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Bold> From Metaphysics to Method

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The stimulating programme of The Dappled World is metaphysics in the service of methodology. To say that the world is dappled is to say that the laws of nature only apply to certain regions. A central argument for this claim is epistemic. Although the laws, especially laws of physics, are typically thought of as universal, in fact we have only managed to construct precise quantitative models for a very limited range of cases, most of which lie within the artificially simplified environment of the laboratory. We lack models for many real-world situations not because we haven't tried to build them, but because we have tried and failed. This failure is compatible with the existence of a complete set of physical laws, perhaps never to be known, which governs all regions; but the evidence of our history of failures points the other way, to a dappled world.

Nancy Cartwright draws two methodological morals from the inherent patchiness of the nomological. Firstly, if we want to intervene in the world, one good strategy is to construct situations where the laws do apply. Secondly, if we want to understand what is going on outside those simple situations, we should use autonomous methods, rather than attempting to extend nomological science beyond its remit. In these comments I consider three big questions about this programme. What exactly would it be for the world to be dappled? How strong is the case for dappling? How tight is the connection between dappling and the methodological morals drawn from it? Covering so much ground in such a short compass runs the risk of misconstruing Nancy Cartwright's project or her arguments; fortunately this symposium gives her the opportunity to set me right.

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As a first approximation, I have said that for the world to be dappled would be for only some regions of the world to be nomological or law-governed. The motion of the planets might be nomological, the motion of a fluttering thousand dollar bill in St. Stephen's Square might not be. How dramatic this claim is depends on what one means by a law. Let us distinguish two broad possibilities. The first is Humean: a law is an exceptionless, projectible regularity among occurrent and, some would add, observable properties. The non-Humean options are various, but I will focus on the idea that a law is a stable relationship between capacities.

Humean dappling is very plausible and, I think, very widely accepted. The world is mostly a messy place where many forces and other capacities are simultaneously in play, and much if not all of what happens is governed by unobservable entities and processes. Exceptionless

regularities among occurrent properties, and certainly among occurrent and observable properties, are the exception, not the rule. This claim is difficult to resist without maintaining heroically that these superficial properties are all the properties there are.

To deny Humean dappling would be to assert that the superficial properties the Humean is willing to cite form a closed system, so that whenever one set of these properties are instantiated, so is another similarly superficial set. But we have no reason to believe that this is generally so, to believe that what follows from the antecedent set is completely independent of all the other, deeper property instantiations. To suppose that the superficial properties form a closed system is like supposing that if the blue light follows the green light on a black box once, then this will happen every time. We have no reason to suppose this, because there may be many different inner configurations that yield a green light, for only some of which a blue light will follow. Perhaps we will be lucky enough to find some especially simple boxes, for which there are exceptionless superficial generalisations, but such generalisations will not be applicable to all boxes. This is the very plausible picture of Humean dappling. It seems to me true, but also weak, because it is compatible with the existence of a more fundamental physics of deep properties that governs all the superficial properties, indeed all properties whatever.

The situation becomes more complicated and interesting when we consider non-Humean dappling. Our first approximation then becomes the claim that there are anomalous regions, even when laws are construed as stable relations between capacities, or between capacities and any other properties. This is bolder than the claim of Humean dappling, since capacity laws may hold even where there is no exceptionless regularity between occurrent or observable properties. Thus many who gladly admit that there is no Humean regularity for the fluttering bill would insist that a gravitational law nevertheless covers this case, since a stable relation between masses and gravitational forces still applies to the bill, though other forces are also in play.

How shall we now interpret the more radical dappling claim, in the context of capacity laws? Not, I take it, as the denial of capacities outside the privileged regions. Such a claim seems plainly false, as gravity, for example is an unshieldable long-range force. Whether or not all of the world is governed by laws, the dappler and her opponent the fundamentalist seem to agree that it is shot through with capacities. Indeed it would seem that dappler and fundamentalist should also agree that the laws of physics say something about complex systems, given the extent to which engineers use physics to build and control extremely complicated systems.

