Notes on Kutach Ch.3

for *Power Structuralism/Metaphysics of Entanglement* reading group, 19-11-14

I think we're not supposed to focus too closely on questions about the relationship of this chapter to the mainstream literature on conditionals. So I've focussed on that...

After preamble setting the general scene, Kutach introduces the familiar idea of a *conditional*, and notes that we're interested here in *counterfactual* ones. K124 notes that "counterfactuals" are typically allowed true antecedents. This is an instance of various more general worries in the conditionals literature about labels - for the reason noted, "counterfactual" isn't the best word, but "indicative" vs "subjunctive" don't do the job either. (Lewis discusses this at the beginning of his 1973.) But anyway, we all understand the distinction clearly enough, as evidenced by the Adams example: ¬Oswald ⤳ Someone else. Two clearly different ⤳ operators to be distinguished by whatever labels you choose (Bennett uses "Did-Did" and "Had-Would" in his 2003 book).

I'm not entirely sure I followed the passage on p.124 in which Kutach wonders if what he's theorising about is even a conditional. So it's not that his proposal is not akin to standard treatments of *counterfactuals*, but that it doesn't look like a *conditional* at all? At the top of the para he's talking about "central features of ordinary language *conditionals*", and picks out these three features: obeying MPP, ignoring unlikely possibilities, having a modal character. Those are three quite different things. E.g. there are discussions about logical features of this or that conditional operator (Transitivity, Antecedent Strengthening, even MPP (see e.g. McGee's counterexample)). That ordinary language conditionals in general have a modal character seems contentious to me. The thing about unlikely possibilities will hopefully become clear in due course. Is this all a debate about "ordinary language conditionals", or is it rather about a pair of devices that play a central theoretical role for various purposes?

Goodman

Use > for the Goodman conditional. Later Kutach will introduce his own "nomic conditional" □⇒. While we're at it, let's use □→ for the counterfactual that we all know and love, the one in the Oswald-Kennedy example that we recognised, and that people such as Goodman and Lewis are, in their different ways, trying to analyse. (So, e.g., Bennett bills Goodman's approach and the worlds approach as two central and rival research programmes in the project of analysing the natural language *Had-Would* conditional.)

K125: "Each capitalised variable here represents a token event coarse-grained as some event type, and it also stands for the proposition that that event occurred". I wasn't sure here whether K was retailing Goodman, or putting his own gloss on (e.g. talk of coarse-grained event types).

Now Kutach reports the truth-conditions that Goodman used:[1]

> $A > C$ is true iff there is an appropriate set, S, of truths cotenable with A, such that A and S and the laws of nature together entail C.

We'll want to know more about "appropriate" and "cotenable", and Kutach says this:

> A proposition is cotenable with a set of propositions only if their conjunction is logically consistent, but there are other conditions Goodman wanted to specify in order to designate a special class of appropriate propositions. He seemed to conceive of his project as identifying a general rule for isolating a correct set of propositions that result in the correct truth value for the counterfactual conditional.

Note "only if", not "iff". Back up a bit: Goodman's basic proposal is that the truth-conditions involve an appropriate S such that A, S and laws entail C, and the task is to spell out "appropriate"; that's where cotenability will come in.

I cough, plus *there is a large amount of nitroglycerine in the room*, plus *Laws* together entail *CCC is blown to smithereens*. So if I had coughed then CCC would have been blown to smithereens? Surely not. Okay, so better insist that the things in S be *true*.

I cough, plus *I don't cough* together entail anything you like. So consistency with A ought to be a necessary condition for inclusion in S. Hence, I take it, Kutach's wording.

But more than mere logical consistency with A is needed. E.g., *the air pressure near the table remains constant* is logically consistent with *I cough*, but *I cough* plus *Laws* entails *the air pressure near the table changes*. So add *the air pressure near the table remains constant* to S, and A + S + Laws again entails any C you like. So *the air pressure near the table remains constant*, despite being logically consistent with the antecedent of our conditional, must be inappropriate for inclusion in *S*. So (this is reconstructing from vague memory but I *think* it's right...) what Goodman actually means by cotenability of S with A is $\neg(A > \neg S)$. Then he worried about the appearance of a counterfactual in the analysans...

