this type of proliferation is metaphysically unobjectionable, but his argument is unclear. At any rate, perhaps enough has been said for present purposes.

The point is that Kim's two proposed solutions to the problem of proliferation, even if they could be made to work, would involve, at very least, a lot of philosophical endeavour. If the position I have argued for is correct, this endeavour would be wasted. For if (1*) is accepted, then the property-exemplification account does not entail event proliferation. The property of being Sebastian's stroll supervenes on the property of being Sebastian's leisurely stroll. Therefore, by (1*), the instances of these properties can be identical. So (1*), in addition to being intuitively plausible, has the merit of avoiding a lot of potentially wasted hard work. In conclusion, unless we adopt (1*), we will either end up multiplying entities beyond necessity, or by multiplying effort beyond necessity. Therefore, I recommend acceptance of (1*).[1]

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DISJUNCTIVE LAWS?

By DAVID OWENS

IT is frequently said that any generalization entailed by a law or a set of laws is itself a law.[1] It is also frequently said that any generalization which supports subjunctive conditionals and enables us to make predictions is a law.[2] Neither of these state-

[1] See Hempel ([6], p. 346) or Lewis ([7], p. 368). The assumption is questioned but not undermined by Fodor ([3], p. 140).
[2] Goodman ([5], pp. 20–22).

ments is true. There are some disjunctive generalizations which are entailed by genuine laws but which are not themselves laws. And these generalizations fail to be laws despite the fact that they support predictions and counterfactual suppositions. They fail to be laws because they cannot be confirmed in the way that laws are confirmed and they do not explain in the way that laws explain.

It would be wrong to hold that a generalization with a disjunctive antecedent or a disjunctive consequent was *ipso facto* no law. Consider the following statement:

(1) (∀*x*) (if *x* either has a mass of less than *M* grams and experiences a force of less than *F* newtons or has a mass of more than *M* grams and experiences a force of more than *F* newtons then *x* either accelerates at less than *A* metres per second or accelerates at more than *A* metres per second)

Newton's third law tells us that the acceleration of a body is a function of its mass and the force applied to it and thus entails statements of the form (1). Further such a statement is a law in its own right. So we might conjecture that nomologicality, as well as truth, is preserved under entailment. But here we would be wrong.

By disjoining the law that a rigid cube of a certain size will pass through a square hole of a similar size when it approaches it from certain angles with the law that yellow things reflect light of a certain wavelength we can derive the following generalization:

(2) (∀*x*) (if *x* is either a rigid cube of size *S* or appears yellow then either it passes through a square hole of size *S* or it reflects light of wavelength *W*)

Were nomologicality preserved under entailment (2) would be a law. Is it a law?

When philosophers are asked to distinguish lawlike generalizations from generalizations which are, if true, only accidentally true, they usually allude to the following characteristics of a law: it supports subjunctive conditionals, its instances confirm it, it can be used to make predictions about unexamined cases and the instantiation of its antecedent explains the instantiation of its consequent. Let us apply these tests of lawhood to (2).

Given its derivation, it seems clear that (2) supports the subjunctive conditional which says that were anything to satisfy (2)'s disjunctive antecedent, it would satisfy (2)'s disjunctive consequent: '$(P \rightarrow Q)$ & $(R \rightarrow S)$, therefore $(P \vee R) \rightarrow (Q \vee S)$' seems to be a valid pattern of inference for subjunctive conditionals. It also seems valid for indicative conditionals. (2) entitles us to assert that if the disjunctive predicate which appears in its antecedent is satisfied then the disjunctive predicate which appears in its consequent will also be satisfied. Thus (2), given its derivation, supports predictions.

Is (2) confirmed by its instances? There are two questions here. First, can it be confirmed by the evidence which confirms the laws from which it is derived? Secondly, can it be confirmed in any other way?

