Ordering Supervaluationism,
Counterpart Theory, and Ersatz Fundamentality

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Many philosophical theories make comparisons between objects, events, states of affairs, worlds, or systems, and many such theories deliver plausible verdicts only if some of the elements they compare are ranked as 'best.' When the relevant ordering does not have such 'best' or 'tied for best' elements the theory wrongly falls silent or gives badly counterintuitive results. I call these *limit assuming* theories. Here are several examples of such theories.

Teleological ethical theories: "A teleological theory says that … an act is *right* if and only if it or the rule under which it falls produces, will probably produce, or is intended to produce *at least as great a balance of good over evil* as any available alternative" (Frankena 1963, 14).

Maximizing conceptions of practical reason: "An agent's will is weak if he acts, and acts intentionally, counter to his own best judgment; …It is often made a condition of an incontinent action that it be performed despite the agent's knowledge that another course of action is better. I count such actions incontinent …" (Davidson 1970, 21).

David Lewis's theory of de re modal claims: The counterparts in a possible world *w* of some object *o* are any objects in *w* that "resemble [*o*] closely enough in important respects … and that resemble it no less closely than do other things existing there" (1973, 39).

The Mill/Ramsey/Lewis "best system" theory of laws of nature: "A contingent generalization is a *law of nature* if and only if it appears as a theorem (or axiom) in each of the true deductive systems that achieves a best combination of simplicity and strength" (Lewis 1973, 73).[1]

Donald Davidson's theory of interpretation: "If we want to understand others, we must count them right in most matters. … We make maximum sense of the words and thoughts of others when we

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[1] Contrast Quine: "we have no reason to suppose that man's surface irritations even unto eternity admit of any one systematization that is scientifically better or simpler than all possible others" (1960, 23).

interpret in a way that optimises agreement" (1973, 19; cf. LEWIS 1974).[2]

David Lewis's theory of content: "…overall eligibility of referents is a matter of degree, making total theory come true is a matter of degree, the two desiderata trade off. The correct, 'intended' interpretations are the ones that strike the best balance" (1984, 66).[3]

Robert Stalnaker's theory of conditionals: "Intuitively, the *value* of the [conditional's selection] function should be that world in which the antecedent is true which is most similar, in relevant respects, to the actual world" (1975, 198).

'Limit violations' can make limit assuming theories go badly awry. Take Lewis's theory of counterparts, for example. If for every potential counterpart of *o* in world *w* there is another that does better qua potential counterpart of *o*, then there are no elements of the maximal order on potential *o*-counterparts that are at least as good qua potential counterparts of *o* as any other elements of the order. In such a case the limit assuming nature of Lewis's theory—again, it looks for objects in *w* that "resemble [*o*] no less closely than do other things existing there"—means that according to Lewis *o* has no counterparts at *w*. So Lewis has no analysis of de re modal claims about how things are with *o* at *w*. But, as I argue here, we may have robust and clear judgments about how things are with *o* at *w*. Other limit assuming theories are vulnerable to similar cases. In light of this the extensive debate over the limit assumption for counterfactuals looks parochial at best. Limit violations threaten so many different theories that piecemeal responses do not suffice.

Here I introduce and develop a very general technique that allows any limit assuming theory to handle limit violations. *Ordering supervaluationism,* as I call it, adds a partial preorder to the resources of ordinary supervaluationism. Just as ordinary supervaluationism is a general purpose strategy to be deployed when various candidate interpretations of an expression are tied for best, ordering supervaluationism is a general purpose strategy to be deployed when for each of the various candidate interpretations of an expression another is better. And it does no harm to appeal to ordering supervaluationism, with an appropriate preorder, when we would usually use ordinary supervaluationism. Just as ordinary supervaluationism helps us save and generalize 'uniqueness assuming' theories, ordering supervaluationism helps us save limit assuming theories. With so many otherwise attractive limit assuming theories, this is a sensible, methodologically conservative approach.

Section 1 presents motivating examples from counterpart theory in detail, and section 2 explains why revisionary semantic and ordinary supervaluationist approaches are unattractive. Sections 3 and

[2]Matti Eklund's view on interpretation has similar formal requirements, despite its very different motivations. For example, Eklund writes that "the semantic values are whatever comes *closest* to satisfying the conditions laid down by the [possibly inconsistent] senses" (2002b, 265; see also his 2002a, 322–323, and much of his later work).

[3]Cf. Ted Sider's characterization of "no fact of the matter" philosophical disputes (2001a, 189–190).

4 lay out ordering supervaluationism and use it to generalize some important limit assuming theories. Finally, section 5 argues that the application of ordering supervaluationism can make a difference to some standing philosophical debates. What if there is "ever-deeper novel structure" (Schaffer 2003, 512)? What if "matter is infinitely divisible, with different properties at each level" (Block 2003, 138)? What if "things get ever more basic without limit" (Schaffer 2010, 62)? These questions are as intrinsically interesting to the ordering supervaluationist as they are to anyone. But appeal to ordering supervaluationism can mitigate the impact of their answers on the practice of metaphysics.

1. Limit violations in counterpart theory

It is helpful to begin to think about ordering supervaluationism in the context of Lewisian theories of de re modality. This is because it is easy to see how ordering supervaluationism handles counterpart theoretic limit violations, and the relevant orderings are relatively well understood. My aim here is not to defend counterpart theory; it is rather to display the virtues of ordering supervaluationism by applying it on behalf of counterpart theorists.

