# *Want* comparatives and the natural language metaphysics of desire

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- **Note:** This is an extended version of a handout for a talk given at the MIT Syntax-Semantics Reading Group (LFRG) on March 15th, 2017. (Section 5 was excluded from original.)

## 1 Introduction

- Bach (1986): Model-theoretic semantics requires a *natural language metaphysics*.
  - "What kinds of things and relations among them does one need in order to exhibit the structure of meanings that natural languages seem to have?" (Bach 1986: 573)
- Some examples: possible worlds, events, plural individuals, degrees, kinds
- **Proposal:** A natural language ontology of desire states (and a semantics of *want* to go with it) in which intensity of desire correlates with part-whole structure in a particular dimension.[1] Based on two independent observations from earlier work:
  - **First:** *want* can appear in verbal comparatives such as (1–2), comparing the intensity of two desires (Villalta 2008; Lassiter 2011a, 2011b):

(1) Ann wants Sara to leave {more than/as much as/less than} she wants Jesse to leave.

(2) Ann wants to leave more than Mary wants to stay.

  - **Second:** The measure functions in verbal comparatives track part-whole relations. Hence (3) can compare distance or time, but not speed: big running events cover more distance and time than their smaller parts, but not necessarily greater speed.

(3) Ann ran more than Mary did.

- If (i) *want* comparatives are verbal comparatives, (ii) they compare intensity of desires, and (iii) measure functions for verbal comparatives must track part-whole relations of eventualities, then it must be that intensity of desire tracks part-whole relations of desire states.

[1] A disambiguation: I use "state" in a neo-Davidsonian sense, rather than in the sense commonly used in the literature on dynamic semantics and epistemic modals. (I.e., think "state" as in "stative," not "state" as in "information state.")

- **The plot:**
  - Section 2: Discuss a constraint on certain nominal and verbal measurement constructions, including comparatives
  - Section 3: A bird's-eye view of the proposal
  - Section 4: Incorporate world-ordering and quantification
  - Section 5: Mutually incompatible desires (and premise semantics)

## 2 Monotonicity in nominal and verbal measurement constructions

### 2.1 Monotonic measure functions

- Certain measure functions seem to respect part-whole relations of entities in a way that others don't.
  - A big chunk of gold weighs more than any of its proper gold-parts, but it's not necessarily any purer.
  - A collection of water has a greater volume than any of its proper water-parts, but not necessarily a higher (or lower) temperature.
- Now consider the depth of a collection of snow. There's a sense in which depth is like mass and volume, and a sense in which it's not.
  - Not every bit of snow necessarily has a greater depth than its proper parts (take the snow in East Baltimore vs. the snow in all of Baltimore).
  - But if we only look at a particular, *salient* part-whole relation (namely, that between horizontal "layers" of snow and their sums), part-whole relations are tracked.
- Let's put all these measure functions (mass, volume, depth, etc.) under one umbrella.

(4) Let $\mu$ be a measure function, $A$ a domain of entities, and $\sqsubseteq^c$ a contextually salient part-whole relation.
  a. $\mu$ is **monotonic** on $\sqsubseteq^c$ in $A$ iff for all $x, y \in A$, $x \sqsubset^c y$ entails that $\mu(x) < \mu(y)$.
  b. $\mu$ is **non-trivially monotonic** on $\sqsubseteq^c$ in $A$ iff $\mu$ is monotonic on $\sqsubseteq^c$ in $A$, and there exists some $x, y \in A$ such that $x \sqsubset^c y$.

- As we will see, the notion of a monotonic measure function (on a part-whole relation, in a domain) is relevant to the grammar.

### 2.2 Pseudopartitives and durative adverbials

- Krifka (1989) and Schwarzschild (2002, 2006) on pseudopartitives:

(5) a. i. five ounces of gold
  ii. # twenty-four carats of gold
  b. i. three liters of water

ii. # 30°C of water

- Krifka (1989): parallel between pseudopartitives and durative adverbials like *for an hour*:

(6) a. i. Ann sang for an hour.
ii. # Ann sang for 90 decibels.
(Events of singing last longer than their singing-parts, but not necessarily louder.)

b. i. Ann drove for ten miles.
ii. # Ann drove for thirty miles per hour.
(Events of driving go farther than their driving-parts, but not necessarily faster.)

- Schwarzschild: not only do some measurement constructions require the use of monotonic measure functions, but some require the use of *non*-monotonic measure functions, such as measure-noun compounds:

(7) a. i. # five-ounce gold
ii. twenty-four-carat gold
b. i. # three-liter water
ii. 30°C water

- This also accounts for the difference between (8a) and (8b), the latter of which requires that each cherry be huge. (Weight is monotonic on $\sqsubseteq$ in $[\![$cherries$]\!]$, weight per cherry is not.)

(8) a. five pounds of cherries
b. five-pound cherries

- In summary, it looks like the grammar has access to information about the (non-)monotonicity of measure functions (on a part-whole structure, in a domain).

### 2.3 Nominal and verbal comparatives

- Schwarzschild notes that requirements about monotonicity also extend to nominal comparatives (see also Bale & Barner 2009, Wellwood 2015):

(9) Baltimore got more snow than Williamstown did.
**Available comparisons:** depth, overall volume
**Unavailable comparisons:** temperature, beauty, purity

(10) Ann bought more coffee than Mary did.
**Available:** weight, volume
**Unavailable:** strength, temperature

(11) Ann ate more pudding than Mary did.
**Available:** weight, volume
**Unavailable:** viscousness, flavorfulness

- Recent work has shown that this monotonicity requirement holds for verbal comparatives as well (Nakanishi 2007, Wellwood et al. 2012, Wellwood 2015):

(12) Ann ran more than Mary did.
**Available:** time, distance
**Unavailable:** speed, peak acceleration, properness of form

(13) Wallace's car accelerated more than Gromit's did.
**Available:** time, change of speed
**Unavailable:** initial/final speed, rate of change in speed, difficulty

(14) Lou's coffee cooled more than Eddie's did.
**Available:** time, downward change in temperature
**Unavailable:** initial/final temperature, rate of decrease in temperature

- Assuming that the denotations of nouns and VPs are predicates of entities and eventualities, respectively, this leads to the generalization in (15):

(15) Schwarzschild's Generalization (SG): Nominal/verbal comparatives can only use measure functions that are non-trivially monotonic on $\sqsubseteq^c$ in the domain given by the noun/VP.