It is, I think, clear that (2) cannot be confirmed by the evidence which confirms the laws from which it is derived. (2) entails certain things which are not entailed by either the cube law or the reflectance law taken separately. It could be the case that all cubic objects behaved in accordance with the cube law and yet (2) was false because some non-cubic objects were yellow but did not reflect light of the required wavelength. Therefore, when we assert (2), we are ruling out certain eventualities which are not ruled out simply by asserting the cube law. But does the evidence for the law about cubes give us any reason to rule out these possibilities? It seems not since evidence about the behaviour of cubic objects is irrelevant to questions about the reflectance of yellow objects.

The point applies *mutatis mutandis* to the evidence we have in favour of the generalization that all yellow things reflect a certain kind of light. Such evidence has no bearing on the behaviour of cubes in the presence of square holes. So it is not clear how evidence relevant to just one of these laws could confirm our disjunctive generalization.

Could there be evidence for (2) which was not evidence for either of the laws from which it was derived? Might we have a reason to believe that since this object is either cubic or yellow it will either pass through square holes or have a certain reflectance, a reason which is not also a reason to believe that this object will pass through square holes nor a reason to believe that it will have a certain reflectance? Since the predicates 'cubic' and 'yellow' refer to such diverse properties it is hard to see how this could be.

The case against the confirmability of (2) can be summed up as follows. Generalizations of the form 'All *A*s are *B*s' which are confirmable in the way characteristic of laws satisfy this condition:

> *The Relevance Principle*: if we observe an event which satisfies both *A* and *B*, we are entitled to infer that other events which satisfy *A* will also satisfy *B*.

Generalization (1) conforms to this requirement. If we observe the acceleration of a thing with one mass and force applied we may predict how other bodies with a different mass and force applied will accelerate. However, generalizations like (2) fail this requirement. We may observe a sphere which is both yellow and has a certain reflectance (and thus satisfies (2)) but this gives us no reason to infer that something blue and cubic will either have the reflectance of a yellow object or pass through a square hole (and thus also satisfy (2)).

An objector might just insist on the following intuitively appealing principle: if I have good reason to believe *A*-events bring about *B*-events and good reason to believe *C*-events bring about *D*-events, then I have good reason to believe that *A or C*-events bring about *B or D*-events. But my point is not that we don't have good reason to believe the latter statement. The fact that it is derived from true, lawlike statements gives us good reason to believe it and to make predictions and counterfactual suppositions on the basis of it. But the way in which this statement is supported by its instances is not the way in which a law is supported by its instances.

Another objector may deny that (2) supports our case. He may say that evidence for the law about the manoeuvrability of cubes is also evidence for a law about the manoeuvrability of things of every shape. Observations of how squares behave towards square holes will also tell us how circles behave towards circular holes and so on. And if anything has a reflectance then it must have a surface with a shape. So it isn't really possible to find a yellow object whose behaviour is relevant to the reflectance law but is simply irrelevant to the cube law. However, even if every object with a colour must have a shape, those aspects of that object's behaviour which are relevant to the truth of laws about shape are quite independent of those which bear on the truth of chromatic laws.

It may come as something of a surprise that there are generalizations which support predictions and counterfactual suppositions and yet are not confirmed by their instances. But the surprise is lessened when we realize that there is a close connection between confirmation and explanation.

Confirmation is roughly the converse of explanation.[3] A law is confirmed by a pair of events which instantiate its antecedent and its consequent respectively if and only if the law explains the joint occurrence of these events. If we can predict where we cannot explain and if confirmability goes with explanatory potential, then it is to be expected that predictive power and confirmability will sometimes come apart. Similarly, if we can sometimes say what would have occurred in certain slightly different circumstances without being in a position to explain what actually did occur then it is to be expected that some unconfirmable statements will support subjunctive conditionals.

Laws must explain the occurrence of the events which instantiate their consequent. But (2) does not explain the occurrence of an event which instantiates its consequent. It draws attention to the fact that the explanandum event satisfies one disjunctive predicate while the explanans event satisfies another. But we do not know why the explanandum event happened until we know which member of the antecedent disjunction was satisfied by the explanans event and which member of the consequent

[3] This connection is noted by Dretske ([2], p. 261).

disjunction the explanandum event was thereby caused to satisfy. Explanatory illumination is lost when we insert the non-disjunctive predicates involved in a proper explanation into a disjunction of predicates, some of which are irrelevant to the case at issue.