Suppose that for some rational number n Al is now exactly n millimeters tall. Al could have been exactly $n-1$ millimeters tall. It follows from this, Lewis would say, that some possible world contains a counterpart of Al who is $n-1$ millimeters tall. Consider a possible world w containing someone who is $n-1$ millimeters tall and who, in all other respects, resembles Al exactly if possible and, if not, very, very closely. (Like Al, that person has black hair, brown eyes, and so on—let us suppose—but he happened to take fewer multivitamins than Al in fact has.) Call him 'w−Al−1'. Given that w contains no 'competitors' to be Al's counterpart that resemble him at least as well as w−Al−1 does, w−Al−1 is Al's unique counterpart in w. According to Lewis, whether a claim about how things are with Al at w is true or false depends on how things are with w−Al−1 at w: 'Al is F in w' is true iff w−Al−1 is F in w.

If a world w' contains someone who exactly resembles w−Al−1 (call him w'−Al−1) and also contains someone who is $n-\frac{1}{\sqrt{2}}$ millimeters tall and resembles Al at least as well as w'−Al−1 in all other respects, then in virtue of better resembling Al than w'−Al−1 does, that person (w'−Al−$\frac{1}{\sqrt{2}}$) 'beats' w'−Al−1 for the status of being Al's counterpart in w'. If, in similar fashion, a third world w'' contains w''−Al−1, w''−Al−$\frac{1}{\sqrt{2}}$, and w''−Al−$\frac{1}{\sqrt{3}}$, then w''−Al−$\frac{1}{\sqrt{3}}$ beats the others and (if there are no other competitors) is Al's counterpart in w''. And so on. For any finite set of positive integers F, a world w^F that contains, for all $n \in F$, w^F−Al−$\frac{1}{\sqrt{n}}$ and no other people that closely resemble Al contains a counterpart of Al, namely w^F−Al−$\frac{1}{\sqrt{o}}$, where o is the greatest integer in F. By contrast, consider a world w^I that contains, for all positive integers n, w^I−Al−$\frac{1}{\sqrt{n}}$ and no other people that closely resemble Al. w^I does not contain *any* counterparts of Al, because each potential counterpart is beaten by another that more closely resembles Al in height. We are left with the following odd situation: although for every positive integer n, w^I–Al–$\frac{1}{\sqrt{n}}$ has a counterpart in some possible world that is a counterpart of Al, *none* of the w^I–Al–$\frac{1}{\sqrt{n}}$s are *themselves* counterparts of Al. The potential counterparts of Al that more closely resemble Al beat out the others that less closely resemble Al, leaving no counterparts of Al in w^I.

This result is odd because w^I contains so many good candidates to be Al's counterpart. But this is not yet really a puzzle, since Lewis is not attempting to do justice to intuitions about counterparthood. Rather, the value of the notion of counterparthood depends on the role that counterparts play in a larger theoretical framework. The puzzle arises when we try to evaluate de re modal claims about how things are with Al in w^I. In particular, we have robust judgments that Lewis cannot explain, because Al lacks Lewis-counterparts in w^I. For example, (1) seems true, because all the potential Al counterparts in w^I are at least $n - 2$ millimeters tall.

(1) Al is at least $n - 2$ millimeters tall in w^I.

And (2) also seems true, because some potential Al counterpart (for example, w^I-Al-$\frac{1}{\sqrt{4}}$) is such that all the potential Al counterparts that resemble Al at least as well as that potential Al counterpart does are at least $n - 0.5$ millimeters tall.

(2) Al is at least $n - 0.5$ millimeters tall in w^I.

Contrast these with some claims that seem false.

(3) Al's height measured in millimeters is a rational number in w^I.

As we consider potential Al counterparts in w^I that more and more closely resemble Al, we never come to a potential Al counterpart such that all potential Al counterparts that resemble Al at least as well are of a height that is rational when measured in millimeters. Suppose someone argued that (3) is true, on the grounds that the height of w^I-Al-$\frac{1}{\sqrt{100^{100}}}$ measured in millimeters is a rational number, and that surely w^I-Al-$\frac{1}{\sqrt{100^{100}}}$ resembles Al closely enough to be relevant to the question of whether (3) is true. The obvious and apt response is that the height of someone in w^I who still better resembles Al is an irrational number when measured in millimeters. So (3) is false. And (4) is also false, for analogous reasons.

(4) Al's height measured in millimeters is an irrational number in w^I.

On Lewis's theory (1)–(4) are all anomalous in exactly the same way, because Al simply does not have any counterparts in w^I. Finally, we want a theory that reconciles the falsity of (3) and (4) with the truth of (5).

(5) Al's height measured in millimeters in w^I is a rational or an irrational number.

Here is one more example. First, consider a possible world w that contains exactly one universe—call it U—with a beginning but not an end. Take some finite duration of time (a year, say) and partition the event that is the life of U into year long events, enumerated by the positive integers: year 1, year 2, year 3, and so on. Consider another possible world w' that contains a sequence of infinitely many universes, each of which is finite in duration although the whole sequence of universes has a beginning but not an end. The life of the first universe exactly resembles U's year 1, the life of the second universe exactly resembles U's years 1 and 2, the life of the third universe exactly resembles U's years 1 and 2 and 3, and so on. Suppose that some of the universes in w' resemble U well enough that they would count as U's counterpart if they were not beaten by another universe in w'. Nevertheless U has no counterpart in w', according to Lewis's theory. But we want claims like

(6) In w', U includes year n.

to be true for every positive integer n. Note also that this judgment shows that in limit violating cases we should not just take the set of potential counterparts of o to be those that resemble o 'well enough.' If we did, then for infinitely many positive integers (6) would be false.

