Logique & Analyse **211** (2010), 345–365

METAPHYSICAL EXPLANATORY ASYMMETRIES

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Abstract
The general view is that metaphysical explanation is asymmetric. For instance, if resemblance facts can be explained by facts about their relata, then, by the asymmetry of explanation, these latter facts cannot in turn be explained by the former. The question however is: is there any reason to hold on to the asymmetry? If so, what does it consist in? In the paper we approach these questions by comparing them to analogous questions that have been investigated for scientific explanations. Three main asymmetry criteria have been proposed for the latter: (i) causation, (ii) unification, and (iii) explanatory dependence. We argue that the last criterion, but not the former two, can be of help to metaphysical explanation: metaphysical explanations are asymmetric if the explanatory dependence criterion (in modified format) holds of them.

1. *Introduction*

Consider the following explanatory claims:

(#) The flagpole's shadow is 10m, because the flagpole is 10m (and the sun's angle of elevation is 45°).
(1) The flagpole resembles all other 10m objects, because it is 10m.
(2) The flagpole is 10m, because its parts are jointly 10m.
(3) The flagpole is disposed to be visible from a great distance, because it has a great height.
(4) The flagpole is beautiful, because it has a symmetrically shaped shadow (or plug in your favourite aesthetic theory).

*Many thanks to Stefano Caputo, David Liggins, Miguel Ángel Sebastián, Maarten Van Dyck, an anonymous referee, and audiences in Geneva and Girona for helpful feedback. The research for this paper was supported by the Research Fund Flanders through research project no. G.0158.05. Jan Willem Wieland is PhD fellow of the same fund.

(5) The proposition that the flagpole is 10m is true, because the fact that the flagpole is 10m exists.
(6) The singleton {flagpole} exists, because the flagpole does.
(7) We think about the flagpole's shadow, because our brain parts such and such are active.
(8) The flagpole has the property 'being such that all of us think of its shadow', because all of us think of its shadow.

(#) is an ordinary claim, whereas (1)–(8) are less ordinary. The latter are metaphysical explanatory claims, or at least candidates thereof, where respectively resemblance facts are explained by facts about their relata (e.g. Armstrong 1978: 50–1); facts about wholes by facts about their parts (e.g. Kim 1994: 67); dispositional facts by categorical facts (e.g. Ruben 1990: 225–30); evaluative facts by non-evaluative facts (e.g. Kim 1990); the truth of propositions by their truthmakers (e.g. Rodriguez-Pereyra 2005); facts about classes by facts about their members (e.g. Correia 2005); mental facts by neurophysiological facts (e.g. Kim 1990); and Cambridge facts by non-Cambridge facts (Kim 1974).

In this paper we shall not deal, in general, with the important issue what might discern (1)–(8) from (#). Rather, we will be focussing on only one aspect of them, i.e. their supposed asymmetry.[1] Take notice:

> One explains the truth of the proposition that the rose is red in terms of the rose's being red, but not vice versa. (Rodriguez-Pereyra 2005: 21)

> It is natural to assert that things resemble each other because they have something in common, counter-intuitive to say that they have something in common because they resemble each other. (Armstrong 1978: 50)

> Often it is thought, and claimed, that a thing has a supervenient property because, or in virtue of the fact that, it has the corresponding base property, or that its having the relevant base property explains why it has the supervenient property. All these relations are essentially asymmetric. (Kim 1990: 16)

[1] In the present debate asymmetry is understood locally, i.e. one explanatory claim can be asymmetric (X explains Y, and not so that Y explains X), even if not all of them are. By this usage, which we shall follow, there can be explanatory asymmetries in the plural: each explanatory claim that is asymmetric constitutes an 'explanatory asymmetry'.

> a is prior to $\{a\}$ insofar as the existence of a explains, or helps explain, the existence of $\{a\}$ — while the converse is false. (Correia 2005: 53)

Asymmetry is the consensus, and to our knowledge nobody ever denied, or even questioned it. It would follow that all of the following claims are false (or, if they are true, that (1)–(8) are false):

(1*) The flagpole is 10m, because it resembles all other 10m objects.
(2*) The flagpole's parts are jointly 10m, because the flagpole is 10m.
(3*) The flagpole has a great height, because it is disposed to be visible from a great distance.
(4*) The flagpole has a symmetrically shaped shadow, because it is beautiful.
(5*) The fact that the flagpole is 10m exists, because the proposition that the flagpole is 10m is true.
(6*) The flagpole exists, because the singleton {flagpole} does.
(7*) Our brain parts such and such are active, because we think about the flagpole's shadow.
(8*) All of us think of the flagpole's shadow, because the flagpole has the property 'being such that all of us think of its shadow'.

