LEWIS, CAUSATION, BAROMETERS: DUBIOUS FATE OF AN EXAMPLE*

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Since *Crítica* published Eduardo Flichman's criticism of Lewis's theory of causation including a significant counterexample [Flichman 1989], new contributions to the controversy have appeared in papers by Dorothy Edgington [Edgington 1990], [Edgington unpublished] and myself [Abeledo 1995], and finally Helen Beebee's defense of Lewis [Beebee 1997] and Flichman's "Response" [Flichman 2000].[1] Here I present my own reaction to some parts of Beebee's defense and Flichman's response. I shall not review in detail the history of the debate. Rather, in section 1 I describe briefly the aspects of [Flichman 1989] and [Edgington 1990] that induced me to chime in, and sketch the main conclusions of my paper. In section 2 I recall, as concisely as I can, Beebee's principal lines of argumentation and proceed to present my objections and ob-

[1] Hereafter, I shall refer to Flichman [1989] simply as 'Flichman's paper', to Abeledo [1995] as 'my paper', to Beebee [1997] as 'Beebee's defense' or, more briefly, 'Beebee', and to Flichman [2000] as 'Flichman's response'.

servations.[2] Finally in section 3 I comment on Flichman's response and attempt to answer to his critical remarks.

1. *Flichman, Edgington, Abeledo*

Since Flichman's paper centers on his rejection of the causalist program, he makes a rather incidental use of Lewis's barometer example as a test case.

He brings up the example with the purpose of making a twofold criticism. On the one hand, he argues that the ordering of worlds supported by Lewis with the purpose of assuring irreversibility is erroneous (Flichman's objection). On the other hand, he points out that, were this world ordering accepted, Lewis must accept a causal statement that is grossly contrary to intuition (Flichman's counterexample). The exposition of the counterexample, which was to motivate Edgington's approval and my paper, runs to a mere eleven lines in a twenty-some page long paper.

Now Flichman does not say nor imply that Lewis must unavoidably choose between reversibility and accepting the above mentioned ordering of worlds. He merely points out that with this ordering Lewis's theory is still not safe. The reader can wonder: could Lewis withdraw his proposed ordering and yet avoid reversibility?

Now whereas Edgington (without backing up the claim) assumed he could not, I thought the matter demanded inspection. The goal of my paper was solely to establish whether that possibility existed. My analysis was primarily formal, precisely because I intended to determine how far it was possible for a defender of Lewis's causation theory to avoid both pitfalls (reversibility and Flichman's counterexample). The formal escape route existed: one could envisage an ordering of worlds that did the trick; but once the

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[2] For the sake of brevity, I shall omit those that coincide with Flichman's as laid out in his response.

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desired ordering was found it would need to be argued for. It was not my job to find the arguments; I rather expressed my doubts that sound ones could be found. Summing up my results in the concluding section I claimed that I had shown Flichman's criticism not to be conclusive 'from a formal point of view'; but that the consequences were 'still unfortunate for Lewis's counterfactual theory of causation'.

2. *Beebee*

2.1. Beebee's position

I shall now consider Beebee's arguments in defense of Lewis's theory (or any other theory based on the notion of counterfactual dependence). Beebee's strategy proceeds on two separate lines, developed respectively in sections IV and V of her paper.

For ease of reference I reproduce here Beebee's notation and main formulas with her numbering, which coincide neither with those of Flichman's paper nor with those of mine:

p: the atmospheric pressure being 1000mb
b: the barometer's working well
r: the barometer's reading 1000mb

(1) $\sim O(r) \;\square\!\!\rightarrow\; \sim O(p)$
(2) $\sim O(r) \;\square\!\!\rightarrow\; \sim O(b)$
(3) $\sim O(r) \;\square\!\!\rightarrow\quad O(p)$

In IV Beebee claims there are reasons for the rejection of (1) that are independent of the truth or falsity of (2). Hence, Lewis does not need to stick by his criticized argument, since abandoning it does not endanger irreversibility. Reasons: according to Lewis's miracular analysis, (1) is false regardless of whether b occurs or not in the nearest