(What's wrong with *logical consistency with A and Laws* as the requirement? I don't recall, and I think things get quite complicated in the literature here.)

I think then there were problems similar to the flagpole example for the D-N model. But anyway, all that goes under the project as Kutach describes it. And you have to see that project through if you want to use Goodman's analysis of > as an analysis of the counterfactual conditional that we all know and love.

Now (K125 last para) Kutach presents a Goodmanian account of counterfactual dependence. (Question: Isn't counterfactual dependence of A on B just $\neg B \mathbin{\square\!\!\rightarrow} \neg A$? So once you have an account of $\square\!\!\rightarrow$ you automatically have an account of counterfactual dependence? So why is the following section needed? We're about to see...)

M is the match striking. *E* is the match lighting. *s* is "the actual state of the universe at some time *t* during the striking". So it's a kind of time slice, except that it's a state, not an event. Alter a suitable

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[1] I've used A and C rather than C and E, because I found it helpful to think of this as an analysis of a certain kind of conditional operator. Notwithstanding the distancing form "ordinary language conditionals" previously noted, I can't see why we *shouldn't* think of it like that - it looks like a logical operator to me. Then the analysis of this operator is going to be used later on to talk about causation, and then we'll be substituting statements about a cause or an effect occurring, or not occurring, and so on, into antecedent and consequent.

region of s to get rid of the striking, to give $s_{\neg M}$. Okay, now it's pretty clear that the s-slice will evolve given the (deterministic) laws to a slice where the match is lit, and the $s_{\neg M}$-slice will evolve given the (deterministic) laws to a slice where the match is not lit. [Top of p.126, Kutach sets aside complications involving probability].

Okay, at this point we've talked about states of slices and laws, but not about counterfactuals or dependence.

Now Kutach says:

> One reason that $M > E$ is true is that there is a true proposition, <that s occurred>, which is seemingly cotenable with M and together with the laws entails E. [...] Similarly, $\neg M > \neg E$ is true because there is a proposition seemingly cotenable with $\neg M$, namely <that $s_{\neg M}$ occurred>, such that together they entail $\neg E$.

(Is there a typo there? I've substituted $s_{\neg M}$ for s.)

But actually it's more like:

> One reason that $M > E$ is true is that there is a true proposition, <that s occurred>, which [captures] M and together with the laws entails [something that captures] E. [...] Similarly, $\neg M > \neg E$ is true because there is a proposition [that captures] $\neg M$, namely <that $s_{\neg M}$ occurred>, such that together they entail [something that captures] $\neg E$.

In the Goodman case, the stuff that had to be cotenable with the antecedent consisted of extra conditions that delivered the consequent when combined with the laws. Here the antecedent isn't being combined with anything; it's just been done away with, so to speak, in favour of something more specific and maximal. So in this paragraph is seems like Kutach is giving another, vaguely but not really, Goodmanian account of the truth conditions for >.

I'm not entirely sure what the message of the next paragraph is.

Then Kutach turns to the familiar definition:

> In greater generality, Goodman's account of counterfactuals appears to support the following definition: E counterfactually depends on C iff $(C > E) \wedge (\neg C > \neg E)$. If I were going to use this version of counterfactual dependence myself, I would clarify how it applies to a comprehensive range of cases, but because I will be providing an improved definition of my own, I want to focus on a few salutary components that can be salvaged.

(The gloss I gave above on counterfactual dependence should have included the first conjunct. I keep forgetting it because it's trivial in Lewis's framework when you're analysing dependence between actual events, given the worlds analysis of the truth-conditions. In others, like Goodman's, it's not really trivial in the same sense.)

I'm not sure if I'm just nitpicking, but how exactly is it that Goodman's account supports that definition? Why not say instead: "That *is* the definition; it's a further question, and one purely derivative on the success of the account in giving the truth conditions for $\square\!\rightarrow$, whether it gets the idea of counterfactual dependence (extensionally) right"?