There are, however, other more interesting interpretations of non-Humean dappling, of which I will mention two. ‘Pluralist dappling’ is not the claim that there are anomalous regions (when laws are construed as relations between capacities), but rather that different regions are subject to different laws, because different regions are subject to different combinations of capacities. ‘Anomalous dappling’ is the view that there really are anomalous regions, because although capacities are everywhere, they do not always combine in lawlike ways.

Fundamentalism entails that everything that happens is nomologically governed, so anomalous dappling is clearly incompatible with fundamentalism. But what about pluralist dappling? Here we may need to distinguish two versions of fundamentalism. One is simply the view that everything that happens is governed by law. This is the completeness of the nomological, but it places no constraint on how many laws there are or over the range that each covers. A second version of fundamentalism is that everything is governed by the laws of physics, where these

laws are understood to have universal scope, so that the same laws apply throughout. Pluralist dappling is compatible with the first version of fundamentalism but not the second. I shall take it that we want a conflict between dappling and fundamentalism, so opting for pluralist dappling would force us to take the imperialism-of-physics version of fundamentalism.

It seems to me, however, that this is the less attractive reading of fundamentalism, because it is hostage to murky questions about just where the boundary of physics is to be drawn and just what it means for a law to be universal. For to say that the laws of physics are universal is not to say that each of them is everywhere instantiated. The issue here is unclear, in somewhat the same way as the mind-body problem. Dualists claim that there are non-physical properties, but once it is made clear that what determines whether a property is physical cannot be the physics we happen now to believe but rather the complete and perhaps never to be known physics, it becomes unclear what would make a property in the relevant sense non-physical. Similarly, the pluralist dappler claims that there is behaviour that does not supervene on the laws of physics but, insofar as that behaviour is conceded to be nevertheless law governed, it is unclear on what grounds we would deny that the relevant law is part of the ultimate physics. So I prefer to focus on the ambitious claim of anomalous dappling, which does make for a clear foil to the cleaner version of fundamentalism, the version that maintains just that everything is governed by laws of nature, whether these are laws of ‘physics’ or not.

Anomalous dappling is not simply the view that although we have laws that apply to certain simple regions, we do not now have nomological models to cover the rest. This epistemological point, though the basis for a central argument for anomalous dappling, should not be confused with the metaphysical claim. Nor is anomalous dappling simply the view that our current models, and what we currently take to be laws, cannot be extrapolated to cover all regions. That is a consequence of anomalous dappling but it is a weaker claim, since it is compatible with the universal reign of law, just not of laws as we know them now. Anomalous dappling is the claim that there are regions or situations, such as that of the thousand dollar bill, where not all behaviour is nomological, however deep and capacity-laden one’s conception of law. This is strong stuff, distasteful to those who think there can be no capacity, cause or even physical property or object without associated laws, but it is a claim that, as Cartwright shows, can be backed by arguments.

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Why Believe in Anomalous Dappling?

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There seem to be two main types of argument for anomalous dappling, one metaphysical, the other epistemic. A metaphysical argument for anomalous dappling appeals to the nature of capacities and of the ways they interact, making out the case that some capacities are not apt for nomological relations or that even capacities apt for such relations in certain simple situations fail to enter into laws in more complicated environments. Thus it is claimed that what happens in situations where two or more forces are in play need not be the ‘sum’ of what each force would do alone, with the consequence that even if there are laws for each force acting in isolation, we cannot combine these to have a law for the forces acting in concert. This is what examples such as that of the thousand dollar bill are meant to suggest.