2. Some problems for semantic and ordinary supervaluationist treatments

Lewis famously accommodates limit violations for counterfactuals within his semantics for counterfactuals. In *Counterfactuals* he presents his semantics in terms of a system of spheres centered on the world of evaluation, where

> Any particular sphere around a world i is to contain just those worlds that resemble i to at least a certain degree. … The smaller the sphere, the more similar to i must a world be to fall within it. To say the same thing in purely comparative terms: whenever one world lies within some sphere around i and another world lies outside that sphere, the first world is more closely similar to i than the second. (1973, 14)

Lewis does not need to make the limit assumption, because his semantics allows for the possibility that there is an "infinite descending sequence of smaller and smaller spheres without end" (19). A counterfactual is "non-vacuously true if there is some antecedent-permitting sphere in which the consequent holds at every antecedent-world" (16).[4] Contrast Lewis's actual semantics with one according to which a counterfactual is non-vacuously true iff all the antecedent-worlds in the smallest

[4]A sphere is antecedent-permitting iff it contains some world in which the antecedent is true.

sphere that contains an antecedent-world are also consequent-worlds. Such a semantics is obviously limit assuming, since it delivers the verdict that a given counterfactual is true only if there is a smallest antecedent-permitting sphere.

It is natural to ask whether Lewis's semantics for counterfactuals could be adapted into a semantics for de re modal claims. On this line, we would analyze (7) as saying that there is some candidate for *o*-counterparthood in *w* such that every at least as good candidate for *o*-counterparthood in *w* is *F* in *w*.

(7) In *w*, *o* is *F*.

Such a semantics would get the right results about examples (1)–(6). Indeed, it turns out that a similar semantics deems a given de re modal claim true exactly when ordering supervaluationism deems it ordering supertrue. And although semantic approaches introduce a fair amount of machinery into the semantic theory of de re modal claims, ordering supervaluationism introduces essentially the same machinery. So one might think that the two approaches are in a standoff.

The problem for semantic approaches is that on a comprehensive semantic approach, the same basic machinery will have to show up in the semantics over and over again. We cannot stop at de re claims: we must also handle 'is a law of nature,' 'is a charitable interpretation,' 'is the right thing to do,' and so on, for whatever limit assuming theories we might endorse. While the theorist who handles limit violations in her semantics applies the same basic principles that the ordering supervaluationist does, she applies them anew in each of many different places. By contrast, ordering supervaluationism gives a single mechanism that we can appeal to whenever we need to generalize a limit assuming theory to accommodate limit violations. For an analogy, consider the proposal that (for some vague predicate '*F*') the underlying semantics of '*o* is *F*' is '$\bigwedge_{i \in I}(o \text{ is } F_i)$,' where '$F_i$' is an admissible precisification of '*F*' iff $i \in I$. It is totally uncontroversial that ordinary supervaluationism improves on this kind of semantic approach to vagueness by being more general and more economical. Ordering supervaluationism improves on the semantic approach mooted above in just these respects.

Supervaluating in the usual way is also unsatisfactory. Suppose we kept Lewis's semantics for de re claims, but looked to "what is common to all or most ways (or all or most reasonable ways) of making the choice" between candidates for *o*-counterparthood in *w*, "caring little what happens on any particular way of making" the choice (Lewis 1976, 70). An analogous strategy is roundly dismissed in the literature on counterfactuals, and with good reason: if we supervaluate, and "if ever there were closer and closer antecedent-worlds without end, there would be no admissible selection functions at all" (Lewis 1973, 82). Stalnaker agrees:

> … if the limit assumption were to fail, there would be too few candidates to be the selec-

> tion function rather than too many. Any selection function would be forced to choose worlds which were less similar to the actual world than other eligible worlds. This is why the supervaluation method does not provide a way to avoid making the limit assumption. (STALNAKER 1980, 96)

The analogous problem for de re claims is that it is wrong to admit interpretations according to which *o*'s counterpart in *w* is an object that is less similar to *o* than other eligible objects in *w*. Stalnaker and his followers do argue that there are no limit violations for counterfactuals. But those arguments are irrelevant to the possibility of limit violations for counterpart theory and other limit assuming theories. For example, anyone who thinks that (as is plausible) it might have been that there were infinitely many things better and better resembling Al ipso facto admits that there are limit violating cases for Lewis's analysis of counterparthood.

Recently VON FINTEL 1999 and 2001 and GILLIES 2007 have diverged from Lewis and Stalnaker by defending "strict" analyses of counterfactuals. Because von Fintel endorses the limit assumption (1999, 137; 2001, 145–146, fn. 4)—indeed, it is a crucial part of his dynamics of the modal horizon (1999, 142; 2001, 137–144)—his analysis is not immediately helpful in the current setting. Likewise for Gillies' analysis.[5] But Gillies is circumspect about the limit assumption where possible, and some of the ways in which he is circumspect might encourage the following thought: the counterfactual '$A > C$' is true at *i* iff every *A*-world that resembles *i* at least as well as some *A*-world privileged by the context of utterance is a *C*-world. If we adapted this kind of story to de re claims, (7) (i.e., 'In *w*, *o* is *F*') might be analyzed as ascribing *F*-ness to every object in *w* that is at least as good a candidate for *o*-counterparthood as some object in *w* privileged by the context of utterance. This particular account is semantic, and is thus subject to the same objection I made earlier: the same tweak will need to be made over and over again throughout our semantic theory, instead of just once, in the supervaluationist scaffolding. But the thought behind this semantic approach could be put in supervaluationist terms by permitting an object to be an admissible 'counterpart' for *o* in *w* iff it is in *w* and is at least as good a candidate for *o*-counterparthood as some object in *w* privileged by the context of utterance. Such accounts have the further problem that they ask *a lot* of context: it is hard to see how context could pick out the right privileged world to underwrite truth-conditions that match our intuitions (POLLOCK 1976, 9). And recall schemas like (6): 'In w', *U* includes year *n*.' *No* possible world makes (6) come out true for *every* positive integer *n*. Finally, the demands on context become even more pressing if we drop the assumption that the relevant preorder is total. And the totality assumption is something we should avoid: given how many comparatives look partial,[6] there is every reason to

[5]For example: "$s\Diamond\varphi = s'$ iff s' is the smallest set in $\mathbb{D}_i$ such that $s \subseteq s'$ and $s' \cap [\![\varphi]\!] \neq \varnothing$" (357).

