depends on an answer to the question "Who will judge (quis judicabit)?" Note that no analogous problem exists for normal PD-utilities. The construction of von Neumann–Morgenstern-utilities excludes intersubjective haggling about "correct" utilities. This is precisely why one can be sceptical about (non-co-operative) game-theoretical scenarios of the emergence of unarbitrated moral rights and duties. Rights are in need of intersubjective interpretation, as are duties, and if an arbiter for interpretations is chosen, a standard PD will no longer represent the situation correctly.

My last comment concerns Stemmer's conception of distributive justice. From his rational agent perspective, he adjudicates a distributive principle which reflects the relative powers of agents. This principle implies that stronger players can legitimately claim a larger piece of the cake. Stemmer calls such a distribution contractually just, so we may assume that he mainly wants to legitimise the agents' uses of their bargaining power in contract dealings. Then, however, it is astonishing that the name "Nash" is not mentioned by Stemmer. The Nobel-honoured Nash-solution to game-theoretical bargaining problems rests on the agents' imagined or real use of their bargaining power. There is a momentous "Nash-programme" in bargaining theory which attempts to spell out the implications of Nash's fertile ideas. Of course, recourse to violence is ruled out in game-theoretical bargaining scenarios. But Stemmer, who introduces no such limitation, cannot very well allow this move, since "winner takes all" instead of proportional partition would be the likely result of winning Hobbesian combats.

My critical remarks show that I do not think that Stemmer has improved the defences of the rational choice paradigm's ventures into ethics. The virtues of his book consist in a very clear delineation of the basic features (as standardly understood) of an ethics within the limits of rational choice. Stemmer is to be applauded for not retouching what others dislike about the rational choice approach. Except, of course, that he adds a Schopenhauerian section on altruism and pity. This section helps remind us that rational agents need not be cold and self-interested in a narrow sense.

University of Bayreuth RUDOLF SCHÜSSLER
Bayreuth, Germany

Phil Dowe, *Physical Causation*, Cambridge University Press, Cambridge, 2000, 225 pages, GBP 35.00, ISBN: 0521780497.

Physical Causation by Phil Dowe is both a very good book and further proof that philosophy can benefit from the contributions of contempo-

rary science. The focus of *Physical Causation* is on the following three questions:

1. What are causal processes and interactions?
2. What is the connection between causes and effects?
3. What makes a cause different from its effects?

Dowe claims that there are two ways to interpret each of these questions. One might intend by asking questions (1)–(3) to ask for a conceptual analysis of our ordinary concept of causation (or the concept of causation as employed by contemporary scientists, if that concept differs from the ordinary concept). Alternatively, one might intend to ask what causation in fact is in the actual world. Dowe calls this latter question a request for an *empirical analysis* of causation. According to Dowe, a true conceptual analysis will be *a priori* and necessarily true, whereas an empirical analysis will be *a posteriori* and (probably) contingently true.[1] Dowe's goal in *Physical Causation* is to provide a true empirical analysis.

Given that Dowe focuses on providing empirical analyses, it is curious that he never explicitly states what justifies one in believing that a particular empirical analysis is correct. One might think that what justifies an empirical analysis is evidence that the relation picked out by the conceptual analysis is both contingently co-extensive with and supervenient on the relation picked out by the empirical analysis. But Dowe does not explicitly argue that his empirical analysis is extensionally equivalent to the correct conceptual analysis, i.e., that for any *actual* pair of events, the true conceptual analysis implies that pair of events is causally related if and only if the empirical analysis implies that they are causally related. I wonder if the quest for an empirical analysis is motivated by the assumption that there is one fairly natural non-disjunctive relation that is actually co-extensive with the causal relation. Is there a point to empirical analysis if this is not the case?

In the first half of the book, Dowe states, explains, and provides convincing arguments against a variety of alternative answers to questions (1)–(3). Here, Dowe discusses Hume's regularity theory, various versions of David Lewis's counterfactual account, Patrick Suppes's positive statistical relevance account, Jerold Aronson and David Fair's versions of the transference theory, Russell's account of causal lines, and various versions of Wesley Salmon's account of causation.[2] The second half of the book is

occupied with Dowe's own answers to these questions. I will concentrate here on Dowe's answer to the first question:

(1) A *causal process* is a world line of an object that possesses a conserved quantity; a *causal interaction* is an intersection of world lines that involves exchange of a conserved quantity.[3]

