_S \ldots X \ldots]}{P([_S \ldots X \ldots]) \wedge \forall Y \in ALT(X)[\neg P([_S \ldots Y \ldots])]}$, where $ALT(X) = \{Y\colon [_S \ldots Y \ldots]$ presupposes more than $[_S \ldots X \ldots]\}$ and P(S) = presupposition of S.

To illustrate, consider the effects of MP on the interpretation of a simple present tense sentence:

(44)
$$
\begin{aligned}
&[\![\text{John is asleep.}]\!]\\
&= MP_{ALT(PRESENT)}([[\![\text{asleep}]\!]([\![\text{PRESENT}]\!](t))]([\![\text{John}]\!]))\\
&= MP_{\{PAST\}}(\exists t[[[\lambda t.\lambda x.x \text{ is asleep at } t \wedge x \text{ is alive at } t]([\lambda t.t](t))](j)])\\
&= MP_{\{PAST\}}\left(\exists t \frac{[[\lambda t.\lambda x.x \textit{ is asleep at } t \wedge x \textit{ is alive at } t](t)](j)}{\varnothing}\right)\\
&= MP_{\{PAST\}}\left(\exists t \frac{[\lambda x.x \textit{ is asleep at } t \wedge x \textit{ is alive at } t](j)}{\varnothing}\right)\\
&= MP_{\{PAST\}}\left(\exists t \frac{j \textit{ is asleep at } t \wedge j \textit{ is alive at } t}{\varnothing}\right)\\
&= \exists t \frac{j \textit{ is asleep at } t \wedge j \textit{ is alive at } t}{\varnothing \wedge \forall Y \in \{PAST\}[\neg P\ (John\ be.Y\ asleep)]}\\
&= \exists t \frac{j \textit{ is asleep at } t \wedge j \textit{ is alive at } t}{\varnothing \wedge \neg P\ (John\ be.PAST\ asleep)}\\
&= \exists t \frac{j \textit{ is asleep at } t \wedge j \textit{ is alive at } t}{\varnothing \wedge \neg(t < t_0)}\\
&= \exists t \frac{j \textit{ is asleep at } t \wedge j \textit{ is alive at } t}{\neg(t < t_0)}
\end{aligned}
$$

Prior to the application of MP, the sentence has no presupposition; afterwards, the negated presupposition of the past tense is linked to the time of John's being alive and asleep, resulting in the antipresupposition that that time must not be prior to the utterance time. (In the simplified system with only two tenses used here, it therefore must be present.)

In summary, the mechanism responsible for the presupposition exhaustification process which explains the typical presentness of the present tense in simple singular sentences on the present tense vacuity hypothesis is formalized as MP, a grammatical operator (or placeholder for a non-grammatical pragmatic operation) which computes, relative to a definite scope, antipresuppositions from weak presuppositional elements with presuppositionally stronger alternatives.

[8] I do not argue for this grammatical treatment of MP on independent grounds; If a non-grammatical account of local exhaustification phenomena turns out to be correct, the grammatical formalization used here may perhaps be interpreted as indicating the scope of a pragmatic or discourse-level operation.

2.5 Distributivity

Sentences with plural or conjoined subjects often give rise to multiple readings, including distributive readings (on which the property expressed by a predicate independently holds of each of the individuals constituting the set, group or plurality expressed by the subject), and collective readings (on which the property holds of the subject referents considered as a plurality, set, or group):

(45) Distributive: John and Mary are tall.
(46) Collective: John and Mary are a couple.