Hence quite a lot follows from the asymmetry of explanation. In this paper we address two interrelated questions:

- Is there a good reason for regarding metaphysical explanations as asymmetric, or is this just a widespread prejudice?
- If there is asymmetry, what is its nature?

We tackle these questions by comparing them to analogous questions that have been investigated for scientific explanations, and proceed as follows. In Sect. 2 we briefly describe how the asymmetry problem has arisen in the literature on scientific explanation. In Sect. 3 we discuss the most popular tool for dealing with the problem, viz. causation. In Sects 4–5 we discuss two alternative criteria that have been proposed: unification and explanatory dependence. In Sect. 6 we spell out the metaphysical explanations (1)–(8), and in Sect. 7 we investigate whether the three criteria from Sects 3–5 can be applied to those cases. Sect. 8 concludes our investigation.

2. *Nomic expectability*

According to Hempel's deductive-nomological model of scientific explanation (Hempel & Oppenheim 1948; Hempel 1965), the tuple <L, $C_1, \ldots C_k$> is a potential explanans for sentence E exactly if:

- L is a sentence which describes an universal law;
- $C_1, \ldots C_k$ are sentences which describe particular conditions;
- E is deductively derivable from the conjunction of L, $C_1, \ldots C_k$;
- E is not deductively derivable from $C_1, \ldots C_k$ alone.

Furthermore, <L, $C_1, \ldots C_k$> is a *true* explanans for E iff it is a potential explanans for E and all premises (both laws and conditions) are true. Consider the famous flagpole example (it seems to originate from a suggestion of Bromberger to Hempel, see Bromberger 1992: 8):

(F1)	L	$s = h/\tan(a)$.
	C_1	The height of the flagpole is 10m.
	C_2	The angle of elevation of the sun is 45°.
∴	E	The shadow of the flagpole is 10m.

In this case, the length of the shadow (s) is explained by the geometrical law coupled with the height of the flagpole (h) and the angle of elevation of the sun (a). E is deductively derivable from the conjunction of L (which is put as a geometrical law, but may be specified in physical terms, i.e. that light travels in straight lines), C_1 and C_2, but not from C_1 and C_2 alone. And if both L, and C_1 and C_2 are true, we have a true explanans for E. This is basically Hempel's seminal theory of (deductive) scientific explanation.

As is well-known, among other problems it faces the asymmetry problem. We just saw that by Hempel's model the length of the shadow receives an explanation. But the same can be done for the height of the flagpole:

(F2)	L	$h = s \cdot \tan(a)$.
	C_1	The shadow of the flagpole is 10m.
	C_2	The angle of elevation of the sun is 45°.
∴	E	The height of the flagpole is 10m.

So by the geometrical law plus the angle of elevation of the sun, we can both explain the length of the shadow by the height of the flagpole (derivation F1), and vice versa (derivation F2). This should not surprise us: filling out two

of the three variables, will give us (and so explain, according to Hempel) the third, no matter which one it is. This is a very counterintuitive result however: intuitively, almost everyone agrees that the length of the shadow can be explained by the flagpole's height, but its height cannot be explained by the length of its shadow.

Interestingly, Hempel's own response to the problem is that our intuitions are mistaken, and have to be corrected by philosophical analysis (1965: 352–4). For him, explanations are the instruments by which understanding of the world is achieved. So understanding the world is the intellectual benefit we can acquire by constructing explanations. What does this understanding of the world consist in?

> Thus a D-N Explanation answers the question 'Why did the explanandum-phenomenon occur?' by showing that the phenomenon resulted form certain particular circumstances, specified in C_1, C_2, ... C_k, in accordance with the laws L_1, L_2, ... L_r. By pointing this out, the argument shows that, given the particular circumstances and the laws in question, the occurrence of the phenomenon was to be expected; and it is in this sense that the explanation enables us to understand why the phenomenon occurred. (Hempel 1965: 337)

In other words: understanding must be identified with nomic expectability (i.e. expectability based on laws), and this is the one and only intellectual benefit we can acquire by constructing explanations. Once we realise that understanding equals expectability, we can get rid of our bad intuitions, and realise that explanations are symmetric. Why is the flagpole's height 10 meters? Because the shadow is 10 meters, and, coupled with information about light and the sun's position, the height can be expected on the basis of this. That's all.

Yet most philosophers of science were not convinced by Hempel's attempt to juggle away the asymmetry problem. The most popular path to solve the problem, and thus to rule out derivation F2 as non-explanatory, undoubtedly consists in invoking causation. This path will be discussed in the next section.