$\sim r$-worlds. The rather strong conclusion of her analysis is that not only (1) is false but (3) is true. Let us recall that the denial of (1) in Lewis's theory is equivalent to the 'might' counterfactual

    (3a) $\sim O(r)$ $\diamondsuit\!\!\rightarrow$ $O(p)$;

which is to say, some among the nearest $\sim r$-worlds are p-worlds; perhaps others are $\sim p$-worlds. But in Beebee's ordering *all* of the nearest $\sim r$-worlds are p-worlds.

    Confident that she has defended Lewis from reversibility, Beebee turns in V to analyze (2) in order to show that Flichman's criticism is invalid. The argument is essentially that although Lewis's ordering is correct, and hence the counterfactual 'If the reading had not been 1000mb, the barometer would not have been working well' is true, (2) is not a correct symbolization. Let us symbolize it now as

    (2a) $\sim O(r)$ $\square\!\!\rightarrow$ $\sim B$ (where B = 'The barometer is
                                      working well').

The reason why Beebee considers (2) an incorrect symbolization is that, according to her interpretation of Lewis's notion of event,[3] there is no (genuine) event b corresponding to statement B. Therefore, in spite of Lewis's ordering and of the ensuing truth of (2a), it is not the case that r causes b.

2.2. My comment on Beebee's arguments

In section 3 below I point out my many coincidences with Flichman's response. Here I make some additional remarks of my own.

i   Beebee remarks in section II: 'rejection of (1) seems to involve a commitment to (2), so [Lewis] cannot con-

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[3] Laid out in [Lewis 1986b]; published, that is, long after the example here at stake appeared in "Causation" [Lewis 1973b].

sistently reject both (1) and (2)'. And in section III she remarks that Lewis is not required to assert (2) in order to motivate the denial of (1) 'despite what he seems to suggest...'.[4] I do not think Lewis implies in any way that he is thinking there is some logical connection between (1) and (2). Rather, it appears to me that Lewis merely considered two different, and prima facie plausible, orderings of worlds; one that made (1) true and (2) false, and one that made (1) false and (2) true. His claim is that the second ordering is correct. He does not mention the possibility of their being jointly false, nor does he deny it; but his being mistaken about this matter is well-nigh inconceivable.[5] In fact, besides the orderings I present in my paper making (1) and (2) false, one could set up orderings that make both true: orderings in which the nearest $\sim r$-worlds are all worlds in which the barometer is not working well *and* the pressure is not 1000mb.[6] But these are not at all plausible. (Flichman defends the truth of both counterfactuals; but in his account two different orderings are used.) Therefore, the falsity of one of the counterfactuals does not logically entail the truth of the other, nor vice versa. And if we restrict ourselves to at least moderately plausible orderings, it is the truth of one of them that leads to the falsity of the

[4] Flichman in his section 5 criticizes these remarks.

[5] Following Lewis, Beebee and I take for granted throughout that *one and the same resolution of vagueness* is used in evaluating all these counterfactuals. That is to say, they are analyzed as if they were uttered under the same context. Flichman, instead, tries to evaluate each statement in its own context, which is different (and thus may generate a different ordering of possible world) when the consequent is different. I agree with, and am partly responsible for, the pragmatics favored by Flichman (see [Abeledo and Flichman 1994], [Abeledo, Miguel and Paruelo 1995], [Abeledo, Flichman, Miguel, Paruelo and Venier 1996], [Paruelo and Venier 1995]). In my paper, however, I try to study these counterfactuals from Lewis's point of view.