All of the predicates involved in the present tense sentences with plural or conjoined subjects displaying the paradoxical behavior noted above introduce distributive readings:

(47) John and Bill are both very handsome. → Handsome(John) ∧ Handsome(Bill)
(48) #All the American presidents are male. → Male(Barack Obama) ∧ Male(George W. Bush) ∧ ...
(49) 2012 and 2016 are leap years. → Leap-Year(2012) ∧ Leap-Year(2016)
(50) Every Friday this semester is a holiday. → Holiday($Friday_1$) ∧ Holiday($Friday_2$) ∧ **...**

Following Link (1987), Lasersohn (1998), and others, I analyze distributivity as a covert operator (D) which encodes universal quantification over members of collections of entities denoted by a plural or conjoined nominal phrase:

(51) $[\![D]\!] = \lambda S.\lambda P.\forall x \in S[P(x)]$, where S is the set of entities denoted by the plural or conjoined nominal phrase

The distributivity operator introduces universal quantification to the present tense sentences with conjoined subjects:

(52) $[\![\text{John and Bill are tall}]\!]$

$$= [[\![D]\!]([\![\text{John and Bill}]\!])]([\![\text{tall}]\!]([\![\text{PRESENT}]\!](t)))$$

$$= \frac{[[\lambda S.\lambda P.\forall x \in S[P\ (x)]](\{j, b\})]([\lambda t.\lambda x.x \textit{ is tall at } t \wedge x \textit{ is alive at } t](t))}{\varnothing}$$

$$= \frac{[\lambda P.\forall x \in \{j, b\}[P\ (x)]](\lambda x.x \textit{ is tall at } t \wedge x \textit{ is alive at } t))}{\varnothing}$$

$$= \frac{\exists t_1\ [j \textit{ is tall at } t \wedge j \textit{ is alive at } t_1]}{\varnothing} \wedge \frac{\exists t2\ [b \textit{ is tall at } t \wedge b \textit{ is alive at } t_2]}{\varnothing}$$

Crucially, the universal quantification introduced by D may now enter into scope relations with MP. In the next section I will explore the consequences of each possible scope relation on the truth and felicity conditions of sentences with conjoined individual and interval subjects, showing that D>MP scope in sentences with individual subjects but MP>D scope in sentences with interval subjects predicts exactly the pattern of vacuous and non-vacuous behaviors of the present tense observed above.

3. Scope Ambiguity

In any sentence with a covert distributivity operator and a covert presupposition maximization operator (MP), a crucial scope ambiguity arises:

(53) $D[MP[_S \ldots X \ldots]]$
(54) $MP[D[_S \ldots X \ldots]]$

A different behavior is predicted by each of the two possible scope relations. If MP occurs inside the scope of a the distributivity operator in a sentence with a plural subject featuring a weak presuppositional element X with presuppositionally stronger alternatives, one antipresupposition will be computed for each element in the domain of quantification (e.g., for each referent of the plural subject). On the other hand, if MP occurs outside the scope of distributivity, at most one antipresupposition will be computed for the entire sentence:

(55) $D[MP[_S \ldots X \ldots]]$:
$= \forall x \ldots [MP[_S \ldots X \ldots x \ldots]]$
$= MP[_S \ldots X \ldots x_1 \ldots] \wedge MP[_S \ldots X \ldots x_2 \ldots] \wedge MP[_S \ldots X \ldots x_3 \ldots]$
$= \frac{[_S \ldots X \ldots x_1 \ldots]}{\neg P\ ([_S \ldots Y \ldots x_1 \ldots])} \wedge \frac{[_S \ldots X \ldots x_2 \ldots]}{\neg P\ ([_S \ldots Y \ldots x_2 \ldots])} \wedge \frac{[_S \ldots X \ldots x_3 \ldots]}{\neg P\ ([_S \ldots Y \ldots x_3 \ldots])}$

(56) $MP[D[_S \ldots X \ldots]]$:
$= MP[\forall x[_S \ldots X \ldots x \ldots]]$
$= MP[[_S \ldots X \ldots x_1 \ldots] \wedge [_S \ldots X \ldots x_2 \ldots] \wedge [_S \ldots X \ldots x_3 \ldots]]$
$= \frac{[_S \ldots X \ldots x_1 \ldots] \wedge [_S \ldots X \ldots x_2 \ldots] \wedge [_S \ldots X \ldots x_3 \ldots]}{\neg P\ ([_S \ldots Y \ldots x_1 \ldots] \wedge [_S \ldots Y \ldots x_2 \ldots] \wedge [_S \ldots Y \ldots x_3 \ldots])}$