3. *Causation*

After describing the flagpole case, among other counterexamples to Hempel's model, Hausman says (what many have suggested before):

> The most plausible diagnosis of these cases of D-N arguments that are not explanations is that the premises in these arguments fail to focus on the causes of the phenomena described in their conclusions. (1998: 157)

The solution corresponding to this diagnosis is straightforward: only derivations from causes (causal derivations) are explanatory, derivations from effects are not. The literature hosts a wide variety of criteria for distinguishing causes and effects (in terms of causal mechanisms, counterfactual dependence, probabilities, or whatnot). In the following we take up Hausman's criterion of independent alterability which is explicitly put forward for the D-N model. That is, Hausman holds on to the idea that explanations are arguments. He simply adds a criterion which ensures that the factors in the explanans are causes of the fact to be explained. The criterion is that D-N arguments are explanations iff:

> for every pair of variables, X and Y, whose values are specified in a derivation, if the value of X were changed by intervention, then the value of Y would be unchanged. (1998: 167)

In general, D-N arguments that cite causes in the explanans satisfy this criterion, whereas those that cite effects do not. It works as follows in the flagpole case. For X take the sun's angle of elevation, and suppose we change it from 45° to, say, 20° (e.g. by way of mirrors). Then the sun's angle of elevation is independently alterable relative to the other conditions specified in the derivation just in case it does not affect them. This holds for the flagpole's height, but not for its shadow. If we change the sun's angle of elevation, the flagpole's height remains unaffected, but a change of the shadow would automatically follow. Furthermore, because derivation F1, but not F2, satisfies this criterion of independent alterability, only F1 is explanatory.

Now for the motivation. How can causation as additional condition be justified? Why would causation matter to explanation? Or again: why do causes explain their effects, but effects not their causes? First, it can be argued that causal derivations, as opposed to non-causal derivations, provide knowledge that is useful from a practical point of view. Here are some examples of practical functions which causal explanations can have:

- Suppose that two students, A and B, hand in a quasi-identical copy of a written exam. There are some plausible explanations: there might be a source C which has communicated answers to both A and B; or A has copied B's answers, or vice versa. Suppose it turns out that A has copied from B, while B did not cooperate. If anyone needs to

be punished, it must be A, not B. This shows that explaining a fact (in case: the similarities) is sometimes motivated by the importance the explanation has for determining our attitude towards other people (in case: punish A, B, or both). In general causal explanation can be important for our legal or moral judgments.

- When the space shuttle Challenger exploded on 28 January 1986, a committee of twelve investigators tried to find an explanation. This search was attitude-related (NASA wanted to know who was responsible), but also aimed at preventing similar accidents in the future.
- If a physician tries to explain the symptoms of his patient (by invoking a disease that causes them) or a car mechanic tries to determine why a car does not work, these explanations are motivated by the desire to restore the original state of the object.

These three functions relate to explanations of particular events. If the explanandum is more generic (e.g. a pattern of behaviour, or the incidence of a disease in a society) then the practical function is also more generic: the explanation provides an effective strategy to manipulate the explanandum. For example, if part of the explanation of why lung cancer occurs, is that people smoke, the practical use of this explanation lies in the fact at convincing people to stop smoking is an effective strategy for reducing the incidence of lung cancer. If an explanation request (why-question) is motivated by one of the practical functions mentioned above (or a similar one) this entails that the answer must be a causal explanation. This is how causation as additional constraint can often be justified in the context of scientific explanations.

A second argument is that independent alterability, and so causation, accounts for predictability (Hausman 1998: 170–2). We can correctly predict what will happen if something happens to one of the conditions in case they are independently alterable. But this is not possible if they are not. So if we change the angle in F1 (to 20°, say), we can still correctly predict the shadow's length (for we can safely assume that the height remains the same during our intervention):

(F1*)	L	$s = h/\tan(a)$.
	C_1	The height of the flagpole is 10m.
	C_2	The angle of elevation of the sun is 20°.
∴	E	The shadow of the flagpole is ±27.5m.

But if we similarly change the angle in F2, we cannot predict the flagpole's height, for we do not know the new length of the shadow:

(F2*)	L	$h = s \cdot \tan(a)$.
	C_1	The shadow of the flagpole is ? meters.
	C_2	The angle of elevation of the sun is 20°.
∴	E	The height of the flagpole is ? meters.

And if we keep the old value of the length (i.e. 10m), we would get an incorrect result (i.e. $\pm$3.6m), for we cannot assume that the shadow's length remains the same. Generally, causal explanations enable more correct predictions of future events. Note that this is also a practical reason for preferring causal explanations. In the cases we mentioned before, causation was indispensable for practical reasons (e.g. manipulation). Here it is not indispensable, but causal knowledge is better. But it is better for a practical reason: predictions. This will be important in Sect. 7. Let us turn to the next criterion.