[6] This possibility was brought to my attention by Flichman.

other, and *not* vice versa. Probably Lewis's commitment to a world ordering that makes (2) true is motivated by his desire to reject (1). But that is not the same as logical entailment.

ii   Regarding Beebee's arguments of section IV: One can indeed attempt to justify the rejection of (1) with arguments that do not rely on the truth of (2).[7] However, that does not mean that (1) and (2) are altogether independent: although Lewis's logic for counterfactuals (as opposed to, for example, Stalnaker's) does not have among its rules 'Conditional Excluded Middle', it contains instead a principle that I shall call 'Conditional Excluded Fourth'; in symbols:

(CEF) $(A \square\rightarrow B) \vee (A \square\rightarrow \sim B) \vee (A \diamondsuit\rightarrow B \,\&\, A \diamondsuit\rightarrow \sim B)$

Explained in terms of Lewis's semantics, either all the nearest A-worlds are B-worlds, or they are all ∼B-worlds, or some of them are B-worlds and some others are ∼B-worlds. A consequence of (CEF) is that denying the truth of

(1) $\sim O(r) \square\rightarrow \sim O(p)$

leaves us only two alternatives:

Either we support, as Beebee does,

(3) $\sim O(r) \square\rightarrow O(p)$

or we fall back on

(4) $\sim O(r) \diamondsuit\rightarrow \sim O(p) \,\&\, \sim O(r) \diamondsuit\rightarrow O(p)$.

Now supporting (3) must necessarily commit us to accepting (2), since there is no way one can claim, and much less in the *nearest* ∼r-worlds, that the barometer can be working well while its reading does not correspond to the

[7] Whether these arguments succeed is entirely another question. But Flichman has discussed that matter thoroughly.

actual pressure. Analogously, supporting (4) leads us to accept

(5) $\sim O(r) \diamondsuit\!\!\rightarrow \ \sim O(p) \ \& \sim O(r) \diamondsuit\!\!\rightarrow \ \sim O(b)$.

So that Beebee's endorsement of (3) shall drive her to accept (2); and should she take back this endorsement while still denying (1), she must accept (5). Now (5) is precisely the formal and costly escape route I showed in my paper.[8] In other words, if Beebee's arguments in favor of rejecting (1) for reasons different from those offered by Lewis were accepted, one of the goals of her first line of argumentation would be achieved: the example would not be reversible. But she fails in making the negation of (1) completely independent of the acceptance of (2) without resorting to the 'costly alterations' I proposed, since the only way to deny jointly (1) and (2) would be to endorse (4) and therefore (5). Thus the success of Beebee's defense depends exclusively on her arguments of section IV. Should they be unacceptable, the situation would be exactly that described in my paper: either we accept (2) and consequently Flichman's counterexample, or we try a way out through the 'might' conditionals of (5), with the huge drawbacks I mentioned (and are underlined in Flichman's response).

iii   An attempt to defend Lewis's ordering based on the claim that Flichman and I ignore Lewis's theory of events could have been anticipated. Lewis does not give his phrase the symbolic form (2), or any other. One could suspect that he does not consider the barometer's working well as an event, or at least that he has not at the moment of writing reached a decision on that matter. And so

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[8] I am not discussing yet Beebee's argument of V; but if it were successful, instead of (2) and (5) we should have (2a) and

(5a) $\sim O(r) \diamondsuit\!\!\rightarrow \sim O(p) \ \& \ \sim O(r) \diamondsuit\!\!\rightarrow \ \sim B$.

it could be, since in his [1973b] Lewis appeals only to a very vague notion of event, and would only much later (in "Events" [Lewis 1986b]) develop a theory of events to fill in the gap. Beebee's argument —were it correct— would effectively save Lewis's theory from the counterexample. In subsequent paragraphs I present some objections to that argument. But I wish to make here a very minor objection to the strategy. With good sense, Lewis has the habit of presenting his theories as independent modules that may be separately examined. Each of them may be, if accepted, combined with theories other than his own. His possible worlds theory of counterfactuals may be accepted even if his modal realism is rejected. The counterfactual analysis of causation may be combined with another author's counterfactual semantics. In "Causal Explanation" Lewis says 'this paper is not meant to rely on my views about the analysis of causation' [Lewis 1986a]. I already pointed out in my paper that the escape route via accepting (5) is only possible if we reject those theories of counterfactuals —such as Stalnaker's— that contain Conditional Excluded Middle. It would seem now that —supposing Beebee's interpretation of "Events" [Lewis 1986b] and her defense were acceptable— Lewis's theory of causation unavoidably needs to be supplemented by his own theory of events. I do not intend to criticize the latter here; but if any defects in it should be found in the future, they might carry over to the counterfactual analysis of causation, thus adding to the problems this analysis already has.