In case the presuppositionally weak element involved is the present tense, the present antipresupposition is predicted to project above conjunction (as observed in sentences with plural or conjoined individual subjects) when D scopes over MP, but not to project (as observed in sentences with plural or conjoined interval subjects) when MP scopes over D:

(57) (John is dead, Bill is alive:) #John and Bill are tall.
(5) (Uttered in 2013:) 2012 and 2016 are leap years.

To illustrate, consider the derivation of the truth and felicity conditions of (58), in which D scoping over MP results in two antipresuppositions: one for each individual in the set of subject referents. Such an interpretation corresponds to a discourse context in which it is presupposed that the time of John's being tall and alive is not in the past and additionally that the time of Bill's being tall and alive is not in the past—in other words, both John and Bill are alive and tall at the time of utterance:

(58) ⟦John and Bill are tall.⟧

$$= [⟦D⟧(⟦\text{John and Bill}⟧)](MP_{ALT(PRESENT)}(⟦\text{tall}⟧(⟦\text{PRESENT}⟧(t))))$$
$$= [[\lambda S.\lambda P.\forall x{\in}S[P(x)]](\{j,b\})](MP_{\{PAST\}}([\lambda t.\lambda x.x \text{ is tall at } t \wedge x \text{ is alive at } t](t)))$$
$$= [\lambda P.\forall x \in \{j, b\}]\ (MP_{\{PAST\}}\ (\exists t\ \frac{(\lambda x.x \text{ is tall at } t \wedge x \text{ is alive at } t)}{\varnothing}))$$
$$= [\lambda P.\forall x \in \{j, b\}]\ \exists t\ \frac{\lambda x.x \text{ is tall at } t \wedge x \text{ is alive at } t}{\varnothing \wedge \neg t < t0}$$
$$= \forall x \in \{j, b\}\ (\exists t\ \frac{\lambda x.x \text{ is tall at } t \wedge x \text{ is alive at } t}{\varnothing \wedge \neg t < t0})$$
$$= \exists t_1\ \frac{j \text{ is tall at } t \wedge j \text{ is alive at } t_1}{\varnothing \wedge \neg t_1 < t_0} \wedge \exists t_2\ \frac{b \text{ is tall at } t \wedge b \text{ is alive at } t_2}{\varnothing \wedge \neg t_2 < t_0}$$
$$= \exists t_1\ \frac{j \text{ is tall at } t \wedge j \text{ is alive at } t_1}{\neg t_1 < t_0} \wedge \exists t_2\ \frac{b \text{ is tall at } t \wedge b \text{ is alive at } t_2}{\neg t_2 < t_0}$$

Based on the two general lifetime inferences resulting from the derivation, both John's and Bill's individual lifetime parameters can be updated to reflect the new information that John and Bill are each alive at the time of utterance:

(59) $j_t \rightarrow j_t$, where $t \nless t_0$

(60) $b_u \rightarrow b_u$, where $u \nless t_0$

This interpretation correctly predicts that if either John or Bill (or both) is not alive at the time of utterance, the sentence will be infelicitous. An interpretation on which MP scopes over D, on the other hand, results in a single antipresupposition (the negation of the conjunction of two separate past presuppositions) and corresponds to a discourse context in which it is presupposed that it is not the case that both the time at which John is tall and alive is past and the time at which Bill is tall and alive is past—in other words, either Bill is tall and alive at the time of utterance, or John is, or they both are (but, critically, both need not be):