### 2.4 Summary

- Monotonicity is a crucial feature of nominal and verbal comparatives.
- Since *want* comparatives are verbal comparatives comparing intensity of desire, intensity must be monotonic over some salient part-whole relation of desire states.

## 3 *Want* comparatives: A bird's-eye view

### 3.1 Semantic Assumptions

- As previously stated, denotations of VPs are event predicates. Internal arguments are semantic arguments of the verb, while external arguments are not, instead being added by a higher voice head responsible for assigning the external argument $\theta$-role (cf. Kratzer 1996).
- Note: I ignore matrix clause intensionality for convenience.

(16) $[\![\text{want}]\!] \approx \lambda p \lambda e.\ e$ is a state of wanting $p$

(17) $[\![\text{Ann wants } p]\!] = \exists e[\textsc{in}(e, w) \wedge \textsc{Exp}(e, a) \wedge [\![\text{want}]\!](p)(e)]$

- In context $c$, *Ann* $VP_1$ *more than Mary* $VP_2$ is true iff there is an Ann-$\text{VP}_1$ing eventuality that exceeds by contextually-determined $\mu^c$ any Mary-$\text{VP}_2$ing eventuality.
- More formal representation below. $\Theta$ is $\theta$-role of external argument (agent/experiencer/etc.). Presupposition is SG. (See Wellwood 2015 for one implementation of compositionality.)

(18) $[\![\text{Ann VP}_1 \text{ more than Mary VP}_2]\!]^c =$

a. Assertion:
$\exists e[\Theta_1(e, a) \wedge [\![\text{VP}_1]\!](e) \wedge \mu^c(e) > \max(\{d \mid \exists e'[\Theta_2(e', m) \wedge [\![\text{VP}_2]\!](e') \wedge \mu^c(e') \geq d]\})]$

b. PRESUPPOSITIONS:
$\forall e, e' \in [\![\text{VP}_1]\!][e \sqsubset^c e' \rightarrow \mu^c(e) < \mu^c(e')]$
$\forall e, e' \in [\![\text{VP}_2]\!][e \sqsubset^c e' \rightarrow \mu^c(e) < \mu^c(e')]$

(19) $[\![\text{Ann wants } p \text{ more than Mary wants } q]\!]^c =$

a. ASSERTION:
$\exists e[\text{Exp}(e, a) \wedge [\![\text{want}]\!](p)(e) \wedge \mu^c(e) >$
$\max(\{d \mid \exists e'[\text{Exp}(e', m) \wedge [\![\text{want}]\!](q)(e') \wedge \mu^c(e') \geq d]\})]$

b. PRESUPPOSITIONS:
$\forall e, e' \in [\![\text{want}]\!](p)[e \sqsubset^c e' \rightarrow \mu^c(e) < \mu^c(e')]$
$\forall e, e' \in [\![\text{want}]\!](q)[e \sqsubset^c e' \rightarrow \mu^c(e) < \mu^c(e')]$

### 3.2 The structure of desire states

- Desire states extend in two dimensions: "horizontally" (time), and "vertically" (intensity).
- Extension through time is obvious (and required for tense/aspect), and also verified by acceptability of (20):

(20) For three hours, Heinrich wanted to leave the party.

- Before talking about two dimensions, let's talk about one: time. At its simplest, a timeline can be thought of as an ordered set of moments in time.
- Let's situate an event—say, an event of running by Ann—on that timeline:

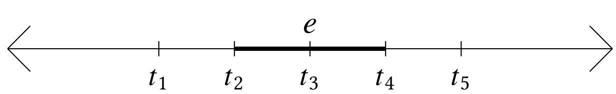



Figure 1: Ann's running event, situated in time

- The set of moments $\tau(e)$ that $e$ spans: $e$'s **temporal trace**.
- Notice that $\tau(e)$ is not the same as $e$'s temporal duration: the amount of time that Ann ran is not the same thing as the set of moments during which she ran.
- But there's a relationship between $\mu_{\text{dur}}$(e)—$e$'s duration—and $\tau(e)$.
  - If two events both go from 2PM to 4PM (and thus have the same temporal trace), they have the same duration (2 hours).
  - If one event goes from 2PM to 4PM, and another goes from 2PM to 5PM, the latter has a greater duration (3 hours > 2 hours).
- So we can talk about time in three (relevant) ways: moments ($t_1$), intervals ($[t_2, t_4]$), and degrees of duration (2 hours).
- Back to two dimensions. *want* comparatives involve comparing degrees of intensity ($\mu_{\text{int}}(e)$). So intensity is to the vertical dimension what temporal duration is to the horizontal.

- So we have a vertical analog to duration. What about moments and intervals? Let's give a vertical analog for each.
  - The vertical "timeline": a set of **altitudes** ($k_0$, $k_1$, etc.) ordered by $\leq_K$.
  - Temporal intervals ⇒ **vertical intervals** (e.g., $[k_1, k_3]$).
- A desire state *e* doesn't just occupy an interval of time, but a space on a Cartesian coordinate system (i.e., a set of moment-altitude pairs):

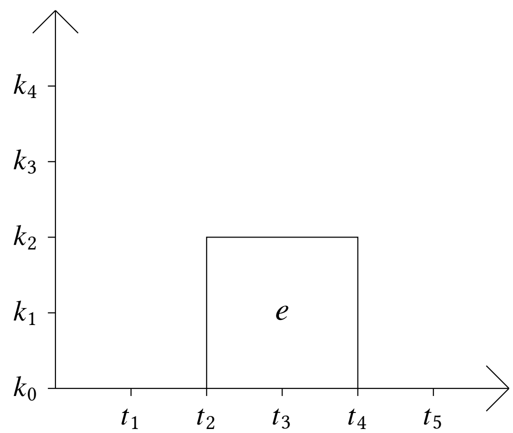



Figure 2: Ann's desire state, situated horizontally and vertically

- $\pi(e)$: set of pairs that *e* occupies. So in Fig. 2, $\pi(e) = \{(t, k) \mid t \in [t_2, t_4] \wedge k \in [k_0, k_2]\}$.
- From $\pi(e)$ we can redefine $\tau(e)$ (temporal trace), and define $\kappa(e)$, *e*'s **vertical span**:

(21) a. $\tau(e) = \{t \mid \exists k[(t, k) \in \pi(e)]\}$
b. $\kappa(e) = \{k \mid \exists t[(t, k) \in \pi(e)]\}$

- Finally, we say that $\mu_{\text{int}}$ and $\kappa$ are related in the same way that $\mu_{\text{dur}}$ and $\tau$ are.