Certainly forces and capacities may interact in complicated ways that are not in any intuitive sense ‘additive’. This is easiest to see in cases where one capacity changes another: elastic bands become brittle, food becomes inedible and drugs lose their potency. The simple picture of a composition of forces as vector addition is inapplicable to most interactions between capacities. But the complexity of capacity interaction does not appear strongly to support anomalous dapppling, for at least two reasons. The first is that this complexity does not discriminate anomalous dapppling from pluralist dapppling. Non-additivity may support the idea that laws vary by region, but it does not, I think, suggest that regions where non-additive forces are in play are therefore anomalous. A fundamentalist must admit that capacities change, but he may maintain that this is itself a lawful process. Just as a breakdown of occurrent regularities should not lead us to deny lawfulness—we move to capacities—so a breakdown of capacities should not lead us to deny lawfulness—we move to lawful change in capacities, or second-order capacities.

A second reason why it does not seem that the complexity of capacity interaction provides a good argument for anomalous dapppling is that it would prove too much. The realms of law are supposed to be those of the lab or perhaps deep space, where situations are simple enough for laws to hold. The trouble is that shielding is only a matter of degree. We can create or occasionally find regions where the forces other than the ones we want are minimal, but we never completely eliminate gravity, dust, friction, interference, noise. So, from a metaphysical point of view, if a multiplicity of forces and the complexity this involves meant that we have no laws, then the conclusion of the argument from complexity threatens to deliver not anomalous dapppling, where laws hold in some regions but not in others, but nomological chaos, a completely anomalous world.

I turn now to an epistemic argument for anomalous dapppling. We have good theoretical models for certain properties in certain regions. The success of these models provides the best reason one could have for believing that the laws they cite govern the regions to which the models apply. Conversely, where we have no successful models, we have no reason to believe in nomological control. This perhaps only supports what we might call ‘agnostic dapppling’, according to which we do not know whether laws rule the unmodelled regions; but even this more modest position might be strong enough to support the methodological morals that Cartwright wishes to draw. In any event, the epistemic argument can be strengthened by adding the observation that in many cases the absence of models remains even after concerted scientific effort. Here perhaps we have some reason to believe the full claim of anomalous dapppling, by a kind of inference to the best explanation, where the best explanation for our failure to find laws in a certain region is that there aren’t any there.

The crucial question then is whether the best explanation for our failure to find successful models for a given region is metaphysical or just epistemic. Is the best explanation of our failure the absence of laws or just that we are too dim to find them? I find this a difficult question to answer. Perhaps scientists and those who empathise with them tend to adopt fundamentalism as kind of regulative principle, acting as if the laws can be found if only we are sufficiently clever. And even a dappler can I think endorse this stance, since it need be no part of her claim that we have already discovered all the laws there are. The presumption of lawfulness may be the best way to uncover the remainder. But this pragmatic justification for a fundamentalist stance gives no reason to believe that fundamentalism is true, and so no reason to believe that anomalous

dappling is false. Indeed it may suggest that we have a tendency systematically to overrate the probability of fundamentalism, as we tend often systematically to turn hopes into beliefs.

Perhaps the reason that the epistemic argument for dappling is difficult to assess is that the inductive evidence for fundamentalism provided by our modelling successes and the evidence against fundamentalism provided by our failures are both weak. (It would be instructive to compare these two arguments to the familiar miracle argument from success to realism and the pessimistic induction from failure to anti-realism.) Taken alone, the fact that we have good models in certain regions hardly compels the conclusion that such models exist for all regions; but the failure to find models seems similarly inconclusive, since the fault is as plausibly explained by our cognitive weaknesses as by an anomalous world. Fundamentalists seem to face no particular difficulty in accounting for scientific failures: the Lord may be very subtle without being nomologically malicious.