(61) ⟦John and Bill are tall.⟧

$$= MP_{ALT(PRESENT)}([⟦D⟧(⟦\text{John and Bill}⟧)](⟦\text{tall}⟧(⟦\text{PRESENT}⟧(t))))$$
$$= MP_{\{PAST\}}([[\lambda S.\lambda P.\forall x{\in}S[P(x)]](\{j,b\})]([\lambda t.\lambda x.x \text{ is tall at } t \wedge x \text{ is alive at } t]([\lambda t.t](t))))$$
$$= MP_{\{PAST\}}([\lambda P.\forall x{\in}\{j,b\}[P(x)]](\ \frac{[\lambda t.\lambda x.x \text{ is tall at } t \wedge x \text{ is alive at } t](t)}{\varnothing}))$$
$$= MP_{\{PAST\}}([\lambda P.\forall x{\in}\{j,b\}[P(x)]](\ \frac{\lambda x.x \text{ is tall at } t \wedge x \text{ is alive at } t}{\varnothing}))$$
$$= MP_{\{PAST\}}(\forall x{\in}\{j,b\}(\ \frac{\exists t[x \text{ is tall at } t \wedge x \text{ is alive at } t]}{\varnothing}))$$
$$= MP_{\{PAST\}}(\ \frac{\exists t_1[j \text{ is tall at } t_1 \wedge j \text{ is alive at } t_1] \wedge \exists t_2[b \text{ is tall at } t_2 \wedge b \text{ is alive at } t_2]}{\varnothing \wedge \varnothing})$$
$$= \frac{\exists t_1[j \text{ is tall at } t_1 \wedge j \text{ is alive at } t_1] \wedge \exists t_2[b \text{ is tall at } t_2 \wedge b \text{ is alive at } t_2]}{\neg(t_1 < t_0 \wedge t_2 < t_0)}$$

Since it is indeterminate based on the truth conditions and presuppositions generated by this interpretation exactly which of John and Bill (if either) has his aliveness not located in the past, no general lifetime inferences can be made. In other words, since all that is derivable is a general restriction on the pair of times at which John and Bill are alive respectively, we cannot decisively conclude about either John or Bill that he is alive at the utterance time, and consequently, no updates to individual lifetime parameters are licensed.

The corresponding interpretation of a sentence with a plural or conjoined interval subject with MP scoped over D, however, generates just one antipresupposition, namely, that not all of the intervals denoted by the subject are past:

(62) ⟦2012 and 2016 are leap years.⟧
$= MP_{ALT(PRESENT)}([⟦D⟧(⟦2012 \text{ and } 2016⟧)](\text{leap-year}(⟦PRESENT⟧(t))))$
...
$= \frac{\exists t_1[2012 \textit{ is a leap year at } t_1] \wedge \exists t_2[2016 \textit{ is a leap year at } t_2]}{\neg(t_1 < t_0 \wedge t_2 < t_0)}$

This interpretation corresponds to a discourse context in which it is presupposed merely that it is not the case that both 2012 and 2016 are past—predicting the sentence to be felicitous when uttered in 2013, which is observed. On the other hand, the interpretation with D scoping over MP predicts two separate antipresuppositions, one for each year, resulting in truth and felicity conditions satisfiable only in a context in which both 2012 and 2016 are past:

(63) ⟦2012 and 2016 are leap years.⟧
$= [⟦D⟧(⟦2012 \text{ and } 2016⟧)](MP_{ALT(PRESENT)}(⟦\text{leap-year}⟧(⟦PRESENT⟧(t))))$
...
$= \exists t_1 \frac{2012 \textit{ is a leap year at } t_1}{\varnothing \wedge \neg t_1 < t_0} \wedge \exists t_2 \frac{2016 \textit{ is a leap year at } t_2}{\varnothing \wedge \neg t_2 < t_0}$

Moreover, since intervals are temporally unenrichable, the two interpretations of the sentence with a conjoined (or plural or universally quantified) interval subject, unlike the two interpretations of the sentence with a conjoined (or plural or universally quantified) individual subject, do not differ with respect to the number of parameter updates they license.

