

## *Against proportionality*

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A statement of the form ‘C caused E’ obeys the constraint of proportionality precisely when C says no more than what is necessary to bring about E. For example, suppose that

(1) The cape’s being red caused the bull to charge

and that bulls can’t distinguish one shade of red from another. Then proportionality prohibits us from saying that

(2) The cape’s being crimson caused the bull to charge.

On what basis does proportionality issue this prohibition? Here are two possible answers:

- Statement (2) is false.
- It is conversationally inappropriate to assert Statement (2).

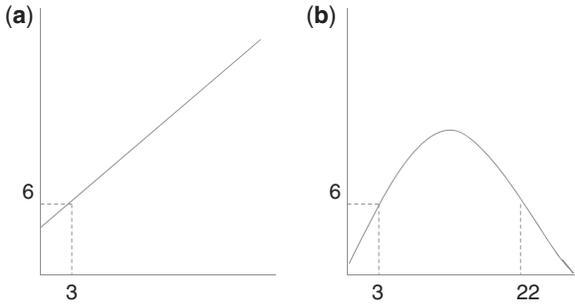
Call these the *semantic* and the *pragmatic* rationales for proportionality. Our main beef is with the semantic rationale, though we think the pragmatic thesis is overstated.

Proportionality matters to philosophy, not just because it bears on the general question of understanding what causation is, but because it is relevant to thinking about how the causal efficacy of supervenient properties and the causal efficacy of subvenient properties are related (Shapiro and Sober 2007). In the philosophy of mind, Yablo (1992) used the concept of proportionality to argue that mental properties, not neurophysiological properties, cause behaviour. Yablo was replying to Kim’s (1993, 1998) causal exclusion argument that non-reductive physicalism entails that mental causation does not occur. Yablo’s idea has a predecessor in Putnam’s (1975) argument against reductionism, although Putnam was discussing explanation, not causation. If a square peg fails to pass through a round hole in a board, it is, according to Putnam, the size and shape of each that explains why this happens, not the microproperties and relations of the many molecules that comprise the peg and board (for discussion, see Sober 1999).

Proportionality is often discussed in the context of counterfactual theories of causation (Jackson and Pettit 1988; List and Menzies 2009; McGrath 1998; Menzies 2008a, 2008b; Woodward 2008; Yablo 1992). One counterfactual approach involves reasoning as follows. Statement (1) is true in part because the bull would not have charged if the cape had not been red, while Statement (2) is false because the bull might have charged had the cape not been crimson. After all, the cape might well have been scarlet, in which case the

bull still would have charged.

Two possible functions relating  $x$  to  $y$ .



The example just described involves dichotomous variables – either the cape is red or it is not, either the cape is crimson or it is not, and either the bull charges or he does not. What happens if we shift to variables that have more than two states? Consider, for example, the two functions depicted in the accompanying figure. Are states of the  $x$ -variable causes of states of the  $y$ -variable? For example, consider the statement

(3)  $x = 3$  caused  $y = 6$ .

The counterfactualist we are considering will say that (3) is true if the functional relationship linking  $x$  to  $y$  is that given by (a). After all,

(4) If  $x$  had not equalled 3,  $y$  would not have equalled 6

is true when  $x$  and  $y$  have the linear relationship shown in (a). But suppose the functional relationship is the one given in (b) and that all  $x$ -values between 0 and 30 have non-zero probability density. This suffices to render (4) false, and so this counterfactualist will conclude that (3) is false as well. Scientists will greet this result with incredulity. Causal modelling in the sciences does not balk at functional relationships like (b). Non-monotonic functions like (b) do not mean that point values for  $x$  fail to cause point values for  $y$ .

In the face of (b), counterfactualists may be tempted to bite the bullet and go disjunctive. Perhaps they will say that Statement (3) is false and that the true causes of  $y$ -values are disjunctions of  $x$ -values (e.g. the disjunction  $x = 3$  or  $x = 22$ ). This seems implausible, however, as it will mean rejecting almost all the causal statements we think are true. For example, Statement (1) will be judged false because the cape's being red is just one disjunct in a very long disjunction. The 'real' cause of the bull's charging, according to this response, is the cape's being red *or* the bull's being prodded by a picador *or* other bulls challenging the bull's authority *or* neuroscientists directly stimulating specific

brain regions *or* . . . . Yet, the bull described in Statement (1) faced only a red cape; none of the other disjuncts just enumerated apply, and still our counterfactualist says that (1) is false.