4. *Unification*

As we have seen in Sect. 2, Hempel identifies understanding with being able to show that the explanandum event could have been expected on the basis of certain laws and conditions. Kitcher (1981, 1989) identifies scientific understanding with unification. Unification can be provisionally characterized as systematic predictability: unifying our experiences amounts to showing that the particular events and regularities we have observed, could have been predicted by using a limited number of argument patterns over and over again. In Kitcher's view, all explanations are deductive arguments, but not vice versa: only arguments that unify have explanatory power.

The central concept in Kitcher's theory of explanation and understanding is *argument pattern*. An argument pattern is a triple of (i) a sequence of schematic sentences, (ii) a set of sets of filling instructions, and (iii) a classification. A schematic sentence is an expression obtained by replacing some, but not necessarily all, of the non-logical expressions in a sentence with dummy letters. The filling instructions are directions for replacing the dummy letters. An argument pattern contains one set of filling instructions for each entry of the sequence of schematic sentences. A classification describes the inferential characteristics of a sequence of schematic sentences. An example:

> *Sequence of schematic sentences*
> (1) a is a P.
> (2) All Ps are bald.
> (3) a is bald.

Filling instructions
a must be replaced with the name of an individual, P with an arbitrary predicate.
Classification
(1) and (2) are premises, (3) follows from (1) and (2) by means of universal instantiation and modus ponens.

An example of an argument (which, in turn, is a couple of a sequence of sentences and a classification) fitting this pattern is:

Sequence of sentences
(1) Horace is a member of the Greenburgh School Board.
(2) All members of the Greenburgh School Board are bald.
(3) Horace is bald.
Classification
(1) and (2) are premises, (3) follows from (1) and (2) by means of universal instantiation and modus ponens.

Kitcher uses argument patterns to distinguish explanations from non-explanatory arguments. For an individual with knowledge K (a set of sentences), an argument A can only be an explanation if it is acceptable relative to K (i.e. if the premises of A are members of K). But not all acceptable arguments are explanations: an acceptable argument is an explanation iff it instantiates an argument pattern that belongs to a privileged set of argument patterns. This set of argument patterns is privileged because it has a higher unifying power with respect to K than any other conceivable set of argument patterns.

We shall not discuss which factors determine the unifying power of a set of argument patterns in detail. All we need to know is that paucity of patterns is one of the factors: sets that do contain superfluous patterns are not optimal. Kitcher uses this criterion to rule out the use of accidental generalisations like 'All members of the Greenburgh School Board are bald.' It is possible to derive Horace's baldness through a derivation which contains this premise. However, we also have to explain the baldness of people that are not member of the Greenburgh School Board. The general biochemical argument pattern we set for that can also be used for Horace and his fellow board members. So the argument pattern containing the accidental generalisation is superfluous, and its instantiations are arguments but no explanations.

Kitcher deals with explanatory asymmetries in a similar way (1981: 525; 1989: 484–7). The flagpole's shadow cannot be explained by the flagpole's height because there is an alternative derivation of the flagpole's height which instantiates an argument pattern with greater unifying power. Just consider the fact that unlighted flagpoles also have heights. If we wanted to explain the height by the shadow, we would need a different explanation of the height

in case it is dark. More generally, we would end up with different explanations for the height of lighted and unlighted things, and this is not the case for the derivation of the flagpole's height which invokes an origin and development argument pattern, rather than shadows. Compare:

> Suppose now that we admit as explanatory a derivation of the length of a simple pendulum from a specification of the period. Then we shall have to explain the lengths of non-swinging bodies by employing quite a different style of explanation (an origin and development derivation). (Kitcher 1981: 525)

Kitcher does not specify what this origin an development pattern would consist in. It has to be an argument pattern that is widely applicable (in any case all flagpoles) and yet it should not be too vague (because stringency of argument patterns is also a criterion for unifying power). Suppose we would explain the length of a 10 meters flagpole by referring to (i) the fact that the customer of the factory in which the flagpole was produced ordered a 10 meters flagpole, (ii) the fact that this factory has appropriate communication and quality control procedures which ensure that orders are executed properly, and (iii) a law connecting these antecedent conditions to the explanandum. We guess that this corresponds to what Kitcher had in mind.