In summary, D>MP scope generates interpretations in which the present antipresupposition projects above subject pluralization, conjunction, or universal quantification. Such presupposition projection is observed in sentences with plural, conjoined, or universally quantified individual subjects, suggesting distributivity scopes over presupposition maximization in sentences with individual subjects. On the other hand, MP>D scope generates interpretations in which the present antipresupposition does not project. Lack of projection is observed in sentences with plural, conjoined, or universally quantified interval subjects, suggesting presupposition maximization scopes over distributivity in sentences with interval subjects. D>MP scope results in two individual lifetime parameter updates, and MP>D scope results in none, when subjects are individuals. Neither scope results in parameter updates when subjects are intervals.

4. The Strongest Meaning Hypothesis

In sentences with individual subjects, the scopal structure which makes the correct predictions about the projection of the present antipresupposition above plurality/conjunction is the one which results in the greatest number of individual lifetime parameter updates. In general, the scope of covert operators is ambiguous; I suggest that a principle of meaning strengthening sensitive to parameter updates forces the scope relation between D and MP which results in the greatest number of updates. In sentences with interval subjects, however, the scopal structure which makes the correct predictions with respect to present antipresupposition projection is the one in which MP is closest to the clause root.

There are independent reasons to suspect that a preferential interpretation principle sensitive to something like informativity is operational in natural language. Dalrymple, et al. (1998) show that the diversity of meanings attributed to reciprocal predicates can be reduced to a simple tendency for predicates to be interpreted with the strongest possible logical meaning consistent with the lexical semantics of the non-reciprocal component of the predicate. Winter (2001) observes that the various interpretations of plural predication which seem to wildly differ in logical strength can be attributed to a slightly more general principle requiring that the strongest possible meaning consistent with the lexical properties of the predicate in question be selected for interpretation. Chierchia, et al. (2008) invoke an analogous principle to account for apparently freely mobile covert exhaustivity operators, suggesting that interpreters are compelled to posit such operators wherever they result in the strongest possible proposition.

I propose that a specialized version of the general principle alluded to above, called the Strongest Meaning Hypothesis (SMH), is responsible for disambiguating scope relations in order to maximize the number of individual lifetime parameter updates:

(64) Strongest Meaning Hypothesis (Specialized Version): If a sentence S is ambiguous between two or more interpretations resulting in different numbers of individual lifetime parameter updates, the interpretation resulting in the greatest number of updates is preferred.

Since sentences with plural or conjoined individual subjects result in multiple present antipresuppositions and thus multiple parameter updates when interpreted with D scoping over MP but only one present antipresupposition and no parameter updates with MP scoping over D, the former interpretation is preferred and the present tense is compatible only with subjects whose referents are all alive at the time of utterance. On the other hand, since sentences with plural or conjoined interval subjects result in no parameter updates regardless of the location of MP and D, maximization is performed in a default root position, resulting in the compatibility of the present tense with subjects at least some of whose referents (but not all) must be non-past.

	D > MP	**MP > D**
Individual	<u>2</u>	0
Interval	0	<u>0</u>

(4) (John is dead, Bill is alive:) #John and Bill are both very handsome.
(2) (Some of my uncles are alive and some are not:) #All of my uncles are blond.
(8) (Uttered in the middle of the month:) Every Tuesday this month I fast.
(5) (Uttered in 2013:) 2012 and 2016 are leap years.[9]

In summary, the scope relation between the two covert operators D (distributivity) and MP (presupposition maximization) is ambiguous. A strengthening principle based on the Strongest Meaning Hypothesis forces the listener to choose the scope relation which results in the greatest number of individual lifetime parameter updates. In sentences with plural individual subjects, since D>MP results in more parameter updates than MP>D, the former scope is preferred, while sentences with plural interval subjects never yield parameter updates and thus are interpreted with MP in its default clause-root position.

5. Summary & Conclusion

Sauerland's (2002) present tense vacuity hypothesis explains some vacuous behaviors of the present tense, but it fails to predict the infelicity of the present tense with mixed past and non-past individual subjects. I maintain that the present tense is vacuous and that the infelicity of the present in sentences with plural or conjoined individual subjects is due to the interaction of an individual lifetime parameter on individuals with a principle of preferential interpretation analogous to the Strongest Meaning Hypothesis.