### 3.3 Back to comparatives

- Let's go back to *Ann wants p more than Mary wants q*.
  - Let $e_{\text{Ann}}$ be Ann's maximal current desire state, and $e_{\text{Mary}}$ Mary's.
  - Assume $e_{\text{Ann}}$ is a state of wanting *p*, and likewise for $e_{\text{Mary}}$ and *q*. Finally, assume that $e_{\text{Ann}}$ and $e_{\text{Mary}}$ look as in Figure 3.
- Let's evaluate, assuming that the contextually-determined measure function is $\mu_{\text{int}}$:

(22) $[\![\text{Ann wants } p \text{ more than Mary wants } q]\!]^c =$

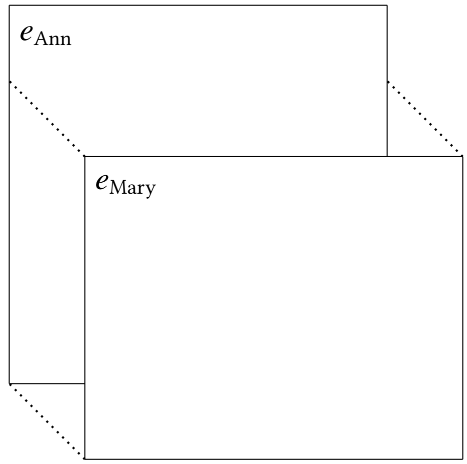



Figure 3: Diagram of Ann's and Mary's desire states

a. ASSERTION:
$\exists e[\text{Exp}(e, a) \wedge [\![\text{want}]\!](p)(e) \wedge \mu_{\text{int}}(e) >$
$\max(\{d \mid \exists e'[\text{Exp}(e', m) \wedge [\![\text{want}]\!](q)(e') \wedge \mu_{\text{int}}(e') \geq d]\})]$

b. PRESUPPOSITIONS:
$\forall e, e' \in [\![\text{want}]\!](p)[e \sqsubset^c e' \rightarrow \mu_{\text{int}}(e) < \mu_{\text{int}}(e')]$
$\forall e, e' \in [\![\text{want}]\!](q)[e \sqsubset^c e' \rightarrow \mu_{\text{int}}(e) < \mu_{\text{int}}(e')]$

- Assuming $\kappa$ and $\mu_{\text{int}}$ have the sort of relationship discussed above, the assertion will be true: $\kappa(e_{\text{Ann}}) \supset \kappa(e_{\text{Mary}})$, so $\mu_{\text{int}}(e_{\text{Ann}}) > \mu_{\text{int}}(e_{\text{Mary}})$. So Ann's state of desiring $p$ exceeds by $\mu_{\text{int}}$ any state of Mary's desiring $q$: Ann wants $p$ more than Mary wants $q$.
- As for the presuppositions, both come out as satisfied so long as $\sqsubseteq^c$ works like layers of snow, relating horizontal strips of desire states to sums of such horizontal strips.

### 3.4 Interaction between *want* and part-whole structure

- $[\![\text{want}]\!]$ works by breaking up a desire state into tiny parts (with very small temporal trace and very small vertical span). Let's call these tiny sub-states of a state $e$ **point-states** of $e$, and let $\text{PT}(e)$ be the set of point-states of $e$. A diagram can be seen in Fig. 4.

- $[\![\text{want}]\!]$ interacts with the part-whole structure of a desire state $e$ by $\forall$-quantifying over $\text{PT}(e)$. So if WANT is everything else in the denotation, $[\![\text{want}]\!]$ will be as follows:

(23) $[\![\text{want}]\!] = \lambda p \lambda e.\ \forall e' \in \text{PT}(e)[\text{WANT}(p)(e')]$

- Any independent evidence for such breaking-up and quantifying? Yes, at least horizontally, from temporal interpretation of embedded clause.

(24) (At 8PM,) Heinrich wanted to leave the party immediately.
ROUGH TRANSLATION: There was a desire state $e$ (at 8PM), with experiencer Heinrich, that was a state of wanting to leave immediately after $\tau(e)$.

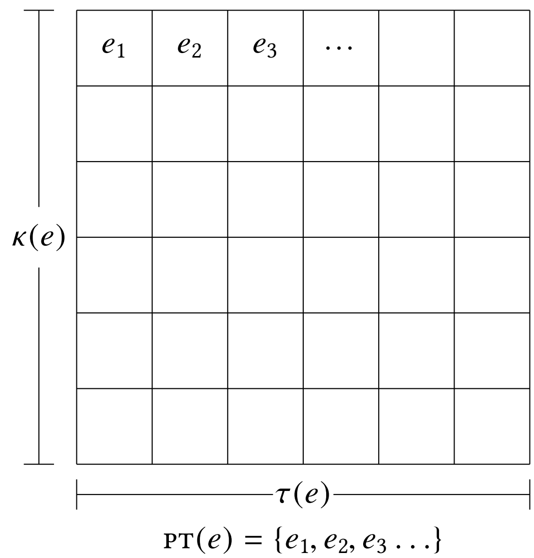



Figure 4: Illustration of point-states

(25) For three hours, Heinrich wanted to leave the party immediately.

a. Wrong translation: There was a three-hour desire state $e$, with experiencer Heinrich, that was a state of wanting to leave immediately after $\tau(e)$. (True if Heinrich's desire from 8PM to 11PM was that he leave at 11:01PM.)

b. Better translation: There was a three-hour desire state $e$, with experiencer Heinrich, s.t. every (near-)momentary substate $e'$ of $e$ was a state of wanting to leave immediately after $\tau(e')$. (True if Heinrich's desire at 8 was to leave at 8:01, at 9:36 was to leave at 9:37, etc. As a result, the desired proposition changes over the course of the desire state.)