Dowe's account is interesting, resourceful, and forcefully presented. However, I do have a few worries about it. My first worry is metaphysical: Dowe's account of a causal process makes use of the concept of an object persisting through time. Dowe claims that an object is 'anything found in the ontology of science (such as particles, waves, or fields), or common sense (such as chairs, buildings, or people).[4] Now, I endorse two admittedly controversial theses about mereology and persistence: the *doctrine of unrestricted composition*, which is the thesis that whenever there are some *x*'s, there is a *y* that is the fusion of these objects, and *four-dimensionalism*, which is the thesis that for any way of dividing up the set of times at which an object exists, there is a corresponding way of dividing the object itself.[5] Given these two theses, there is more in heaven and earth than what can be found in the ontology of science or common sense. But, as Dowe recognizes, allowing these *entities* to count as *objects* creates trouble for his account. The case Dowe considers involves a rotating spotlight that casts a spot in a circular path around the wall of a large building. As Dowe notes, such a spot could move faster than the speed of light, so there is a lot of pressure to deny that there is a causal process proceeding from one part of the wall to the next. However, consider the fusion of each successive area of the wall as the spot moves across it. Let's call this putative object 'Wally.' If Wally really does exist, then energy is conserved by it, and accordingly, given Dowe's account, there is a causal process.[6]

So either Dowe is introducing a special sense of *object*, according to which an entity counts as an 'object' if we pay attention to it, or Dowe must reject either four-dimensionalism or unrestricted composition. I suspect that Dowe will find the first alternative unpalatable; since this move would make object-hood relative to our interests or conceptual scheme, Dowe's analysis of causation would also imply that causation is subjective. But there are powerful reasons to endorse both four-dimensionalism and unrestricted composition, e.g., relativity theory favors four-dimensionalism and the doctrine of unrestricted composition is arguably a truth of logic.[7]

Dowe does provide an interesting discussion of the so-called *causal theory of identity*, according to which 'for an object to display identity over time it is required as a necessary condition that its temporal parts be related as cause and effect'.[8] I think that Dowe provides a plausible

reason to believe that we do think of some objects as continuing over time despite the lack of causal connectivity between their parts. (Dowe gives an example of water ripples moving at phase-velocity.) Accordingly, Dowe concludes that we should reject the causal theory of identity. I agree with Dowe here, but I think that this example also shows that our conventions for picking out what entities count as 'objects' in his sense are extremely arbitrary.[9] Once we let shadows, ripples, and moving spots of light into our ontology, do we have a good reason to keep any other putative object out? Specifically, do we have a good reason to exclude Wally?

My second worry concerns Dowe's account of a conserved quantity. Dowe writes that 'it is common to define conservation in terms of constancy within a closed system. [...] we need to explicate the notion of a closed system in terms only of the quantities concerned. For example, energy is conserved in chemical reactions on the assumption that there is no net flow of energy into or out of the system'.[10] But as Jonathan Schaffer has pointed out, this account of a closed system seems to make Dowe's account circular because there doesn't seem to be a way to explicate the concept of energy flow without appealing to the concept of causation.[11]

As I see it, Dowe has two ways to respond to this worry. First, Dowe could simply provide a list of the quantities whose conservation he believes is relevant to causation and cash out what a causal interaction is in terms of the items on that list; such a list might appear somewhat ad hoc, but it avoids circularity, and is certainly informative. Second, Dowe could appeal to the notion of a universally conserved quantity. Dowe discusses this option, but rejects it because of worries about accidentally universally conserved quantities.[12] Given that Dowe is primarily interested in providing an empirical analysis, it's not clear to me why this is a problem. If we restrict our attention to fundamental quantities, it's not obvious to me that there are any accidentally universally conserved quantities; whether there are any universally conserved fundamental quantities that are not relevant to causation is an empirical question, or is at least as empirical as the question of whether the conserved quantity theory is true. It seems to me that this option deserves more attention.

My third worry concerns the alleged *intrinsic* nature of causation. Many philosophers have claimed that the causal relation is an intrinsic relation, i.e., whether the causal relation obtains does not depend on features of the world that obtain outside of the region in which the causal relation obtains.[13] I am very skeptical about the claim that the causal relation is intrinsic, but given the widespread acceptance that this claim is true, it is worthwhile examining the implications that Dowe's theory has on this issue. Dowe is willing to grant that the direction of a causal process