Now Kutach runs through how this account is going to give the right kind of truth-values to fly-on-wall conditionals, and so to corresponding claims about counterfactual dependencies.

Then he brings up the flagpole-type problem noted above. So there's a problem for Goodman's account. But it didn't seem to be a problem for the Goodman-type account that Kutach seemed to be presenting.

So the idea that you take a proposition about the whole time-slice that clearly captures the intended antecedent, and also fulfils the role of S. Is Kutach presenting this as the basic idea of Goodman's account? If so, is that the right way to think about Goodman? It can't be, can it, because then there would be no need for all the angst about getting the specification of the conditions on S right?

The nomic conditional

"A major problem with Goodman's account is that in order to avoid virtually every mundane counterfactual claim coming out false, it requires laws of a kind that are extremely implausible. "

Kutach presents a kind of dilemma for any attempted application of Goodman's analysis. Horn 1: "there may well be deterministic laws, but all remotely realistic versions of such laws entail nothing whatsoever from a proposition like <that match is scratched> even if it is combined with other propositions concerning actual background facts. Realistic deterministic laws require a full specification of every last microscopic detail of how the match is being scratched". Horn 2: You might be able to do it for "the rules of thumb present in the special sciences", but they're not deterministic.

[Hasn't Kutach just been considering a Goodman-type account and showing how it works? Or was that his modification? See again the question at the bottom of section 1.]

We should think more about Horn 1. This bit on p.130 is important:

> The problem with precisifying an antecedent (and background conditions) as a maximally fine-grained event, though, is that it mischaracterizes the content of the counterfactual claim. When we are considering what would have happened if this match had not been struck, we are not considering one microscopically precise way of instantiating its not being struck but rather a range of relevant pos- sible ways the match could remain unstruck. Modeling the counterfactual with a fundamental event fails to capture the spirit of the antecedent.

and then this:

> If we try to use a plain coarse-grained event to capture the imprecision of the antecedent, we run into the problem that the laws fail in general to deliver a univo- cal answer as to what counterfactually happens.

But the really important bit is the idea of a nomic conditional:

Recall that a *possible fundamental event* is a region plus a nomologically possible arrangement of fundamental attributes over the region. So if we think of, say, the amplitude of some field being isomorphic to a winking Mona Lisa drawn on the ceiling of this room, then we're imagining a possible fundamental event.

A *coarse-grained event* is a set of possible fundamental events. Some of those are uninteresting because, as sets, too diverse and gerrymandered. But others are more interesting, such as a set of possible fundamental events described like the one above, each with a different winking frequency.

A *contextualised event* is a coarse-grained event plus a probability distribution over its members. So perhaps you have a bell curve with most amplitude concentrated at sensible winking frequencies. NB: Nothing has been said about what this probability distribution amounts to; not necessarily subjective probability, not necessarily chance, etc.

> I will abbreviate statements like "If $\bar{C}$ were to happen, then E would happen" as $\bar{C} \Box\!\!\Rightarrow E$ and call this construction the *nomic conditional*. I will not discuss how the nomic conditional can be incorporated into a broader logic but will merely offer clarification for the special case where $\bar{C}$ is a proposition expressing the occurrence of a contextualized event.

I'm a bit confused by that: If you ignore the bar, then that just looks like Kutach is using $\Box\!\!\Rightarrow$ for the good old counterfactual. So how is the nomic conditional different? It seems like it essentially involves the contextualised event. And the important bit is "the value of the nomic conditional is defined as $p_{\bar{C}}(E)$, the probability $\bar{C}$ fixes for E (using the fundamental laws). So *that's* what's important, what defines $\Box\!\!\Rightarrow$. I found the Had-Would language misleading, I think.

Anyhow, the idea is clear enough: You have a contextualised event $\bar{C}$, which is a probability distribution over a set of possible fundamental events. If the laws are deterministic, then each of those possible fundamental events will be followed by an evolution through one definite series of other fundamental events, **if the fundamental events in $\bar{C}$ are big enough**. So let's make that assumption - we're talking about maximal possible fundamental events now. If the events in $\bar{C}$ aren't big enough, I don't think there will be any specific $p_{\bar{C}}(E)$ anyway. Now the important point is that if E is another fundamental event (this time it doesn't need to be maximal), then clearly that gives a probability for E, and that gives $p_{\bar{C}}(E)$, i.e. the value of $\bar{C} \Box\!\!\Rightarrow E$.