- I'm not dealing with tense here, so I won't incorporate the "shifting goal-posts" of the embedded clause.
- The point is the universal quantification over very brief sub-states. The further dicing-up into chunks with very small vertical spans is rendered at least plausible by parallelism (though I see no direct arguments for/against it).
- How small are point-states? I'll jump to the extreme and will say they occupy just one moment and one altitude; slightly bigger point-states are not inherently problematic.

(26) $e/(t,k) = \iota e' \sqsubseteq e[\pi(e') = \{(t,k)\}]$[2]

(27) $\textsc{pt}(e) = \{e/(t,k) \mid (t,k) \in \pi(e)\}$

- Okay, but why is this relevant? To see why, let's look at a case where just one experiencer is at play (e.g., *Ann wants p more than she wants q*).

[2] I'm assuming that the $\iota$ operator ends up being well-defined (i.e., each desire state has exactly one part occupying a given moment-altitude pair). If this is not the case, we can replace $\iota$ with Link's (1983) $\sigma$ operator, which would return the *maximal* such sub-state.

### 3.5 The Upward Subset Constraint

- Ann's about to go on vacation. She wants to be fiscally responsible (RESPONSIBLE), she wants to go to the Bahamas (BAHAMAS), and she wants to eat caviar (CAVIAR). She wants these in decreasing order of intensity. All three are mutually compatible.
- We can think of Ann's desire state as having three big parts:
  - **Lower altitudes:** Ann wants all three propositions at each point-state.
  - **Medium altitudes:** Ann just wants RESPONSIBLE and BAHAMAS at each point-state.
  - **High altitudes:** Ann just wants RESPONSIBLE at each point-state.

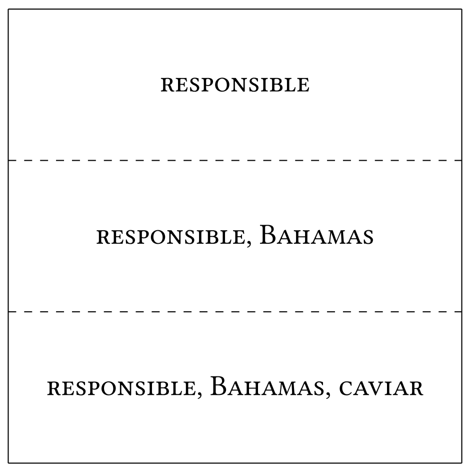
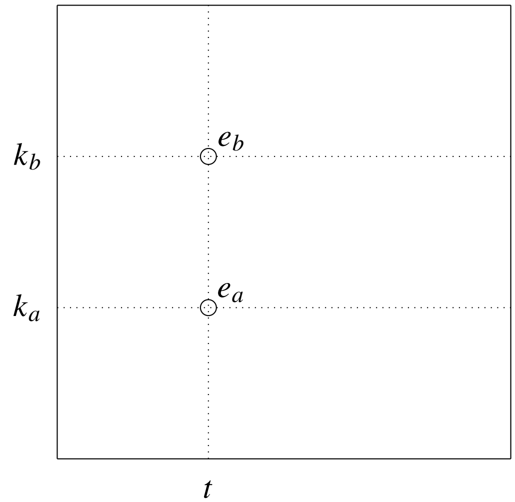



Figure 5: Diagram of Ann's current desire state

- Largest Ann-wanting-CAVIAR state is the lowest third, largest Ann-wanting-BAHAMAS state is the lowest two thirds, and largest Ann-wanting-RESPONSIBLE state is whole state.
- This gets us what we want: Ann's maximal wanting-RESPONSIBLE state exceeds by $\mu_{\text{int}}$ her maximal wanting-BAHAMAS state, which exceeds her maximal wanting-CAVIAR state.
- So Ann wants to be fiscally responsible more than she wants to eat caviar.

(28) UPWARD SUBSET CONSTRAINT (USC):
If $k_a \leq_{\text{K}} k_b$, and if $e_a = e/(t, k_a)$ and $e_b = e/(t, k_b)$ for some desire state $e$ and moment $t \in \tau(e)$, then $\{p \mid \text{WANT}(p)(e_b)\} \subseteq \{p \mid \text{WANT}(p)(e_a)\}$.

- Notice that the USC is not a *grammatical* constraint (in the broad sense), but a constraint on our *model*: it is a (natural language) metaphysical principle.




$\{p \mid \text{WANT}(p)(e_b)\} \subseteq \{p \mid \text{WANT}(p)(e_a)\}$

Figure 6: Illustration of the Upward Subset Constraint

# 4 A Hintikkan WANT, and a USC to match

## 4.1 Defining WANT: von Fintel 1999

- Time to define WANT. My WANT is built around von Fintel's (1999) proposed semantics for *want*, which is itself based on Kratzer's (1981, 1991) work on modality.
- Kratzer: modals rely on two contextually determined backgrounds.
  - **modal base** ($f$): function from worlds to sets of "viable" candidate worlds (**modal domain**). (NB: This is slightly different from Kratzer's formulation in ways that are irrelevant for us.)
  - **ordering source** ($g$): function from worlds to sets of propositions used to generate an ordering over worlds.

(29) $u \precsim_Q v$ iff $\{p \in Q \mid p(u)\} \supseteq \{p \in Q \mid p(v)\}$

(30) $[\![\text{must}]\!]_{\text{Kratzer}} = \lambda p \lambda w.\ \forall u \in \textsc{Best}(\precsim_{g(w)}, f(w))[p(u)]$
(where $\textsc{Best}(\precsim, A) = \{u \in A \mid \neg\exists v \in A[v \prec u]\}$)[3]

- von Fintel's (1999) *want*, and the basis for my WANT (where $\text{Dox}(x, w)$ is set of worlds compatible with $x$'s beliefs in $w$, and $g(x, w)$ is $x$'s priorities in $w$):

(31) $[\![x \text{ wants } p]\!]_{\text{von Fintel}} = \lambda w : \exists u, v \in \text{Dox}(x, w)[p(u) \wedge \neg p(v)].$
$\forall u \in \textsc{Best}(\precsim_{g(x,w)}, \text{Dox}(x, w))[p(u)]$

- (Presupposition is to avoid inference from $x$ *believes that* $p$ to $x$ *wants* $p$.)

[3] I adopt the limit assumption, though nothing in Kratzer's proposal (or von Fintel's, or my own) necessitates it.