This criticism of one counterfactual theory of causality invites consideration of another. This theory begins with the recognition that causal statements of the form ‘C caused E’ are elliptical twice over. The full form should be

(5) It was  $C_1$  rather than  $C_2$  that caused  $E_1$  rather than  $E_2$ .

The fact that the effect side of (5) needs to be understood contrastively is clear from Dretske’s (1972) discussion of explanation. The cause side is contrastive as well (Hitchcock 1996; Maslen 2004, 2009; Menzies 2008a, 2008b; Shaffer 2005).<sup>1</sup> Let us focus just on the latter and consider what a counterfactualist might say about a causal statement of the form

(6) It was  $C_1$  rather than  $C_2$  that caused E.

The counterfactualist may suggest that (6) is equivalent to

If  $C_1$  were to occur, then E would occur. And if  $C_2$  were to occur, then E would not occur.

With a linear relation like (a), the elliptical Statement (3) is harmless, since

(7) For every  $i \neq 3$ , it was  $x = 3$  rather than  $x = i$  that caused  $y = 6$ .

However, when the non-monotonic relationship (b) holds, we must say something more modest, such as

(8) It was  $x = 3$  rather than  $x = 4$  that caused  $y = 6$ .

According to this contrastive formulation of the counterfactual interpretation of causation, both the functional relationships shown in the figure are compatible with the truth of Statement (3).

Which brings us back to the bull. Statement (2) is *not* false flat out, and this is something that a counterfactualist should acknowledge, once the contrastive character of causal claims is recognized. After all,

(9) It is the cape’s being crimson rather than white that caused the bull to charge rather than stand still

is true. We say ‘flat out’ because Statement (2) is elliptical. However, there is no iron law of semantics that says that (2) must be elliptical for the false

1 Contrastive considerations also enter into the concept of one cause’s making more of a difference than another does to an effect (Sober 1988).

claim that

(10) It is the cape's being crimson rather than scarlet that caused the bull to charge.

Conversational context dictates relevant alternatives, and these can vary from context to context. This is why the pragmatic defence of proportionality is overstated. Statement (2) is conversationally inappropriate in some contexts, but in others, it is fine (Bontly 2005).<sup>2</sup>

Suppose you are in a context in which (2) is false because the contextually indicated contrast with crimson is scarlet. This means that you evaluate (2) by attending to (10), and (10) is false. This, of course, does not affect the fact that (9) is true. Context determines what the contrast is in (2), but context plays no such role in (9), because there the contrast is explicit. When philosophers of bull consider cape causation, should they focus on the (contextually) false Statement (2) or on the true Statement (9)? We suggest that this question poses a false dichotomy. The point that needs to be recognized is that (10) is false *and* (9) is true. Both facts are relevant to understanding cape causation. There is no further question about whether the cape's being crimson *really* caused the bull to charge.<sup>3</sup> What is more, there is no conflict between the cape's being red (rather than not red) and the cape's being crimson (rather than white) – both are true descriptions of what made the bull charge. By parity of reasoning, there is no conflict between mental and neurophysiological causation, nor is there a conflict between macro- and microcausation (Shapiro and Sober 2007).<sup>4,5</sup>

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- 2 The question of how context determines the contrasts that are needed to flesh out elliptical causal statements is interesting, but we will not address it here.
- 3 This point is a natural part of manipulationist views of causation (Shapiro and Sober 2007; Woodward 2003, 2008). Consider a fine-grained set of *colours* (which includes crimson, scarlet and shades of non-red *colours* as well) that is exclusive and exhaustive. Let the *colour* variable  $V$  takes the items in this set as values. For this variable to cause a bull to charge, it isn't necessary that *every* manipulation from  $V=i$  to  $V=j$  ( $i \neq j$ ) should be associated with a change in whether the bull charges. The more modest requirement is merely that *some* such manipulation has that character.
- 4 Here we disagree with Menzies (2008a), who sees a conflict between mental and neurophysiological causation despite his sharing our misgivings about proportionality.
- 5 We are grateful to Tom Bontly, Dan Hausman and Mike Titelbaum for useful discussion.

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