[6]See (e.g.) MCCONNELL-GINET 1973, 135–137, KAMP 1975, CRESSWELL 1976, 266, and KLEIN 1980.

think that 'resembles at least as well as' is also partial. But if we were to supervaluate in the way just sketched, the context would, in general, need to privilege more than one world for merely partial preorders—in some cases very many worlds, and in some cases even infinitely many worlds.

3. Ordering supervaluationism for total preorders

An analysis of counterfactuals is strict if, according to it, a counterfactual "is a material conditional preceded by some sort of necessity operator: $\Box(\varphi \supset \psi)$," where '$\Box$' "acts like a restricted universal quantifier over possible worlds" (Lewis 1973, 4). The deployment of a restricted universal quantifier is the feature of strict analyses of counterfactuals that I want to focus on here, for traditional supervaluationism also deploys a restricted universal quantifier. In particular, according to traditional supervaluationism, a sentence is supertrue iff it is true according to every admissible interpretation (van Fraassen 1966, 486–487).

Strict analyses of counterfactuals are distinguished from variably strict analyses by the fact that, on variably strict analyses, "we do not need to choose" the domain over which the universal quantifier quantifies (Lewis 1973, 19). A fortiori, context does not need to choose that domain. On a strict semantics for counterfactuals, the truth of a counterfactual turns on whether every world in an antecedently determined set has a particular feature. On a variably strict semantics, by contrast, the truth of a counterfactual turns on whether there is *some lower bound within which* every world has a particular feature (Swanson 2011). Thought of at a fairly high level of abstraction, ordering supervaluationism enriches ordinary supervaluationism in just the way that variably strict semantics for counterfactuals enrich ordinary strict semantics for counterfactuals. More precisely, ordering supervaluationism and variably strict semantics for counterfactuals both ask whether a given preorder has a lower bound within which all the elements of the preorder share some property.

Accordingly, a sentence is supertrue according to ordering supervaluationism iff there is some lower bound on interpretations such that the sentence is true according to every interpretation within that bound. This core thought could be implemented in a variety of ways. So although for brevity I will sometimes speak as if the particular theory I offer here just is ordering supervaluationism, and nothing else counts, I think it is better to think of ordering supervaluationism as a family of closely related theories rather than as a particular theory. The particular theory I offer here is the product of a range of choices, some of which are wholly unforced, and many of which are driven by considerations about simplicity or aesthetics.

Lower bounds in total preorders are extremely simple: any element that is ordered by a total preorder is in effect a lower bound for that preorder. (We will of course have more interesting lower bounds as soon as we generalize to partial preorders.[7])

Definition 1. *A relation $\lesssim$ on a set S is a **preorder** iff $\lesssim$ is reflexive and transitive.*

Definition 2. *A preorder $\lesssim$ on a set S is **total** with respect to S iff* $\forall x \forall y \big((x \in S \wedge y \in S) \rightarrow (x \lesssim y \vee y \lesssim x) \big)$.

Definition 3. *b is a **lower bound** of a total preorder $\lesssim$ on a set S iff $b \in S$.*

Definition 4. *'φ' is **ordering supertrue**, relative to a preorder $\lesssim$ on a set possible interpretations of 'φ' S, iff there is some lower bound of $\lesssim$ on S such that every interpretation of 'φ' in S that is at least as $\lesssim$ good as that lower bound is true.*

As we discussed earlier, (1), (2), and (5) seem true, and (3) and (4) seem false, given that world w^I contains, for all positive integers n, w^I–Al–$\frac{1}{\sqrt{n}}$ and no other people that closely resemble Al.

(1) Al is at least $n - 2$ millimeters tall in w^I.

(2) Al is at least $n - 0.5$ millimeters tall in w^I.

(3) Al's height measured in millimeters is a rational number in w^I.

(4) Al's height measured in millimeters is an irrational number in w^I.

(5) Al's height measured in millimeters in w^I is a rational or an irrational number.

The preorder of interpretations of (1)—call it '$\lesssim_{(1)}$'—is closely related to the preorder on candidates to be Al's counterpart. $\lesssim_{(1)}$ privileges interpretation (ii) over interpretation (i), interpretation (iii) over interpretation (ii), and so on:

(1) (i) w–Al–1 is at least $n - 2$ millimeters tall in w^I.
(ii) w–Al–$\frac{1}{\sqrt{2}}$ is at least $n - 2$ millimeters tall in w^I.
(iii) w–Al–$\frac{1}{\sqrt{3}}$ is at least $n - 2$ millimeters tall in w^I.
⋮

(1) is ordering supertrue because some lower bound of $\lesssim_{(1)}$—for example, 'w–Al–1 is at least $n - 2$ millimeters tall in w^I'—is such that every interpretation of (1) that is at least as $\lesssim_{(1)}$ good as that lower bound is true. Similarly for (2); it is ordering supertrue because some lower bound of $\lesssim_{(2)}$—for example, 'w–Al–$\frac{1}{\sqrt{4}}$ is at least $n - 0.5$ millimeters tall in w^I'—is such that every interpretation of (2) that is at least as $\lesssim_{(2)}$ good that lower bound is true.