- Definition of WANT, adjusted to fit our event semantics, below (where $\text{Dox}(e)$ is set of worlds compatible with beliefs of experiencer of $e$). I put aside for now how world-ordering is generated, so I will just write $\lesssim_e$ for the world-ordering generated at $e$.

(32) $\text{WANT} = \lambda p \lambda e : \exists u, v \in \text{Dox}(e)[p(u) \wedge \neg p(v)].\ \forall w \in \textsc{Best}(\lesssim_e, \text{Dox}(e))[p(w)]$

(33) $[\![\text{want}]\!] = \lambda p \lambda e : \forall e' \in \textsc{pt}(e)[\exists u, v \in \text{Dox}(e')[p(u) \wedge \neg p(v)]].$
$\forall e' \in \textsc{pt}(e)[\forall w \in \textsc{Best}(\lesssim_{e'}, \text{Dox}(e'))[p(w)]]$

- In short: $e$ is a state of wanting $p$ iff at every point-state $e' \in \textsc{pt}(e)$, all $\lesssim_{e'}$-ideal worlds are $p$ worlds. I will ignore the presupposition from here on out, redefining $[\![\text{want}]\!]$ as follows:

(34) $[\![\text{want}]\!] = \lambda p \lambda e.\ \forall e' \in \textsc{pt}(e)[\forall w \in \textsc{Best}(\lesssim_{e'}, \text{Dox}(e'))[p(w)]]$

### 4.2 A USC for our WANT

- We now have our semantics for *want*. We next have to go back to the metaphysics and rearticulate the USC in terms of the new WANT.
- Let's put aside eventualities and part-whole structure for a bit, and just talk in terms of world-orderings.
- Common view of gradable intensionality: comparison of desirability involves looking at *non*-ideal worlds as well as ideal ones.
- Let's say Ann orders worlds as in (35) (more ideal worlds toward top). So she wants RESPONSIBLE, BAHAMAS, and CAVIAR.

(35)
a. RESPONSIBLE, BAHAMAS, CAVIAR
b. RESPONSIBLE, BAHAMAS, −CAVIAR
c. RESPONSIBLE, −BAHAMAS, CAVIAR
d. RESPONSIBLE, −BAHAMAS, −CAVIAR
e. −RESPONSIBLE, BAHAMAS, CAVIAR
f. −RESPONSIBLE, BAHAMAS, −CAVIAR
g. −RESPONSIBLE, −BAHAMAS, CAVIAR
h. −RESPONSIBLE, −BAHAMAS, −CAVIAR

- Question: Which does Ann want more, RESPONSIBLE or CAVIAR? Answer: Look at slightly-less-than-ideal worlds (35b). RESPONSIBLE still holds throughout, but not CAVIAR.
- Easier for a −CAVIAR world to count as "near-ideal" than a −RESPONSIBLE world, so Ann wants RESPONSIBLE more than CAVIAR.
- Another method: don't peer down at slightly sub-ideal worlds, drag those worlds up. E.g., we might collapse the distinction between CAVIAR and −CAVIAR worlds, as in (36):

(36)
a. RESPONSIBLE, BAHAMAS
b. RESPONSIBLE, −BAHAMAS

c. −responsible, Bahamas

d. −responsible, −Bahamas

- Notice, no leap-frogging: no world is now better than a world it used to be worse than.
- caviar no longer holds in all ideal worlds (36a); however, responsible (and Bahamas) still do. So Ann wants responsible (and Bahamas) more than caviar.
- Each method also works for responsible and Bahamas.
  - First method: look at (35). We have to go to (35c) to find −Bahamas worlds, but all the way to (35e) for −responsible. So Ann wants responsible more than Bahamas.
  - Second method: collapse (36) to (37), removing distinction between Bahamas and −Bahamas worlds. responsible still holds in all ideal worlds, while Bahamas doesn't, so Ann wants responsible more than Bahamas.

(37) a. responsible

b. −responsible

- Relevance? WANT—and thus ⟦want⟧—can't "peer down" at sub-ideal worlds; only looks at ideal worlds. So first method is unavailable, but second method is still available.
- New USC: WANT still ∀-quantifies over ideal worlds. But at higher point-states, ordering gets more squished (dragging worlds up to ideal). More worlds are ideal ⇒ fewer propositions hold in all ideal worlds. So at higher point-states, WANT holds of fewer propositions.

(38) Upward Subset Constraint (World-Quantification Version):
If $k_a \leq_K k_b$, and if $e_a = e/(t, k_a)$ and $e_b = e/(t, k_b)$ for some desire state $e$ and moment $t \in \tau(e)$, then:

a. $\mathrm{Dox}(e_a) = \mathrm{Dox}(e_b)$, and

b. $\precsim_{e_b}$ is at least as coarse as $\precsim_{e_a}$.

(39) a. If $\precsim_1$ and $\precsim_2$ are preorders over the same set of worlds, then $\precsim_1$ is **at least as coarse** as $\precsim_2$ iff the following two conditions hold for all worlds $u$ and $v$ in the domains of $\precsim_1$ and $\precsim_2$:

i. If $u \prec_1 v$, then $u \prec_2 v$.

ii. If $u \parallel_1 v$, then $u \parallel_2 v$. ($u \parallel v$ iff $u \not\precsim v$ and $v \not\precsim u$)

b. $\precsim_1$ is **coarser** than $\precsim_2$ iff $\precsim_1$ is at least as coarse as $\precsim_2$, but not vice versa.

c. $\precsim_1$ is **at least as fine-grained** as $\precsim_2$ iff $\precsim_2$ is at least as coarse as $\precsim_1$. $\precsim_1$ is **more fine-grained** than $\precsim_2$ iff $\precsim_2$ is coarser than $\precsim_1$.

## 5 Incompatible desires

### 5.1 Juggling viewpoints

- Obvious fact: We can have mutually incompatible desires. Here's a scenario, heavily modified from Portner & Rubinstein (2016):

> Imagine that Mary has just been sworn in as mayor of Hometown, USA. Furthermore, by a quirk of the organizational structure of Hometown, the mayor has completely unchecked power with respect to what projects in town get greenlit. When Mary was campaigning for mayor, she made two sincere promises to her constituents: (i) that she would protect the endangered population of local Hometown frogs, and (ii) that she would draw more tourists to Hometown. Now suppose that according to Mary's beliefs, in order to protect the frogs, the wetlands have to be preserved, but in order to draw more tourists, the wetlands have to be drained so that a hotel can be built. In other words, protecting the frogs and drawing more tourists are not mutually compatible.