5. *Explanatory dependence*

Another attempt to account for the asymmetry of scientific explanations without invoking causation is Jobe (1976). Jobe, too, adheres to the idea that explanations are arguments. In order to rule out derivation F2 as non-explanatory, he proposes the explanatory dependence criterion. To wit:

> A sentence P is explanatorily dependent on a sentence Q iff there are D-N explanations of Q that do not involve P; but every D-N explanation of P involves Q. The restriction we wish to impose on D-N explanations [...] can be stated as follows: An admissible explanation of a sentence Q must not involve a sentence P such that P is explanatorily dependent of Q. (1976: 544)

This works as follows in the flagpole case. The shadow's length is explanatorily dependent on the flagpole's height, but not vice versa, for there are explanations of the flagpole's height that do not involve the shadow (e.g. the explanation that invokes the origin and development argument pattern from the previous section, or some less unified explanation), but any explanation

of the shadow's length involves the flagpole's height. As the present criterion goes, the shadow's length cannot be used to explain the flagpole's height, and F2 is ruled out.

Note that Jobe confuses variables and their specific values in the text just cited. It is not the case that the sentence 'the shadow is 10m' is explanatorily dependent on the sentence 'the flagpole is 10m', for if the sun's angle of elevation is e.g. 50° then the sentence 'the shadow is 10m' cannot be derived from the sentence 'the flagpole is 10m' (but it can be derived from 'the flagpole is $\pm$12m'). It is only the case that the shadow's length is explanatorily dependent on the flagpole's height, which are two variables.

Jobe's basic motivation for this criterion has nothing to do with expectability, nor with practical usefulness, nor with unification. Rather, the nice feature of his criterion is that it directly rules out circular explanations, such as the loop between flagpole's height and its shadow (which would exist if both F1 and F2 were admissible).

So far the three asymmetry criteria that have been set forth to account for the asymmetry of scientific explanation.[2]

6. *Metaphysical derivations*

In the following we spell out the metaphysical claims (1)–(8) from Sect. 1 in terms of the deductive-nomological model.

Regularity 1: x has property F iff x resembles all Fs.

(1a)	L	Something is 10m iff it resembles all other 10m objects.
	A	Our flagpole is 10m.
∴	B	The flagpole resembles all other 10m objects.

(1b)	L	Something is 10m iff it resembles all other 10m objects.
	B	Our flagpole resembles all other 10m objects.
∴	A	The flagpole is 10m.

[2] Both non-causal asymmetry criteria have their critics. See e.g. Barnes (1994) for unification, and Woodward (1984) for explanatory dependence. Since we are only surveying the different options as to asymmetry in the literature on scientific explanation, we shall not discuss that here.

Regularity 2: x has property F iff x's parts jointly have property F (usually proper parts which adjoin, but do not overlap one another spatially).

(2a)	L	Something is 10m iff the sum of its parts is 10m.
	A	The flagpole's parts are jointly 10m.
∴	B	The flagpole is 10m.

From now on the obvious reverse derivations (2b)–(8b) from B to A shall be omitted.

Regularity 3: x has dispositional property F iff x has categorical property G.

(3a)	L	Something is disposed to be visible from a great distance iff it has a great height.
	A	Our flagpole has a great height.
∴	B	The flagpole is disposed to be visible from a great distance.

Regularity 4: x has evaluative property F iff x has non-evaluative property G.

(4a)	L	Something is beautiful iff it has a symmetrically shaped shadow.
	A	Our flagpole has a symmetrically shaped shadow.
∴	B	The flagpole is beautiful.

Regularity 5: the proposition that X is true iff the fact that X exists.

(5a)	L	The proposition that the flagpole is 10m is true iff the fact that the flagpole is 10m exists.
	A	The fact that the flagpole is 10m exists.
∴	B	The proposition that the flagpole is 10m is true.

Regularity 6: classes exist iff their members exist.

(6a)	L	{flagpole} exists iff the flagpole exists.
	A	The flagpole exists.
∴	B	{flagpole} exists.

Regularity 7: x has mental property F iff x has neurophysiological property G.

(7a)	L	People think about flagpoles iff brain parts such and such are active.
	A	Our brain parts such and such are active.
∴	B	We think about flagpoles.

Regularity 8: x has Cambridge property F iff y, wholly distinct from x, has property G.

(8a)	L	The flagpole has the property 'being such that all of us think of it' iff all of us think of it.
	A	Someone stops thinking about the flagpole.
∴	B	The flagpole loses the property 'being such that all of us think of it'.

In each case, L describes an universal law (which is an instance of the more general regularity), C describes a particular condition, and E follows deductively from L and C, but not from C alone. It should be stressed that the laws are not supposed to be definitions or conceptual explanations. As many debates in metaphysics have it, the laws are to state a regularity between two sorts of facts in the world (mental and neurophysiological facts, dispositional and categorical facts, etc.).