[7]It may sound a bit odd to call elements of total preorders 'lower bounds,' but I find that keeping this terminology consistent throughout makes it easier to see the similarities between my treatment of total preorders and my treatment of merely partial preorders.

(2) (i) w–Al–1 is at least $n - 0.5$ millimeters tall in w^I.

(ii) w–Al–$\frac{1}{\sqrt{2}}$ is at least $n - 0.5$ millimeters tall in w^I.

(iii) w–Al–$\frac{1}{\sqrt{3}}$ is at least $n - 0.5$ millimeters tall in w^I.

$\vdots$

But neither (3) nor (4) is ordering supertrue. There is no interpretation of (3), for example, that marks a lower $\lesssim_{(3)}$ bound on a set of interpretations of (3) all of which are true.

(3) (i) w–Al–1's height measured in millimeters is a rational number in w^I.

(ii) w–Al–$\frac{1}{\sqrt{2}}$'s height measured in millimeters is a rational number in w^I.

(iii) w–Al–$\frac{1}{\sqrt{3}}$'s height measured in millimeters is a rational number in w^I.

$\vdots$

Finally, (5) is ordering supertrue, even though neither (3) nor (4) is. Because every real number is rational or irrational, any interpretation of (5) ordered by $\lesssim_{(5)}$ can serve as a lower bound.[8]

(5) (i) w–Al–1's height measured in millimeters is a rational or an irrational number in w^I.

(ii) w–Al–$\frac{1}{\sqrt{2}}$'s height measured in millimeters is a rational or an irrational number in w^I.

(iii) w–Al–$\frac{1}{\sqrt{3}}$'s height measured in millimeters is a rational or an irrational number in w^I.

$\vdots$

The example that I sketched at the end of section 1 helps bring out some subtle but important distinctions that ordering supervaluationism is able to make. Imagine, again, an infinite sequence of universes, each of which is finitely long but is also longer than its immediate predecessor by a year. Recall that we want

(6) In w', U includes year n.

to be ordering supertrue for every positive integer n. At the same time we want (8) not to be ordering supertrue, for *no* universe in w' includes *every* year in U.

(8) In w', U includes every year $n \in \mathbb{N}$.

Ordering supervaluationism makes these predictions. For any $n \in \mathbb{N}$, the following preorder of interpretations contains a $\lesssim_{(6)}$ lower bound of a set of true interpretations of (6).

[8] This is the kernel of how to reconcile the validity of conditional excluded middle and limit assumption failures for conditionals (Swanson 201x).

(6) (i) In w', $w' - U - 1$ includes year n.
(ii) In w', $w' - U - 2$ includes year n.
(iii) In w', $w' - U - 3$ includes year n.
$\vdots$

But because there is no $\lesssim_{(8)}$ lower bound such that every interpretation of (8) at least as $\lesssim_{(8)}$ good as it is true, (8) is not ordering supertrue; indeed it is ordering superfalse.

(8) (i) In w', $w' - U - 1$ includes every year $n \in \mathbb{N}$.
(ii) In w', $w' - U - 2$ includes every year $n \in \mathbb{N}$.
(iii) In w', $w' - U - 3$ includes every year $n \in \mathbb{N}$.
$\vdots$

The superfalsity of (8) reflects the fact that w' does not include any endless universes like U.

One important objection to theories of conditionals that do not make the limit assumption is that they generate counterexamples to what John Pollock calls the "Generalized Consequence Principle": "If Γ is a set of sentences, and for each $Q \in \Gamma$, $\ulcorner(P > Q)\urcorner$ is true, and $\Gamma \rightarrow R$, then $\ulcorner(P > R)\urcorner$ is true" (1976, 20; cf. Herzberger 1979). It might seem worrying that ordering supervaluationism generates counterexamples to the similar principle (9):

(9) If Γ is a set of ordering supertrue sentences, and $\Gamma \rightarrow R$, then R is ordering supertrue.

But our judgments about (6) and (8) show that this is in fact a strength of ordering supervaluationism. The set of sentences consisting of every instance of (6) does entail (8). But because our intuitions lead us to reject (8), it is to the theory's credit that it is possible for every instance of (6) to be ordering supertrue without (8) being ordering supertrue. (If there are some similar inferences that we want to save, and we are facing a genuine limit violation, it may be helpful to appeal to something like Stalnaker 1975's notion of "reasonable inferences" in particular contexts.) Moreover, with preorders that do contain 'best' or 'tied for best' elements, ordering supervaluationism agrees with ordinary supervaluationism, so long as the best or tied for best elements are treated as the admissible interpretations for purposes of ordinary supervaluationism. In such cases ordering supertruth and ordinary supertruth both turn on whether the best or tied for best interpretations are all true. So ordering supervaluationism does not disrupt the successes of ordinary supervaluationism.

4. Ordering supervaluationism for partial preorders

Earlier I alluded to the importance of merely partial preorders for counterpart theory and for comparatives more generally. Merely partial preorders represent not just relative ranking but also incomparability: they represent some of their elements as being incomparable to each other, although they can compare those elements to other elements.

Definition 5. *A preorder that is not total with respect to a set S is **merely partial** with respect to S.*

The resemblance preorders that undergird Lewisian conceptions of modal counterparts are excellent examples of merely partial preorders. To see this it helps to start by considering the contrasts between adjectives like 'heavy' and adjectives like 'large.' The former are "one-dimensional," in Hans Kamp's phrase; the latter "multi-dimensional."