iv   Suppose we accept that the barometer's well working is not an event that can enter as such in causal relations: what are we to make of causal statements that intuition would no doubt validate and in which it is mentioned as a cause or an effect? Surely we could rightly assert

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(C1) 'The barometer's well functioning was a cause of
     the barometer's reading 1000mb'

or that

(C2) 'The barometer's being correctly installed was a
     cause of its functioning well'.

Of course, Lewis's theory of *event* causation in no way implies that events are the only possible causes and effects. Rather, the specification of the causal *relata* is an open question in Lewis's [1973b]; in his own words: 'I shall confine myself to causation among events, in the everyday sense of the word: flashes, battles, conversations, impacts, strolls, deaths, touchdowns, falls, kisses, and the like. Not that events are the only things that can cause or be caused; but I have no full list of the others, and no good umbrella-term to cover them all.'[9] But these very words seem to suggest that when those other 'things' are finally taken into account they must be included in a similar analysis, still based on counterfactual dependence. Would it sound acceptable if someone were to put forward a theory according to which: (a) events and other 'things' can be causes and effects, (b) events are causes or effects by virtue of counterfactual dependence whereas other 'things' are causes or effects through an altogether different mechanism?

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[9] As was mentioned above, Lewis did not have a theory of events in 1973; when he attempts to fill the gap in "Events" [Lewis 1986b] he tries to tailor the concept to fit the needs of his theory of causation. Witness, for example, his words of the same year in "Causal Explanation", where he gives this description of the causal relata: '. . . events: Local matters of particular fact, of the sorts that may cause or be caused. I have in mind events, in the most ordinary sense of the word: flashes, battles, conversations, impacts, strolls, deaths, touchdowns, falls, kisses, . . . But also I mean to include events in a broader sense: a moving object's continuing to move, the retention of a trace, the presence of copper in a sample.' I am indebted to an anonymous referee for having suggested this note.

In other words, are we to admit that the similar sounding —and intuitively true— causal statements (C1), (C2), and

(C3) 'The pressure's being 1000mb was a cause of the barometer's reading 1000mb'

are correct on the basis of wholly different analyses?

v   Let us try to change sentence B in the example for one that does not refer to dispositions. We could for example make a description of the barometer, and as I believe, Lewis's difficulties would not disappear. Let us suppose for simplicity that in the context we have a detailed description of the elements used in the design and construction of a Torricelli-type barometer; a vessel with mercury, a glass tube with divisions including a division etched at point Q with the label '1000', etc. Now r becomes r': the event that the mercury level in the tube coincides with the division labeled '1000'. As before, and in agreement with intuition, $\sim O(p) \ \square\!\!\rightarrow\ \sim O(r')$ comes out true, and according to Lewis, p causes r'. What about irreversibility? Lewis would probably judge $\sim O(r') \ \square\!\!\rightarrow\ \sim O(p)$ false, arguing that if the mercury level had not coincided with the division labeled '1000', something would have been wrong in the setup of the experiment. There are many things that could go wrong, but for simplicity let us imagine there are only two possibilities, corresponding to the non-occurrence of either of two events:

b_1: The '1000' division being etched at point Q of the tube

b_2: The liquid in the vessel being mercury

Granting that (2) may not be a correct symbolization, we replace $\sim B$ in (2a) with $\sim O(b_1) \vee \sim O(b_2)$.