Question: Why isn't Kutach proposing this as a rival to Lewis as an analysis of $\Box\!\!\rightarrow$?

So, to evaluate $A \Box\!\!\rightarrow C$, first you parlay A into a contextualised event $\bar{A}$. Then you see, for each element of $\bar{A}$, which fundamental events it'll evolve through. Then you see which of those realise C. Take the sum of the [probabilities] assigned by the contextualised event to the fundamental events that do evolve to C-realisers, and you have the value for $A \Box\!\!\rightarrow C$.

One of the frustrations of teaching Lewis's analysis of counterfactuals is occasionally that students will refuse to see the truth of counterfactuals that are clearly(?!) true (which they are meant to see in order that we can then see the beauty of how they come out true on the analysis), and refuse to see the invalidity of certain inferences involving them that are clearly(?!) invalid (which they are meant to see in order that we can then see the beauty of how that invalidity just drops out of the behaviour

of "closest"). Example of the latter: Transitivity. I think careful attention to context does away with that one. But very occasionally it doesn't work, and this links to an example of the former. When that happens it sometimes seems to be that people don't see counterfactuals as true or false *at all*. Last time this happened the guy kept insisting that they're merely *probable*. Question: How close is that way of thinking to Kutach's $\square\Rightarrow$?

Other questions:

What if you define a numerical similarity measure on Lewis's worlds? So instead of defining $val(A \;\square\!\!\rightarrow C) = 1$ if some $A \wedge C$ world is closer than any $A \wedge \neg C$ world and 0 otherwise, define $val(A \;\square\!\!\rightarrow C)$ to be some function of the similarity-scores of the various $A \wedge C$ worlds?

Bennett says that the Goodman approach ends up needing worlds and thus converges on Lewis's. Do we get anything like that here?

How close is this to Spohn's recent work?

Similar approaches in the literature?

Maudlin in TMWP has a laws-first kind of view (FLOTES - "fundamental laws of temporal evolution"), and offers this account of the truth-conditions for counterfactuals (here Maudlin is, as often, arguing against Lewis):

> We wish to know what would have happened if the bomb had contained titanium in place of uranium. Here is the recipe. Step 1: Choose a Cauchy surface that cuts through the actual world and that intersects the bomb about the time it was released from the plane. All physical magnitudes take some value on this surface. Step 2: construct a Cauchy surface just like the one in step 1 save that the physical magnitudes are changed in this way: uranium is replaced with titanium in the bomb. Step 3: allow the laws to operate on this Cauchy surface with the new boundary values generating a new model. In that model, the bomb does not explode. Ergo (if we got the laws right, etc) the counterfactual is true (p.23)

How similar is this to Kutach?

Jackson had a similar account:

Step 1: Identify the "antecedent time",[2] the time the antecedent is about.

Step 2: Consider a world that is like @ up to that time, and differing at the antecedent time in whatever way is needed to make the antecedent true.

Step 3: Allow the laws to operate on the new state at the antecedent time and see if the consequent is true.

A feature of this kind of account: Jumps.

Jumps as an objection: "If there had been titanium in the bomb, then uranium would have suddenly changed into titanium". True or false?

Jackson's response, iirc: We're not concerned with backtrackers like that.

Problem: Counterexamples without backtrackers. "If there had been titanium in the bomb, then the pilot would have felt two bumps instead of one" (as the plane got lighter twice).

Contrast this with the little miracles of Lewis, which give a smooth transition rather than the jump.

Others in the literature too, e.g. Andreas Hüttemann, perhaps E. J. Lowe. (Note that Huttemann and Maudlin are explicitly laws-first. Kutach is neutral on this.)

Do the objections to Jackson apply to Kutach's account? I don't think so, but why not?

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[2] Not sure whose term this is, perhaps has another usage.