Surely all examples are controversial (e.g. do we really want to explain all evaluative facts by non-evaluative facts?), and some of the regularities may have counterexamples (this is why we do not use the stronger notions of necessary coexistence or necessary covariation). For instance, what if some of the laws turn out to be conditionals such as 'x is disposed to be visible from a great distance if x has a great height' and 'x is disposed to be visible from a great distance if x has a weird colour'? In that case, the derivation of the categorical fact from the dispositional fact seems impossible. But this is only superficially so, for the conditionals can without much difficulty be turned into biconditionals. For these cases we would have the law 'x is disposed to be visible from a great distance iff x has a great height or a weird colour', and from the dispositional fact plus the absence of either categorical fact, we can derive the other categorical fact.

For our purposes we just assume all premises hold, so that we have sixteen D-N explanations, and sixteen times the conclusion of the derivation can be expected on the basis of the laws and conditions in question.

However, if resemblance facts can be explained by facts about their relata; if facts about wholes can be explained by facts about their parts; if dispositional facts can be explained by categorical facts; if evaluative facts can be explained by non-evaluative facts; if the truth of propositions can be explained by their truthmakers; if facts about classes can be explained by facts about their members; if mental facts can be explained by neurophysiological facts; and if Cambridge facts can be explained by non-Cambridge facts; *but not vice versa*, then in all cases (a), not (b), is an explanation. So what entitles us to believe this?

7. *Application*

In this section we investigate whether the three asymmetry criteria of causation, unification and explanatory dependence from Sect. 3–5 are applicable in the eight cases just spelled out. To recap:[3]

CAUSATION. X can be explained by Y iff Y is a cause of X, i.e. values of both Y and a third variable Z are specified in the D-N derivation of X, and Z is independently alterable relative to Y.

UNIFICATION. X can be explained by Y iff there is no alternative D-N derivation of X which instantiates an argument pattern with greater unifying power.

EXPLANATORY DEPENDENCE. X can be explained by Y iff Y is not explanatorily dependent upon X, i.e. there are D-N explanations of Y that do not involve X, but every D-N explanation of X involves Y.

Here is an argument against the usefulness of the former two criteria for metaphysical explanation. Observe that in each case A and B are intimately connected. Consider for example the derivations (3a) and (3b) with the facts that the flagpole is disposed to be visible from a great distance and that the flagpole has a great height. By the law 'something is disposed to be visible from a great distance iff it has a great height', either fact gives us the other, and no further conditions are needed. Or take (1a) and (1b) with the facts that the flagpole is 10m and that it resembles all other 10m objects. By the law 'something is 10m iff it resembles all other 10m objects', either fact gives us the other, and no further conditions are needed. It can be shown

[3] Again: X and Y are placeholders for variables, not for the values they take.

that this intimate connection between A and B forms a problem for both the causation criterion and the unification criterion.

Causation is simple. Since the derivations have just one condition, they cannot be independently alterable with respect to one another, and hence there is no causation.

Also, in the literature it is maintained that the connection between A and B is non-causal anyway (Kim 1974, 1994; cf. Ruben 1990: ch. 7; Liggins 2009). Resemblance facts would non-causally depend upon facts about their relata; facts about wholes would non-causally depend upon facts about their parts; etc. Kim (1974: 42–3) sets forth two arguments for this: an argument from time, and one from modality.

The argument from time is that the facts described by the explanans and explanandum in the metaphysical cases exist simultaneously, where this is not (or need not be) the case for scientific explanations. There is for instance no temporal difference between the fact that our flagpole is 10m and the fact that it resembles all other 10m objects, whereas such a difference does obtain between the flagpole's height and the shadow: the temporal part of the flagpole which is responsible for the blocking of the sunlight precedes the shadow (however small the interval).

The argument from modality is that causal laws are supposedly contingent, i.e. they may fail to obtain, and this does not seem to hold for the metaphysical regularities. As Kim says about the Cambridge case: "the relation strikes us as more intimate than one that is mediated by contingent causal laws." (1974: 43) So it may be a contingent fact that light travels in straight lines, and hence that there is a connection between lengths of flagpoles and their shadows, but this is not so for the connection between resemblance facts and facts about their relata, between facts about wholes and facts about their parts, etc.

There is a further problem about the causation criterion. Metaphysics, unlike a lot of scientific research, is not supposed to be practically useful. As far as we can see, explanation requests in metaphysics are never motivated by practical concerns such as the ones we mentioned in Sect. 3. This means that even if the metaphysical cases are causal (which is not the case, given that the arguments above are correct), the reason of why the causation criterion should be accepted as a constraint on metaphysical explanations does not work.