- In this case, Mary's desires upon being sworn in as mayor might be as in (40).

(40) a. Mary wants to preserve the wetlands.
  b. Mary wants to build the hotel.
  c. Mary wants to preserve the wetlands more than she wants to build the hotel.
  d. All things considered, Mary wants to preserve the wetlands.
  e. All things considered, Mary does not want to build the hotel (and wants to not build the hotel).

- Since building the hotel and preserving the wetlands are mutually incompatible (w.r.t. Mary's beliefs), there can be no set of ideal worlds in which both hold throughout. So in order for (40a) and (40b) to both be true, there must be two different sets of ideal worlds.
- There are many ways this can be done. Here's a non-exhaustive list:
  - **Guises:** Landman (1989): properties can be ascribed to individuals *in view of certain other properties they have*:

    (41) a. John is thoroughly corrupt, but as a judge he is trustworthy.
      b. Sir Hugh Calvin, as a judge, and Sir Hugh Calvin, as a private citizen, have different opinions.

    - (40a): desires of Mary-as-environmental-activist.
    - (40b): desires of Mary-as-economic-reformer.
    - (40d–40e): desires of Mary-as-[environmental activist ∩ economic reformer ∩ other properties of hers].
  - **Bits of mind:** Mary's mind is divisible into parts, each having a different desire state.

    (42) Part of me wants to preserve the wetlands, and part of me wants to drain them and build the hotel.

    - (40d–40e): some mereological operation (sum, group) on Mary's bits of mind.
  - **Desires about situations:** Kratzer (2002) on beliefs: they are about situations. Similarly, it might be that desires are about situations.
    - (40a): Mary's desires w.r.t. a situation including environmentalists protesting at her house, doomsaying scientists, etc.

    - (40b): Mary's desires w.r.t. a situation containing the government's dwindling bank accounts, local businesses closing, etc.
    - (40d–40e): Mary's desires w.r.t. a larger situation containing both aforementioned situations.

- I don't want to choose between these (or some alternative option). So let's abstract away from the particulars and see what they have in common.

  – Objects in view of which desires are evaluated (properties, bits of mind, situations).
  – A way of combining the in-view-of-which objects to negotiate conflicts (intersecting properties, sum/group formation of bits of mind, situation combination).
  – An ordering of those objects by "overallness" (subset/superset properties, bigger bits of mind/groups of bits of mind, larger situations).

- Abstract representations of these:

  – A set $V$ of **viewpoints** from which desires are evaluated. ($\alpha$: variable over viewpoints)
  – An operation $\oplus$ to combine viewpoints ($\alpha_a \oplus \alpha_b$)
  – An ordering $\leq_V$ over viewpoints ($\alpha_a, \alpha_b \leq_V \alpha_a \oplus \alpha_b$)

- New denotation of *want*, minus unchanged presupposition (where $\text{Vw}^c \subseteq V$ is a contextually-determined set of viewpoints, and $\textsc{from}(e, \alpha) = 1$ iff $e$ is from viewpoint $\alpha$):

(43) $[\![\text{want}]\!]^c = \lambda p \lambda e.\ \exists \alpha \in \text{Vw}^c[\textsc{from}(e,\alpha)] \wedge \forall e' \in \textsc{pt}(e)[\forall w \in \textsc{Best}(\precsim_{e'}, \textsc{Dox}(e'))[p(w)]]$

- $\alpha_{\text{env}}$ is M's environmental viewpoint and $\alpha_{\text{fin}}$ her financial viewpoint; $\text{Vw}^c = \{\alpha_{\text{env}}, \alpha_{\text{fin}}\}$.
- $e_{\text{env}}$ is the largest current state s.t. $\textsc{Exp}(e, m)$ and $\textsc{from}(e_{\text{env}}, \alpha_{\text{env}})$. Likewise for $e_{\text{fin}}$ and $\alpha_{\text{fin}}$.
- $e_{\text{env}}$ is a state of wanting to preserve wetlands (and not build hotel); $e_{\text{fin}}$ is a state of wanting to build hotel (and not preserve wetlands). $\mu_{\text{int}}(e_{\text{env}}) > \mu_{\text{int}}(e_{\text{fin}})$.

(44) $[\![\text{Mary wants to preserve the wetlands}]\!]^c =$
$\exists e[\textsc{Exp}(e,m) \wedge \exists \alpha \in \text{Vw}^c[\textsc{from}(e,\alpha)] \wedge \forall e' \in \textsc{pt}(e)[\forall w \in \textsc{Best}(\precsim_{e'}, \textsc{Dox}(e'))[\textsc{wetlands}(w)]]$
(**True.** Witnesses: $\alpha_{\text{env}}$, $e_{\text{env}}$)

- Parallel for *Mary wants to build the hotel.*

(45) $[\![\text{Mary wants to preserve the wetlands more than she wants to build the hotel}]\!]^c =$
$\exists e[\textsc{Exp}(e,m) \wedge \exists \alpha \in \text{Vw}^c[\textsc{from}(e,\alpha)] \wedge \forall e' \in \textsc{pt}(e)[\forall w \in \textsc{Best}(\precsim_{e'}, \textsc{Dox}(e'))[\textsc{wetlands}(w)]]$
$\wedge\ \mu_{\text{int}}(e) > \max(\{d \mid \exists e''[\textsc{Exp}(e'', m) \wedge \exists \alpha' \in \text{Vw}^c[\textsc{from}(e'', \alpha')] \wedge$
$\forall e''' \in \textsc{pt}(e'')[\forall w \in \textsc{Best}(\precsim_{e'''}, \textsc{Dox}(e'''))[\textsc{hotel}(w)]] \wedge \mu_{\text{int}}(e'') \geq d\})]$

Translation: There is a desire state of Mary's, which (i) is from one of the contextually-provided viewpoints, (ii) is a state of desiring wetlands, and (iii) exceeds by $\mu_{\text{int}}$ any desire state of Mary's, which is also from one of the contextually-provided viewpoints, and that is a state of desiring hotel.