While intervals are inherently temporally specified, individuals are inherently temporally *under*specified but enrichable on the basis of new information, including lifetime inferences. I suggest that attached to the semantic representation of each individual is a parameter consisting of an interval or a restriction on intervals which reflects speaker knowledge about the interval over which the individual is alive:

(65) John = j_t, Bill = b_u

The Strongest Meaning Hypothesis has been independently proposed to account for data suggesting that when a listener can assign a sentence more than one meaning, the logically strongest one must be chosen. I propose an analogous principle sensitive to parameter updates: An utterance compatible with two or more interpretations must be interpreted as expressing the

[9] In past tense sentences with plural or conjoined individual subjects, MP is inactive since there is no weak presuppositional element from which to compute tense antipresuppositions. SInce the past tense directly presupposes the priority of the predication time to the time of utterance, both wide-scope and narrow-scope MP interpretations result in one lifetime inference and one individual lifetime parameter update for each subject referent; as a result of the stalemate with respect to the Strongest Meaning Hypothesis, MP is interpreted in its default clause-root position.
Similarly, since intervals do not have lifetime parameters, the specialized version of the Strongest Meaning Hypothesis is indifferent with respect to the narrow-scope and wide-scope MP interpretations of a sentence with a plural or conjoined interval subject, and again MP is interpreted in its default clause-root position.

proposition which results in the greatest number of parameter updates. Since interpretations of sentences with plural or conjoined individual subjects which result in multiple present antipresuppositions generate the greatest number of parameter updates, the present tense is compatible only with subjects whose referents are all alive at the time of utterance. Due to the presence of mandatorily updated lifetime parameters on all individuals, this version of the Strongest Meaning Hypothesis forces D>MP readings of present-tense plural-individual-subject sentences. The computation of a present antipresupposition for each subject referent results in non-vacuous behavior of the present tense.

(57) (John is dead, Bill is alive:) #John and Bill are tall.
(2) (Only some of my uncles are alive:) #All of my uncles are blonde.

In contrast, since intervals lack lifetime parameters, the Strongest Meaning Hypothesis is inactive and MP is interpreted in its default global position in sentences with plural interval subjects. The computation of a single present antipresupposition over the conjunction of all subject referents results in vacuous behavior of the present tense.

(5) (Uttered in 2013:) 2012 and 2016 are leap years.
(66) (Uttered in the middle of the week:) Every day this week is a holiday.

The main contribution of the present paper is to point out a systematic difference between sentences in which the present tense behaves vacuously and those in which it does not: In sentences about individuals with lifetimes, the present tense tends to display non-vacuous behavior, and in sentences about time intervals, the present tense tends to display vacuous behavior. I have shown that the apparent irreconcilability of the two behaviors with both traditional theories and theories on which the present tense is vacuous can be resolved by admitting a formal realization of the distinction between intervals and individuals based on lifetimes and, with some assumptions about the status of distributivity and presupposition maximization as covert operators with flexible scope, looking more closely at the effects of scope on a particular type of informativity. Whether those assumptions are correct remains to be seen, but any theory of the present tense in English must account for the robust correlations between interval and individual subjects and vacuous and non-vacuous behaviors of the present tense, respectively.

Finally, while I have maintained the vacuity of the present tense and explained its non-vacuous behaviors as resulting from a complex set of interactions among a set of independent facts and principles, the opposite approach has been taken: Namely, to maintain the traditional meaning of the present tense and explain its *vacuous* behaviors as resulting from independent principles and facts. In particular, Thomas (2012) suggests that the sentences displaying vacuous behaviors of the present tense which Sauerland's (2002) proposal is intended to explain can in fact be analyzed as futurates or habituals, where futurate and habitual constructions include aspectual operators which introduce vacuous-like (but not actually vacuous) temporal meanings.

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