Now (2a) becomes

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(2a$'$) $\sim$O(r$'$) $\Box\!\!\rightarrow$ [$\sim$O(b_1) $\lor$ $\sim$O(b_2)]

Acceptance of (2a$'$) commits us to choose one of the alternatives

(2b) $\sim$O(r$'$) $\Box\!\!\rightarrow$ $\sim$O(b_1)

(2c) $\sim$O(r$'$) $\Box\!\!\rightarrow$ $\sim$O(b_2)

(2d) $\sim$O(r$'$) $\Diamond\!\!\rightarrow$ $\sim$O(b_1) & $\sim$O(r$'$) $\Diamond\!\!\rightarrow$ $\sim$O(b_2)

and we face again an analogous dilemma: either we accept (2b) and say that the barometer's reading 1000mb caused the division to be etched at point Q of the glass tube; or (2c) with the result that the barometer's reading 1000mb caused the liquid in the vessel to be mercury; or we resort to escape route (2d) which leads us to difficulties exactly analogous to those of accepting (5): *ad hoc* ordering of worlds, etc.

vi   In her endorsement of (3) and (2a), Beebee argues that the world most similar to the base world in which *r* does not take place is a world where the barometer does not work properly, but not because some of the conditions for its correct functioning failed (such as the scale being properly marked, or the liquid being mercury, etc.) but rather in spite of their not failing!!! I find it hard to swallow that this should result from applying Lewis's pragmatics. Can the miracle take place in the precise moment of the antecedent and consequent? Should we believe that such a world is the antecedent-world most similar to the base world? It seems to me that this world ordering would force Beebee to accept as true such counterfactuals as the following:

> 'If the reading had not been 1000mb, the barometer would have been violating well-established laws of nature'

> 'If the reading had not been 1000mb, the meteorologist would have been perplexed'

> 'If the reading had not been 1000mb, the density of mercury would have changed'

This, however, begins to seem to me an argument that, while purportedly supports Lewis's use of counterfactuals for the analysis of causation, rather undermines his theory of counterfactuals.

3. *Flichman's Response*

Flichman responds with a detailed paper in which he, among other things,

(a) refutes Beebee's criticism,
(b) elaborates on his criticism of Lewis's world ordering,
(c) makes some critical remarks about my conclusions,
(d) defends his acausalist position.

I agree with most of (a) and (b), but must answer some of (c). As for the causalist-acausalist polemic, it is outside the scope of my paper, and I shall not go into it here. Comments on some of his remarks, in the order of their appearance, follow.

i   Subsections 6.1 and 6.2 are devoted to general remarks about Lewis's pragmatics. My agreement can readily be surmised from an inspection of the names of the authors of the references cited.

ii   In section 7 Flichman develops several arguments against Beebee's conclusions of section IV. Again I agree with most of them; but the discussion on the truth value of (1) bears no relation to my paper, since no value was proposed therein.[10] Also, as I have shown in section 3

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[10] Though I did remark that Lewis's evaluation seems 'extremely

above, Beebee's arguments in IV would, if correct, solve the reversibility problem, but by themselves do not manage to save Lewis from his predicament without resorting to the maneuvers I describe in my paper.

iii   In section 7, first paragraph of the second argument, Flichman writes: 'Beebee believes she applies correctly... Lewis's pragmatic analysis, but she forgets to contrast it with intuition... We can find the same problem in the arguments presented by Abeledo'. Since I do not apply Lewis's or anybody else's pragmatic analysis,[11] nor affirm the truth or falsity of any counterfactual, I can hardly be said to have that problem.

iv   In section 7 (note 34) Flichman says that when he speaks of the barometer's internal structure he shall refer not only 'to the spatial arrangement and articulation of the pieces, but also to any other relevant property or relation'. In my opinion that should include the density of mercury, or at least some relation between the density of mercury and the markings in the scale of the barometer. Now in the sixth paragraph of section 9 it seems that he considers a change of the properties of mercury as something distinct from a change in the structure of the barometer[12] (here the actual structure of the barometer represents the essential

ad hoc' and that the argument he uses is 'highly questionable'. Still, it was not a purpose of my paper to give reasons for or against the truth of (1) nor, for that matter, of (2). Instead I endeavored to show that the falsity of one does not _necessarily_ lead to the truth of the other; and nonetheless tried to argue that considering them both false is hardly plausible.