A similar point is made by Armstrong in the following passage:

> Suppose that *a* has *P* but lacks *Q*. The predicate '$P \vee Q$' applies to *a*. Nevertheless, when *a* acts, it will surely act only in virtue of its being *P*. Its being $P \vee Q$ will add no power to its arm. ([1], p. 20)

However, Armstrong's claim will meet the following objection.

Perhaps *a*'s being $P \vee Q$ is impotent to explain why *b* is *R* (say), rather it is *a*'s being *P* which does that. But suppose it is also a law that all *Q*-events are *S*-events, then *a*'s being $P \vee Q$ might be said to explain why *b* is $R \vee S$. Armstrong may reply that since *a* is not *Q* and *b* is not *S*, nothing is explained by invoking this new law. But this isn't always true.

The instantiation of (1)'s antecedent surely does explain the instantiation of its consequent: say that *x* has a mass of less than *M* and accelerates at less than rate *A*, nevertheless *x*'s having a mass which is *either* more *or* less than *M* explains why it accelerates at *either* more *or* less than rate *A*. All Armstrong's example shows is that the possession of disjunctive properties does not explain the acquisition of non-disjunctive properties. But what we should expect from a disjunctive property is an ability to explain the acquisition of other disjunctive properties and Armstrong hasn't demonstrated that it would lack this capacity.

Take (2), the law that all objects which are either yellow or cubic either pass through square holes or have a certain reflectance. When we use this statement to underwrite an explanation we set out to explain why an object instantiates some member or other of this disjunctive consequent, that is to make it unsurprising that an object should either have a certain reflectance or pass through square holes. This is a quite different task from explaining why it has a certain reflectance and equally different from the task of explaining why it passes through square holes. And, in the situation envisaged, it is a very much more difficult task. Since the disjoined physical predicates are so diverse, it is difficult to see what can be said about why an event should instantiate *one or other* of them.

In the case of (1) there is no problem about explaining the disjunctive outcome. The mass of an object will be relevant to its acceleration whatever specific mass the object turns out to have so we can explain an acceleration of either more or less than *A* metres per second by saying that the accelerator has a mass of either more or less than *M* grams. But the reflectance of an object will be simply irrelevant to its geometrical behaviour in the presence of square holes and vice versa. So we can't use generalization (2) to explain the behaviour of a yellow cube.

But it may still be asked why, if we can explain Q by means of P and S by means of R, we cannot explain QvS by means of PvR. Explaining the disjunction QvS may be quite a different feat from explaining Q or explaining S but why can't this feat be accomplished by invoking PvR? The following example of Fodor's illustrates how P may explain Q and R may explain S but PvR may fail to explain QvS.

> If I build a gadget that's just a red filter and a buzzer, what the buzzer buzzes for is the redness of the input, not its redness or blueness. And if I have two such gadgets, one that's just a red filter and a buzzer and the other that's just a blue filter and a buzzer, then the whole thing buzzes for red and it buzzes for blue but it doesn't buzz for red-or-blue. ([4], p. 11)

Under what circumstances would it be right to explain why the buzzer buzzes by reference to the fact that the input was red or blue? Fodor suggests that this would be the right explanation in a case in which the computer carried out a logical inference involving disjunction before buzzing. In this case, there would be an explanation of why the machine responded to a red or blue stimulus which was not, in fact, an explanation of why it responded to a red stimulus nor an explanation of why it responded to a blue stimulus.

I have argued that disjunctive laws like (2) neither explain nor are confirmed by their instances. I hope this goes some way towards accounting for the intuition that the disjunctive properties mentioned in (2) are 'unnatural' properties, properties which do not pick out any natural kind. It is not disjunctive properties, as such, which are unnatural for any property can be represented as a disjunction of less inclusive properties. Rather it is the disjoining of disparate properties which produces an ontological mongrel that cannot enter into laws of nature.

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