> With each such adjective is associated a unique measurable aspect. The (numerical) value of that aspect for a given object determines whether or not the adjective applies. For *heavy* the aspect is weight. Other examples are *tall* (associated with height) and *hot* (associated with temperature).
>
> But such adjectives are rare. Even *large* is not one of them. For what precisely makes an object large? Its height? or its volume? or its surface? or a combination of some of these? … There is no fixed procedure for integrating the various criteria. (Kamp 1975, 141)

'Clever' is a classic (and especially clear) example of a multi-dimensional adjective.

> Suppose for example that Smith, though less quick-witted than Jones, is much better at solving mathematical problems. Is Smith cleverer than Jones? This is perhaps not clear, for we usually regard quick-wittedness and problem-solving facility as indications of cleverness, without a canon for weighing these criteria against each other when they suggest different answers. …
>
> Before any decision has been made it is true neither that Smith is cleverer than Jones nor that Jones is cleverer than Smith. The intuitive judgment [is that] Jones and Smith are incomparable in respect of cleverness. (Kamp 1975, 140–141)

With this background in mind, suppose that we specified in great detail the underlying facts relevant to comparing Betty′ (who is slightly less quick-witted than Betty) to Betty″ (who is slightly better at solving mathematical problems than Betty) with respect to how well they resemble Betty. If *resembles Betty at least as well as* were a total preorder, then it would have to be that either Betty′ resembled Betty at least as well as Betty″ or that Betty″ resembled Betty at least as well as Betty′. But this consequence is implausible. Surely Betty′ and Betty″ may simply be incomparable with respect to how well they resemble Betty: 'resembles *o* at least as well as' is at least as multi-dimensional as 'is as clever as' and 'is as large as.' To be sure, some contexts can winnow some incomparabilities. But this does not show that any contexts eliminate all incomparabilities, let alone that most or all contexts do. And as Lewis observes (about the preorders relevant to his semantics for counterfactuals) a total preorder "would be cluttered up with comparisons that matter … only in peculiar cases that will never arise. … [Such a preorder] would be a cumbersome thing to keep in mind, or to establish by our linguistic practice. Why should we have one? How could we? Most likely we don't" (1981, 225). So we should not assume that the resemblance preorders underlying Lewisian modal counterpart relations are total. And quite generally it is prudent to resist such assumptions, especially for limit assuming theories that are sensitive to more than one dimension of comparison. We should not assume that, for example, the preorders representing the simplicity and strength of "true deductive systems" (Lewis 1973, 73) make every such system comparable to every other such system, or that the preorders representing the eligibility of referents and their fit with theory make every interpretation of a language comparable to every other interpretation of that language.

To handle merely partial preorders, we simply need to generalize our earlier way of thinking about lower bounds for total preorders. There are various ways to think about lower bounds for partial preorders; I favor using cutsets.[9]

Definition 6. *A set C is a* ***chain*** *of a preorder $\lesssim$ on a set S iff $C \subseteq S$ and $\lesssim$ is total with respect to C.*[10]

Definition 7. *A set C is a* ***maximal*** *chain of a preorder $\lesssim$ on a set S iff C is a chain of $\lesssim$ on S and no chain of $\lesssim$ on S properly includes C.*

Definition 8. *A set C is a* ***cutset*** *of a preorder $\lesssim$ on a set S iff C contains an element of each maximal chain of $\lesssim$ on S.*[11]

We supplement our earlier definition of lower bounds for total preorders with the more general

Definition 9. *B is a* ***lower bound*** *of a partial preorder $\lesssim$ on a set S iff B is a cutset of $\lesssim$ on S.*

And, repeated from earlier,

Definition 4. *'φ' is* ***ordering supertrue****, relative to a preorder $\lesssim$ on a set possible interpretations of 'φ' S, iff there is some lower bound of $\lesssim$ on S such that every interpretation of 'φ' in S that is at least as $\lesssim$ good as that lower bound is true.*

[9]In Swanson 2011 I show that maximal antichains play the role of lower bounds in the Veltman 1976/Kratzer 1977/Lewis 1981 semantics for counterfactuals, and I explain why cutsets do a better job.

[10]I depart from standard usage in defining standard order theoretic concepts in terms of mere preorders.

[11]For early work on cutsets see Bell & Ginsburg 1984 and Ginsburg 1984; see also Grillet 1969. Some partially ordered sets lack minimal cutsets (Higgs 1985, Lonc & Rival 1987) so minimal cutsets are not good candidates to be lower bounds.

For an interpretation i to be at least as $\lesssim$ good as a set of interpretations B is for i to be at least as $\lesssim$ good as some interpretation in B, and at least as $\lesssim$ good as every interpretation in B to which it is comparable. So 'φ' is ordering supertrue relative to $\lesssim$ iff there is some set, B, containing an interpretation from each maximal $\lesssim$ chain, such that if an interpretation of 'φ' is at least as $\lesssim$ good as every interpretation in B to which it is $\lesssim$ comparable, then that interpretation is true.

Here is an illustration of how ordering supervaluationism handles a merely partial preorder. Consider a possible world w with infinitely many people who closely resemble Betty. Call them 'Betty_1,' 'Betty_{-1},' 'Betty_2,' 'Betty_{-2},' … such that the negative numbered are all simply less quick-witted than Betty, the positive numbered are all simply better at solving mathematical problems than Betty, and the greater the absolute value of a name's subscript, the closer the bearer of that name is to Betty with respect to quick-wittedness or mathematical problem solving ability. (And, following Kamp, assume that the differences in quick-wittedness and mathematical problem solving ability here make for incomparability.) We want sentences like (10) to be true iff there is some integer $m > 0$ and some integer $n < 0$ such that for any Betty_x such that $x \geq m$ and for any Betty_y such that $y \leq n$, Betty_x and Betty_y are both F.