Now the problem for unification. Since there are in the metaphysical cases no further conditions needed to get B from A, or A from B (like the sun which, as third factor, was responsible for the difference between lighted and unlighted things), nothing makes a difference as to the unifying power of the argument patterns instantiated by the reverse derivations. In sum, neither the criterion of causation nor unification rules out the (b)-explanations (nor the (a)-explanations for that matter).

Since A and B are intimately bound up with one another in the metaphysical cases, it is sometimes even suggested that the facts described by them are identical (cf. the discussion in Ruben 1990: 218–22). This would imply that there is no difference between resemblance facts and the corresponding facts about their relata; between facts about wholes and facts about their parts; between dispositional facts and facts about their categorical bases; between truthbearers and their truthmakers; etc. Although this issue has important implications (would it really make sense to ask why the explanation of A by B is irreversible if A and B describe just the same thing?), it is a tricky one, and we do not want to go into it here.

If causation and unification are out, we are left with Jobe's explanatory dependence criterion. On first sight it seems to work. Take again the first metaphysical case. Resemblance facts are explanatorily dependent on facts about their relata because there are D-N explanations of the latter facts that do not involve the former, but any D-N explanation of the former involves the latter. Interestingly, and again because of their intimate connection, the same seems to hold for the values they take. The fact that our flagpole resembles all other 10m objects is explanatorily dependent on the fact that our flagpole is 10m for there are D-N explanations of the latter that do not involve the former, and any D-N explanation of the former involves the latter.

Is this right? Those familiar with the Resemblance Regress may think of the following counterexample:

(2c) x resembles all other 10m objects iff all pairs $\{x$, 10m object $y_1\}$, $\ldots$, $\{x$, 10m object $y_n\}$ resemble all other resembling pairs.

{our flagpole, 10m object y_1}, $\ldots$, {our flagpole, 10m object y_n} resemble all other resembling pairs.

$\therefore$ Our flagpole resembles all other 10m objects.

This is a D-N explanation of the fact that our flagpole resembles all other 10m objects which does not invoke the fact that the flagpole is 10m, and so if the counterexample holds, the criterion of explanatory dependence fails to establish asymmetry in the initial case, i.e. to rule out (2b) as non-explanatory.

However, there are some worries about the counterexample. First, it can be objected that (2c) gets the explanation in the wrong direction. The fact that our flagpole resembles all other 10m objects can explain the fact that {flagpole, 10m object y_1}, $\ldots$, {flagpole, 10m object y_n} resemble all other resembling pairs, but not the other way around. This objection may be right, but the problem with it is that it already assumes the asymmetry of explanation. If we wanted to establish asymmetry in this new case, and we would use the same criterion of explanatory dependence, we are off on a regress (it

is easier to check the regress in terms of the example with classes, see the Appendix for details).

There is nonetheless a second problem with (2c): it, again, invokes a non-causal regularity as law. How about taking that into account? A proposal:

EXPLANATORY DEPENDENCE*. X can be explained by Y iff both of the following:
(i) there are D-N explanations of Y that do not involve X *and are causal*;
(ii) every D-N explanation of X involves Y *or is not causal*.

By a non-causal explanation we basically mean that the independent alterability criterion cannot be applied (and also that there is too much necessity in the law it invokes, but see the discussion above).

On the basis of this modified criterion many asymmetries can be established. Let us spell out two examples in some detail. The first: the fact that the singleton {flagpole} exists can be explained by the fact that the flagpole exists, but not vice versa. According to our criterion, the existence of {flagpole} can be explained by the existence of the flagpole only if the following conditions hold: (i) there is a causal D-N explanation of the existence of the flagpole that does not involve {flagpole}; and (ii) all D-N explanations of the existence of {flagpole} that do not involve the existence of the flagpole are non-causal. Condition (i) is satisfied because there is an origin-and-development explanation of the existence of the flagpole (cf. Sect. 4). Condition (ii) is satisfied because all explanations of the existence of {flagpole} that do not appeal to the flagpole involve non-causal laws (e.g. $\{x\}$ exists iff $\{\{x\}\}$ does, cf. the Appendix). Now consider the second half of the asymmetry. We want the claim that the existence of the flagpole can be explained by the existence of {flagpole} to come out as false if we apply our criterion. This means that either of the following claims must be rejected: (i) there is a causal D-N explanation of the existence {flagpole} that does not involve the existence of the flagpole; (ii) all D-N explanations of the existence the flagpole that do not involve the existence of {flagpole} are non-causal. Both conditions can be rejected: (i) fails because there are no causal explanations of sets, such as the singleton {flagpole}, and (ii) fails because the origin-and-development explanation of the existence of the flagpole is causal.