- So that gets us (40a–40c). The kicker is (40d) and (40e).
- *all things considered*: restricts $\mathrm{Vw}^c$ to only include viewpoints that are sufficiently "big" (by $\leq_V$). I.e., it restricts us to considering viewpoints that resolve conflicts of smaller viewpoints.
- Pretend Mary's environmental & financial viewpoints are the only relevant "small" viewpoints. "Big" viewpoint: $\alpha_{\text{ovr}} = \alpha_{\text{env}} \oplus \alpha_{\text{fin}}$. *All things considered* then restricts $\mathrm{Vw}^c$ to $\{\alpha_{\text{ovr}}\}$.
- Let $e_{\text{ovr}}$ be Mary's maximal current desire state s.t. $\textsc{from}(e_{\text{ovr}}, \alpha_{\text{ovr}})$.
- Here's what we want to say: $e_{\text{ovr}}$ is a state of wanting WETLANDS and −HOTEL. The reason for this is that Ann wants WETLANDS more than HOTEL: $e_{\text{env}}$ reaches higher heights than $e_{\text{fin}}$, so $e_{\text{ovr}}$ should prioritize WETLANDS over HOTEL in its world-orderings.
- The rest of this section is dedicated to cashing this intuition out. The way this is done will be formally easier if we switch from stipulated world-orderings to a premise semantics, so I will do this next.

### 5.2 Premise semantics

- Kratzer (following Lewis (1981)): world-ordering is induced by a set of propositions:

(29) $u \precsim_Q v$ iff $\{p \in Q \mid p(u)\} \supseteq \{p \in Q \mid p(v)\}$

- How can we incorporate this into our theory in a way that easily allows for a coarsening of world-orderings?
- The intuition: not all premises are created equal: lower-ranked premises serve only to break ties left over from higher-ranked premises.
  - (cf. von Fintel & Iatridou 2008, Katz et al. 2012, Rubinstein 2012, Portner & Rubinstein 2016, Reisinger 2016, Pasternak 2016)
- Removing premises from bottom eliminates lowest tie-breakers, coarsening world-ordering.
- More specifically: ordering source $g$ takes a point-state $e$ and returns an **ordered premise set (OPS)**, a pair $\langle Q^g_e, \leq^g_e \rangle$ of a set $Q^g_e$ of propositions and a weak ordering $\leq^g_e$ on those propositions (where $p \leq^g_e q$ iff $q$ is at least as high priority as $p$).
- It will help to define a notion of **upper cut** of an OPS, in two varieties (informally stated below, formally stated in (46)):
  - **Flat upper cut:** A set of propositions constituting some "upper portion" of an OPS.
  - **Ordered upper cut:** An OPS where set of propositions is a flat upper cut and ordering is preserved from original OPS.

(46) a. Premise set $Q_2$ is a **flat upper cut** of ordered premise set $\langle Q_1, \leq_1 \rangle$ iff $Q_2 \subseteq Q_1$, and for all $p \in Q_2$ and all $q \in Q_1$ such that $p \leq_1 q$, $q \in Q_2$.

b. Ordered premise set $\langle Q_2, \leq_2 \rangle$ is an **ordered upper cut** of $\langle Q_1, \leq_1 \rangle$ iff $Q_2$ is a flat upper cut of $\langle Q_1, \leq_1 \rangle$, and for all $p, q \in Q_2$, $p \leq_2 q$ iff $p \leq_1 q$.

- NB: any OPS is an ordered upper cut of itself.
- $\precsim$ uses a set of propositions; new $\precsim^*$ uses an OPS.

(47) $u \precsim^*_{\langle Q, \leq \rangle} v$ iff $u \sim_Q v$ or there exists a flat upper cut $Q'$ of $\langle Q, \leq \rangle$ such that $u \prec_{Q'} v$.

- Rather than having to discuss $\sim^*$ and $\prec^*$ in terms of $\precsim^*$, they can be equivalently defined as in (48):

(48) a. $u \sim^*_{\langle Q, \leq \rangle} v$ iff $u \sim_Q v$.
b. $u \prec^*_{\langle Q, \leq \rangle} v$ iff there exists a flat upper cut $Q'$ of $\langle Q, \leq \rangle$ such that $u \prec_{Q'} v$.

- (47) is as discussed above: lower premises serve as tiebreakers for higher ones.
- For the reader to prove to his/her own contentment: The orderings in the vacation example are achieved if the OPSs are as follows:
  - $\langle Q_1, \leq_1 \rangle$, where $Q_1 = \{\textsc{responsible}, \textsc{Bahamas}, \textsc{caviar}\}$ and $\textsc{caviar} <_1 \textsc{Bahamas} <_1 \textsc{responsible}$
  - $\langle Q_2, \leq_2 \rangle$, where $Q_2 = \{\textsc{responsible}, \textsc{Bahamas}\}$ and $\textsc{Bahamas} <_2 \textsc{responsible}$
  - $\langle Q_3, \leq_3 \rangle$, where $Q_3 = \{\textsc{responsible}\}$
- Note: $\langle Q_3, \leq_3 \rangle$ is an ordered upper cut of $\langle Q_2, \leq_2 \rangle$, which is an ordered upper cut of $\langle Q_1, \leq_1 \rangle$.
- Theorem: If $\langle Q_1, \leq_1 \rangle$ is ordered upper cut of $\langle Q_2, \leq_2 \rangle$, then $\precsim^*_{\langle Q_1, \leq_1 \rangle}$ is at least as coarse as $\precsim^*_{\langle Q_2, \leq_2 \rangle}$.

(49) $[\![\text{want}]\!]^c = \lambda p \lambda e.\, \exists \alpha \in \text{Vw}^c[\textsc{from}(e, \alpha)] \wedge \forall e' \in \textsc{pt}(e)[\forall w \in \textsc{Best}(\precsim^*_{g(e')}, \textsc{Dox}(e'))[p(w)]]$

(50) Upward Subset Constraint (Premise-Semantic Version):
If $k_a \leq_K k_b$, and if $e_a = e/(t, k_a)$ and $e_b = e/(t, k_b)$ for some desire state $e$ and moment $t \in \tau(e)$, then:
a. $\textsc{Dox}(e_a) = \textsc{Dox}(e_b)$, and
b. $g(e_b)$ is an ordered upper cut of $g(e_a)$.