[11]   Except in the sense mentioned in note 5.

[12]   Probably the confusion is generated by the idea that a change of the density of mercury is a violation of a natural law, and not merely a change of structure of a certain object. But any (unmotivated) change of the configuration of the barometer would involve similar violations of natural law.

characterization of its well-working). However that may be, no difficulty seems to ensue for my analysis: it all appears to come down to adding terms to the consequent of (2a′) above, and correspondingly increasing the number of alternatives of the type of (2b), (2c) and (2d).

v   In 11.1 Flichman summarizes my arguments. He underlines, and one can sense an implicit criticism, the formal character of my 'solution' to Lewis's predicament. I must simply point out here that my study was purposefully 'formal', and intended not so much to expound my views on the subject as to show that even if one lets the defenders of Lewis's theory choose whatever world ordering is necessary to steer them clear of counterexamples, still the theory is left in a quandary. With some nuance differences, anyway, the objections made here to my 'solution' are the same ones I mentioned in my paper.

vi   Still, I think; Flichman omits one of the drawbacks of adopting the escape route via (5) that I pointed out in my paper: arguments must be found to defend the idea that the antecedent worlds with broken barometers are just as similar to the actual world as the antecedent worlds with different pressures.[13] It is easy for Lewis (although disputable) to say offhand that the barometer is more vulnerable to small departures from actuality than the weather. It is perhaps just as easy to reverse the argument as Edgington does through mention of the Butterfly Effect. But Lewis's method requires us to present the evidence. And let us suppose we have found arguments in favor of this improbable tie. We have only solved the case of the barometer. Countless other more or less similar examples can surely be presented. Can we be sure that in each and every one we

[13] I should add now that even an approximate tie (not only a microscopically exact tie) would have to be argued for.

shall be able to argue just as effectively against all possible counterexamples?

vii In 11.2 Flichman says that 'the interest in saving Lewis by means of Abeledo's formal resources disappears'; and that once his arguments are accepted, 'it becomes useless to affirm that Lewis's causation analysis can be saved by means of a formal resource that allows (1) and (2) to be false, when it is visible that they are both true (under their own *usual* or at least under their own standard contexts for some competent speakers)'. I believe it is clear by now that what I thought interesting about my results was to establish how far Flichman's counterexample had damaged the theory. Probably, neither Flichman's rather sketchy treatment of the example in his paper nor Edgington's unqualified enthusiasm would by themselves have motivated Beebee's defense and the reassessment in Flichman's response. It should also be clear that my analysis explores what can be done, not from my (or Flichman's) standpoint but from that of Lewis. This may prove valuable, since at least some defenders of Lewis's or similar theories are likely to prove reluctant to accept Flichman's position (which is also mine) in favor of pragmatic methods different from those of Lewis.

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RESUMEN

David Lewis, al defender su teoría de la causación, incurre en una curiosa falla que señala E.H. Flichman en un artículo publicado en 1989, y a raíz de esto ha surgido una serie de artículos que tratan el tema. Entre éstos, uno de Horacio Abeledo, autor del presente trabajo, en el que explora las posibilidades que tiene la teoría de Lewis de sobrevivir al contraejemplo generado por su creador; la conclusión de ese artículo es que la supervivencia es posible desde el punto de vista puramente formal, pero que dicha solución es poco satisfactoria si se pretende que la teoría tenga otras virtudes que las meramente formales. Aquí se intenta responder a dos nuevos trabajos: uno de Helen Beebee que pretende rescatar la teoría de Lewis y otro de Flichman que rebate la propuesta de Beebee y presenta algunas críticas al ya mencionado trabajo de este autor.