The second example: the fact that the flagpole resembles all other 10m objects can be explained by the fact that it is 10m, but not vice versa. According to our criterion, the resemblance fact can be explained by the length of the flagpole only if the following conditions hold: (i) there is a causal

D-N explanation of the length of the flagpole that does not involve the resemblance fact; and (ii) all D-N explanations of the resemblance fact that do not involve the length of the flagpole are non-causal. Condition (i) is satisfied because there is an origin-and-development explanation of the length of the flagpole (see Sect. 4). Condition (ii) is satisfied because all explanations of the resemblance fact that do not appeal to the length of the flagpole involve non-causal laws (e.g. x resembles all other 10m objects iff all pairs $\{x$, 10m object $y_1\}$, ..., $\{x$, 10m object $y_n\}$ resemble all other resembling pairs, see above). Now consider the second half of the asymmetry. We want the claim that the length of the flagpole can be explained by the resemblance fact to come out as false if we apply our criterion. This means that either of the following claims must be rejected: (i) there is a causal D-N explanation of the resemblance fact that does not involve the length of the flagpole; (ii) all D-N explanations of the length of the flagpole that do not involve the resemblance fact are non-causal. Both conditions can be rejected: (i) fails because there are presumably no causal explanations of resemblance facts, such as the fact that the flagpole resembles all other 10m objects, and (ii) fails because the origin-and-development explanation of the length of the flagpole is causal.

One might think that the modification of the criterion is ad hoc and lacks proper motivation. It can nonetheless be shown that the modification is needed for independent reasons. Consider this non-causal explanation of the shadow's length:

	Something is 10m iff the sum of its parts is 10m.
	The flagpole shadow's parts are jointly 10m.
$\therefore$	The flagpole's shadow is 10m.

If this is a good D-N explanation, then we have an explanation of the shadow's length which does not involve the shadow's height after all. As a consequence, the original explanatory dependence criterion would fail to establish asymmetry in the ordinary flagpole case from Sect. 2. Not so for the modified criterion.

Yet the modified criterion does not work in all cases. The explanatory asymmetry, if any, between facts about wholes and facts about their parts is one (for in that case there are presumably alternative causal explanations of either, so that the explanation would run in both directions). The putative explanatory asymmetry between facts about classes and facts about their members where the latter themselves are classes (e.g. between {flagpole} and {{flagpole}}) is another (for in that case there are no alternative causal explanations at all, so that the explanation would run in no direction). However, we are not trying to defend the criterion in all generality. The aim of this paper is more limited: we wanted to know whether there is any criterion

(or set of them) available in the literature on scientific explanation which can establish the asymmetry of metaphysical explanation. Let us conclude our investigation.

8. *Conclusion*

In the introduction we asked:

- Is there a good reason for regarding metaphysical explanations as asymmetric, or is this just a widespread prejudice?
- If there is asymmetry, what is its nature?

The paper's aim was to check the three asymmetry criteria from the literature on scientific explanation. As it turned out, causation cannot establish the asymmetry of metaphysical explanation. Neither can unification. But a modified version of the explanatory dependence criterion do the job for a large group of cases. There is no doubt a moral to all this. That we should be cautious in assuming the asymmetry of explanation in specific cases. And there is also an open question. It has been suggested to us that the explanatory dependence criterion appears to be a surface criterion, one which may work only because of a deeper story about explanatory asymmetries. That is work for a different paper.

Appendix

Claim: the explanatory dependence criterion can establish the explanatory asymmetry between the fact that a exists and the fact that $\{a\}$ does if all D-N explanations of the latter invoke the former.
Counterexample$_1$: by the law that x exists iff $\{x\}$ does, $\{a\}$ exists because $\{\{a\}\}$ does.
Objection to counterexample$_1$: $\{\{a\}\}$ exists because $\{a\}$ does, not vice versa.
Objection to the objection: the foregoing objection already assumes the asymmetry of explanation.
Solution: the explanatory dependence criterion can establish the explanatory asymmetry between the fact that $\{a\}$ exists and the fact that $\{\{a\}\}$ does, namely if all D-N explanations of the latter invoke the former.
Counterexample$_2$: by the law that x exists iff $\{x\}$ does, $\{\{a\}\}$ exists because $\{\{\{a\}\}\}$ does.

Objection to counterexample$_2$: $\{\{\{a\}\}\}$ exists because $\{\{a\}\}$ exists, not vice versa.
There is again an objection to the objection to counterexample$_2$, plus a solution, plus a counterexample$_3$ to the solution, plus an objection to counterexample$_3$, etc.
Conclusion: as the objection to counterexample$_1$ gives rise to a similar counterexample, it is not a good objection. It follows that counterexample$_1$ is not refuted by it.

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