(10) In w, Betty is F.

Ordering supervaluationism rightly delivers the verdict that (10) is ordering supertrue in such circumstances. For any integers $m > 0$ and $n < 0$, {'In w, Betty_m is F,' 'In w, Betty_n is F'} is a cutset of the merely partial preorder that ranks the interpretations of (10) in accordance with the absolute values associated with the names of the subjects. (10) is ordering supertrue iff all the interpretations bounded from below by some $\lesssim$ cutset are true.

Here is a more complicated example which currently popular ways of implementing supervaluationism mishandle. How should we generalize a theory that presupposes that an ordering is total, to create a theory that can handle incomparability? Conventional wisdom has it that we should supervaluate according to a familiar recipe: "any partially defined semantic interpretation will correspond to a class of completely defined interpretations—the class of all ways of arbitrarily completing it" (Stalnaker 1980, 90).[12] In particular, Stalnaker holds that a counterfactual '$A > C$' is supertrue iff it is true relative to every total extension of the partial preorder putatively relevant to its evaluation.

Definition 10. *$\lesssim^*$ on a set S is a **total extension** of $\lesssim$ on S iff $\lesssim^*$ is a total preorder on S and* $\forall x \forall y (x \lesssim y \rightarrow x \lesssim^* y)$.

Lewis proves that—as long as the set of worlds comparable to the world of evaluation is finite—"a

[12] Cf. Stalnaker 1984, 134–135 and 140–142. Other advocates of this approach include Lewis 1981, 226–228, Weatherson 2001, 211 and 2003, 485, and Williams 2008, 418.

counterfactual is true on Pollock's or Kratzer's [partial preorder] semantics iff it is true on Lewis's or Stalnaker's [total preorder] semantics no matter how the missing comparisons are made" (1981, 226).

When infinitely many worlds are comparable to the world of evaluation we have no such guarantee. Suppose that in the world of evaluation (henceforth, *i*), the life of the unique universe has a beginning but not an end, and that we partition its life into years: year 1, year 2, year 3, ... Assume that any world *w* that contains exactly one universe the life of which exactly resembles years *n* and $n + 1$ of *i* is, in the sense relevant to the evaluation of counterfactuals, more similar to *i* than is a world the sole universe of which exactly resembles *n* or $n + 1$ but not both. Assume also, for simplicity, that worlds are otherwise incomparable to each other. So a world the universe of which exactly resembles years 1 and 2 of *i* is more similar to *i* than a world with only a counterpart of year 1, and neither is comparable to a world the universe of which exactly resembles years 2 and 3 of *i*. FIGURE 1 is an incomplete depiction of this partial preorder on worlds. The numbers indicate which years are included in the world.

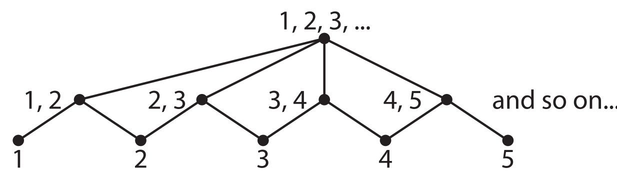

FIGURE 1

According to the partial preorder semantics of POLLOCK 1976, VELTMAN 1976, KRATZER 1979, 1981 and 1991, and LEWIS 1981, (11) is rightly true.

(11) If the life of the universe had been one year long or two years long, it would have been two years long.

But according to the total preorder semantics of STALNAKER 1968 and LEWIS 1973, supervaluated in the way that Stalnaker and Lewis endorse, (11) is wrongly not supertrue. This is because some total extensions of the partial similarity preorder flip back and forth, ad infinitum, between worlds in which the life of the universe is one year long and worlds in which it is two years long.[13]

Ordering supervaluationism, by contrast, rightly delivers the verdict that (11) is ordering supertrue. Consider the obvious preorder isomorphism of FIGURE 1 on interpretations of (11), rather than on worlds. That preorder ranks an interpretation of (11) according to which the world that includes years *n* and $n + 1$ is closest as a 'better' interpretation than any interpretation on which the

[13]Indeed, (11) remains anomalous for Stalnaker even after supervaluating, because some total extensions of this partial preorder violate the limit assumption for counterfactuals. Whenever a partial preorder has infinitely many pairwise incomparabilities, some total extension of it violates the limit assumption.

closest world includes just year n or just year $n + 1$. So the cutset consisting of exactly the two year long universes provides interpretations of (11) such that on every interpretation at least as good as an interpretation in that cutset, (11) is true. So (11) is ordering supertrue. And ordering supervaluationism makes the right predictions even when for any given antecedent world another is closer. Consider

(12) If the life of the universe had been finite, it would have been at least 500 years long.

There is a cutset consisting of interpretations of (12) (to take just one example, the set of interpretations according to which a world including exactly 567 years is 'closest') such that on every interpretation at least as good as an interpretation in that cutset, (12) is true. So (12) is ordering supertrue.

5. Ersatz fundamentality

So far I have focused on how limit assuming theories can be improved with the help of ordering supervaluationism. But in some cases ordering supervaluationism does not just strengthen a standing theory; it makes a significant impact on standing philosophical debates. I want to close with an illustrative case study, on contemporary debates over metaphysical fundamentality.