### 5.3 Back to conflict resolution

- As promised, we'll see how premise semantics can get us (40d) and (40e). To do this, we need to formalize a second natural language metaphysical constraint, relating desires in view of $\alpha_1$, $\alpha_2$, and $\alpha_1 \oplus \alpha_2$.

(51) Vertical maximality:
Let $e$ be a desire state s.t. $\textsc{from}(e, \alpha)$ and $\textsc{Exp}(e, x)$. $e$ is **vertically maximal** iff there is no $e'$ s.t. $\textsc{Exp}(e', x)$, $\textsc{from}(e', \alpha)$, $\tau(e) = \tau(e')$, and $e \sqsubset e'$.

(52) Conflict resolution constraint (CRC):
Let $E$ be a set of vertically maximal desire states $\{e_1, e_2, e_3, \ldots\}$ s.t. for all $e_n \in E$, $\textsc{Exp}(e_n, x)$, $\tau(e_n) = \textsc{t}$, and $\textsc{from}(e_n, \alpha_n)$. Let $\alpha_z = \alpha_1 \oplus \alpha_2 \oplus \alpha_3 \ldots$, and let $e_z$ be a vertically maximal desire state s.t. $\textsc{Exp}(e_z, x)$, $\tau(e_z) = \textsc{t}$, and $\textsc{from}(e_z, \alpha_z)$.

a. $\pi(e_z) = \bigcup\{\pi(e) \mid e \in E\}$
b. For all $(t,k) \in \pi(e_z)$, $Q^g_{e_z/(t,k)} = \bigcup\{Q^g_{e/(t,k)} \mid e \in E \wedge (t,k) \in \pi(e)\}$

- CRC places no requirement on $\leq^g_{e_z/(t,k)}$. But USC does, and USC plus CRC goes a long way.
- Back to Mary. Let FROGS be true in all worlds where frogs are saved (entails WETLANDS in Mary's beliefs), and TOURISM in all worlds where tourism increases (entails HOTEL in Mary's beliefs). FROGS and TOURISM are incompatible in Mary's belief worlds.
- Say that in all point-states $e \in \text{PT}(e_{\text{env}})$, $Q^g_e = \{\text{FROGS}\}$ (all Mary cares about environment-wise is FROGS); *mutatis mutandis* for $e_{\text{fin}}$ and $\{\text{TOURISM}\}$.
- Fig. 7: Illustration of $Q^g_e$ for all point-states $e$ in $e_{\text{env}}$, $e_{\text{fin}}$, and (by CRC) $e_{\text{ovr}}$.

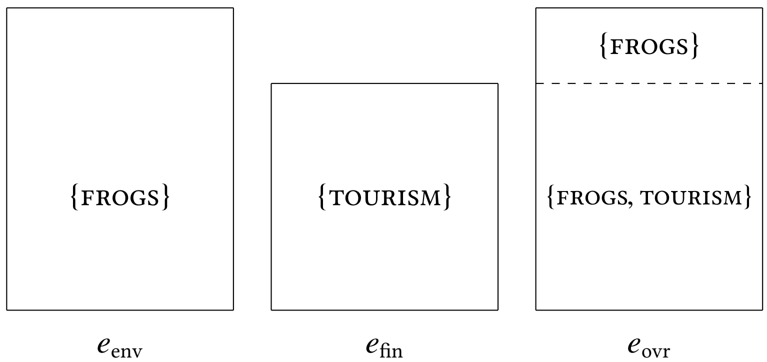



Figure 7: Premise sets in Mary's environmental, financial, and overall desire states (all simultaneous).

- At low altitudes in $e_{\text{ovr}}$, CRC is apathetic about ranking of FROGS and TOURISM. But in order for TOURISM-less OPS at higher altitudes to be ordered upper cut of OPS at lower altitudes (required by USC), it must be that at each point-state $e$ in the lower portion of $e_{\text{ovr}}$, TOURISM $<^g_e$ FROGS.
  - TOURISM-less OPS must be the result of removing TOURISM *from the bottom* of lower-altitude OPS (by definition of ordered upper cut).
- So at lower altitudes, Mary's belief worlds are ordered as in (53). (At higher altitudes, FROGS worlds just outrank −FROGS worlds.) Note that Mary has no belief worlds where FROGS and TOURISM both hold, so that possibility is excluded.

(53) a. FROGS, −TOURISM
b. −FROGS, TOURISM
c. −FROGS, −TOURISM

- So at every point-state in $e_{\text{ovr}}$, WETLANDS and −HOTEL hold in all ideal worlds. So $e_{\text{ovr}}$ is a state of wanting WETLANDS and wanting −HOTEL.
- Furthermore, since *all things considered* essentially restricts domain of event(uality) quantification to $e_{\text{ovr}}$ and its parts, there is no state of wanting HOTEL.
- Therefore, (40d) and (40e) come out as true.

### 5.4 Final note: Where USC and CRC are inadequate

- Imagine the same scenario as before, but $\pi(e_{\text{env}}) = \pi(e_{\text{fin}})$. In this case, USC and CRC make no predictions about the rankings of FROGS and TOURISM: any ranking is okay.
  - By CRC, at every point-state $e$ of $e_{\text{ovr}}$, $Q_e^g = \{\text{FROGS}, \text{TOURISM}\}$. Since unlike before, there is no higher point-state $e'$ s.t. $Q_{e'}^g = \{\text{FROGS}\}$ or $\{\text{TOURISM}\}$, USC does not resolve ranking.
- Several options, with subtle differences.
  - Strengthen USC so that every (non-empty) ordered upper cut of a premise set must be used. In this case, we can't rank FROGS above TOURISM, since there is no higher point-state at which only FROGS appears, so FROGS and TOURISM must be equally ranked.
  - USC is good as it is, but in this case, we just can't construct an overall desire state: Mary can't have overall desires until she wants one more than the other.
  - "Supervaluational": ∀-quantify over possible rankings of FROGS and TOURISM. (In this case, comes out the same as the first option: Mary wants FROGS ∪ TOURISM, but it is false that she wants FROGS and false that she wants TOURISM.)
- I imagine it'll be pretty tricky choosing between these (or some other possibility), especially given the context-sensitivity of $\text{Vw}^c$. For future research!