is an extrinsic feature of that process, which may already be cause for concern.[14] However, Dowe claims that 'whether something is a causal process depends only on the local facts about the process, namely the object's possession of a certain kind of physical quantity. It does not depend on what happens elsewhere in the universe, so in that sense being causal is an intrinsic property of a process'.[15] But this simply is not true. Whether a quantity is a conserved quantity depends on the global features of the universe, not simply on the local features inhering in the region occupied by a causal process. Let us distinguish *being an intrinsic feature of a process* from *being an actual intrinsic feature of a process*. Taking the concept of a *duplicate* as primitive,[16] let us say that a feature F is an *intrinsic feature* of a process iff for any (possible or actual) process that exemplifies F, any duplicate of that process exemplifies F; let us say that a feature F is an *actual intrinsic* feature of a process iff for any actually existing process that exemplifies F, any actually existing duplicate of that process exemplifies F. Given Dowe's account, being a causal process is not an intrinsic feature, but it is an actually intrinsic feature. However, being an actually intrinsic feature is not a very interesting property, and those philosophers who strongly feel that causation is an intrinsic relation will not be satisfied by the fact Dowe's account implies that causation is merely actually intrinsic. *x is a parent of y* is clearly an extrinsic relation; however, given the fact that there are (actually) no intrinsic duplicates of parent–child pairs, *x is a parent of y* is an actually intrinsic relation.

Despite the fact that I have reservations about Dowe's theory, I have no reservations about recommending this book. There is a lot of interesting material in this book; in addition to his discussion of causal processes, causal connections, and causal direction, Dowe provides a stimulating discussion of the issues concerning identity through time, backwards causation, and a chapter-long discussion on problems concerning causation by prevention and omission. Dowe also provides one of the most helpful introductions to the puzzling Bell phenomenon in quantum mechanics that I have seen. In addition, Dowe's writing style is clear, lively, and unpretentious. I learned a lot about causation from this book.[17]

NOTES

[1] Dowe does indicate that one might also take the request for an empirical analysis to be a request for an account that is a posteriori and necessarily true; perhaps the identification of water and H_2O is one such empirical analysis. See p. 4.

[2] And this list is not exhaustive!

[3] See p. 90.

[4] See p. 91.

[5] More formally, four-dimensionalism is the thesis that necessarily, for any x, and any non-empty non-overlapping sets of times T_1 and T_2 whose union is the time span of x, there are two objects x_1 and x_2 such that the time span of x_1 is T_1, the time span of x_2 is T_2, and x is the fusion of x_1 and x_2. I borrow this account of four dimensionalism from Ted Sider. See his article 'Four Dimensionalism', *The Philosophical Review* **106** (1997), pp. 197–231.

[6] See p. 98.

[7] On four-dimensionalism and relativity, see Yuri Balashov, "Enduring and Perduring Objects in Minkowski Space-Time", *Philosophical Studies* **99** (2000), pp. 129–66 and "Relativistic Objects". *Noûs* **33** (1999), pp. 644–62. On unrestricted composition, see David Lewis, *On the Plurality of Worlds* (Oxford: Basil Blackwell, 1986), pp. 211–13, and *Parts of Classes* (Blackwell, 1991), pp. 72–87, Michael Jubien, *Ontology, Modality, and the Fallacy of Reference* (Cambridge: Cambridge University Press, 1993), pp. 14–17. See Dowe pp. 90–109 for a discussion of issues concerning object-hood and persistence.

[8] See p. 105.

[9] Of course, I have a second reason for rejecting the causal theory of identity, namely that it is incompatible with unrestricted composition. As I see things, nearly every object is a part of some persisting whole. But not every persisting whole counts as something that we care about, for we usually restrict our domain of quantification so that it primarily includes objects whose parts are causally related. In order for some entity to be a temporal part of a *chair* or a *person*, it must be a temporal part of a causally integrated entity. This is why a causal requirement is appropriate for chairs or persons, but not for *objects simpliciter*.

[10] See p. 95.

[11] See Jonathan Schaffer's forthcoming review of Dowe's book in *The British Journal for the Philosophy of Science*.

[12] See p. 95.

[13] On the alleged intrinsicness of causation, see D. M. Armstrong, "The Open Door: Counterfactual vs. Singularist Theories of Causation", in Howard Sankey (ed.), *Causation and Laws of Nature*, Dordrecht: Kluwer pp. 175–186, and Peter Menzies, "Probabilistic Causation and the Preemption problem", *Mind* **105** (1996), pp. 88–117.

[14] See pp. 205–206.

[15] See p. 96.

[16] See David Lewis, *On the Plurality of Worlds*, New York: Blackwell: 1986, pp. 61–63.

[17] I thank Chris Heathwood, Gareth Matthews, and especially Jonathan Schaffer, who read several drafts of this review and provided much encouragement. I learned a lot about causation from him as well.

Department of Philosophy KRIS MCDANIEL
University of Massachusetts, Amherst
352 Bartlett Hall
Box 30525
Amherst, MA 01003-0525