Many metaphysical theories talk about the relationship between the most fundamental level of reality and other levels of reality. But the assumption that there is a most fundamental level has come in for a drubbing over the last twenty years or so. Jonathan Schaffer, for example, draws dramatic conclusions from the possibility that for every ontological level another is more fundamental:

> What would a metaphysic of infinite descent look like? The most striking feature of an infinite descent is that *no level is special.* Infinite descent yields an egalitarian ontological attitude which is at home in the macro-world precisely because everything is macro. (2003, 512)

Schaffer's thought here is that all 'levels' must be the same, with respect to their fundamentality, unless they are at the bottom. A metaphysic of infinite descent takes away the bottom, leaving no most fundamental level and indeed no "special" level or levels whatsoever.[14]

What happens if we apply ordering supervaluationism to a "metaphysic of infinite descent"? Suppose that the fundamentality preorder is total, and that there is some level, L, such that for each level at least as fundamental as L, the macro-world supervenes on the distribution of properties at that

[14] In his 2003 Schaffer writes that "unlike bottomness, topness does not seem to carry ontological significance" (fn. 25). For a very different view see his 2007 and 2010.

level. Then (13) is ordering supertrue, for (13) is true according to every interpretation that treats a level at least as fundamental as *L* as though it were most fundamental.

(13) The macro-world supervenes on the distribution of fundamental properties.

We can say this while agreeing with Schaffer 2003 that no particular level is the special level in a metaphysic of infinite descent. Here is another application: some structural realists "see no reason to suppose that there are ultimate constituents of the world, which are not themselves to be understood in structural terms. … [I]t is turtles all the way down" (Saunders 2003, 129). If the macro-world supervenes on the 'most fundamental' structural facts relative to every level at least as fundamental as a given level *L*, then whether or not *L* is at the bottom, then (14) is ordering supertrue.

(14) The macro-world supervenes on the fundamental structural facts.

Similarly for, say, causation. Ned Block writes that

> If there is no bottom level, and if every (putatively) causally efficacious property is supervenient on a lower "level" property (Call it: "endless subvenience"), then (arguably) Kim's Causal Exclusion Argument would show, if it is valid, that any claim to causal efficacy of properties is undermined by a claim of a lower level, and thus that there is no causation. (2003, 138–139; cf. 1990, 168)

But if we have an analysis of causation according to which there is some level, *L*, such that for any level at least as fundamental as *L*, the causal facts supervene on the distribution of the properties that count as most natural relative to that level, then (15) is ordering supertrue.

(15) The causal facts supervene on the distribution of the most natural properties.

And this does not rule out the soundness of causal exclusion arguments *within* a particular level of fundamentality.[15]

One might worry that appealing to this kind of ersatz fundamentality is like trying to pull a rabbit out of an infinitely deep hat. What business do we have talking about the most fundamental level if there really isn't one, or about the most natural properties if there really aren't any? To put this worry in perspective, it may be helpful to recall what counterpart theorists say about the intuitions of uniqueness that naturally accompany talk about what *o* is like in *w*. For example, the Lewisian counterpart relation is neither functional nor injective:

[15] On the importance of distinguishing between 'intralevel' and 'interlevel' exclusion arguments see Kim 2003 (especially 169–170) and Hüttemann & Papineau 2005.

> It would not have been plausible to postulate that nothing in any world had more than one counterpart in any other world. Suppose x_{4a} and x_{4b} in world w_4 are twins; both resemble you closely; both resemble you far more closely than anything else in w_4 does; both resemble you equally. If so, both are your counterparts.
>
> It would not have been plausible to postulate that no two things in any world had a common counterpart in any other world. Suppose you resemble both the twins x_{4a} and x_{4b} far more closely than anything else in the actual world does. If so, you are a counterpart of both. (Lewis 1968, 116)

So when we ask how things are with *o* at a world *w* we sometimes have to consider more than one counterpart of *o* in *w*. Nevertheless we talk in a way that brackets *o*'s possible plurality at *w*: "What is *o* like at *w*?" In cases that call for ordering supervaluationism we have to consider infinitely many objects, of course, but the counterpart theorist is already committed to the existence of worlds in which infinitely many potential *o* counterparts are tied for best. Counterpart theorists make these kinds of commitments because they think we should reject the broadly haecceitistic intuition that we look to just one object in *w* whenever we ask how things are with *o* at *w*. As Sider puts it,

> The counterpart theorist must admit that pretty much any answer to [questions about modality and persistence] could, in principle, be correct, given an appropriate choice of counterpart relation … [T]he counterpart theorist cannot accept the existence of 'deep' 'non-conventional' facts about de re persistence and modality … But the non-existence of such facts is precisely the moral of the puzzles of persistence and their modal analogs. (2001b, 207)

Thus counterpart theorists want to preserve ordinary modal talk while accommodating the possibility that *o* has multiple counterparts in a given world. Ordering supervaluationism lets us preserve talk about the most fundamental level while accommodating the possibility that there are yet more and more fundamental levels. Both kinds of talk are innocuous.

This maneuver might be less attractive in other domains, so I think it is worth emphasizing that we can always choose whether or not to apply ordering supervaluationism to a particular case. Someone who favors epistemicism about vagueness might well favor supervaluationism about fictional characters; similarly, someone who applies ordering supervaluationism in her counterpart theory or in her conception of practical reason might have principled reasons to refrain from applying it elsewhere. These are tools to be used where they are helpful and to be learned from where they turn out not to be helpful. My aim here has been to display some of the utility of ordering supervaluationism by defending its application on the behalf of counterpart theorists and metaphysicians who leave open the possibility that there is no most fundamental or "ground" level. I leave detailed consideration of other potential applications to future work.

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