One familiar feature of good inductive arguments is counterfactual tracking. Thus, my inference that p from the fact that this is what I am told by a reliable instrument or a reliable informant is inductively strong because, supposing that p is true, had p not been the case, the instrument or informant would not have said p . When you tell me that you have a headache I believe you, because I am confident that you would not have said you have a headache if you didn't have one. Suppose now that the world is in fact dappled, with the evidence of successes and failures in modelling being as we actually find them. The question then is whether that evidence would have been different, had there been no anomalous regions. Would we have had more success in modelling, if the world had not been dappled? I have no idea. Maybe we would have, because we would have managed to model some of the regions that are actually anomalous. But maybe we would not have, because those regions, even if nomologically governed, would have been too complex for us effectively to model. Insofar as one cannot choose between these two possibilities, one must I think judge that the argument from failure to dappling is weak.

Would an inductive argument in the opposite direction—from successes to fundamentalism—do any better on this counterfactual criterion? Supposing that fundamentalism is true, would we have had less success in our modelling efforts had the world been dappled? Would any of the regions for which we now have good models have resisted modelling? This too is very difficult to assess: maybe yes, but maybe these are just the regions that would have remained neat and nomological even in a dappled world. The moral I draw is that neither scientific successes nor scientific failures bear effectively on the deep metaphysical question of anomalous dappling. If the question can be answered at all, this can only be done on a metaphysical basis and with a detailed examination of how we should understand what it is to be a law of nature, an examination that I think would have to go beyond the discussions we currently have available to us.

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Does the Metaphysics Support the Methodology?

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My final question concerns the connection between anomalous dappling and the two methodological injunctions I mentioned at the start. One is to attempt the construction of

situations that are law-governed, that is of nomological machines, especially where we have practical need for effective control over the course of nature. The other is to develop autonomous methods of understanding for situations outwith those machines. Presumably those methods will largely be the methods of the special sciences, where the generalisations of those sciences do not qualify as laws of nature and are not reducible, even in principle, to the laws of physics. Let's call this pair of injunctions the methodology of Construction and Autonomy (C&A, for short).

If I understand her correctly, one of Cartwright's main motivations for developing the case for dappling is the support that it would provide for C&A. The thought is that if we accept a metaphysics in which nomological models can have only a limited scope, then we will also accept C&A. After all, if models are scarce, then you want to create situations where the models apply and you don't want to use the method of modelling where it won't work.

The methodology of C&A is attractive, but it is not clear how much it has to do with dappling. Certainly a fundamentalist may be an enthusiastic proponent of C&A. As we have seen, he may agree with the dappler that we shall never manage physical models for all regions, differing only about the reason for that failure. And the fundamentalist may also agree with the dappler that, given that limit on what we will achieve in physics, we are well advised to adopt the policy of C&A. Indeed, even a fundamentalist so epistemically sanguine as to believe that models for all regions will eventually come our way may embrace C&A, both because 'eventually' may be a long time coming and because the special sciences may provide special benefits in both understanding and prediction even for regions where models from physics are already available. Someone who thinks that physics should replace psychology is not a fundamentalist: he is a crazy fundamentalist.

So fundamentalists can endorse C&A. Conversely, a dappler may hesitate fully to endorse C&A. Even if the laws of physics are limited in their scope, it is unlikely that they are limited to the boundary of our current scientific achievements, especially in light of an induction on the increasing reach of the physical sciences over their history. It is agreed on all sides that physical models are very desirable where they are possible, so one may hold that we ought to be devoting substantial resources to seeing just how far physics can stretch, even if we are certain that it cannot cover everything. And even with dappling there remains a great deal of scope for enquiry by fundamental physics about the world entire, such as physics of long-range forces, of conservation laws and of the constitution of matter.

There may be a further internal difficulty facing an argument from dappling to the injunction to construct nomological machines. The motive for this construction is a gain in control. Some control must be possible outside the machines, not least because otherwise the advice to construct machines would be useless, since the act of construction requires control outside a machine. The thought is just that control is better within a machine, because it is more efficient. But a fair comparison of the choice between trying to control a phenomenon within a machine or 'in the wild' requires that we factor in the cost of building the machine. Since either way we must exert control outside a machine, the argument from dappling will not in itself tell us which way is more efficient.

For various reasons then, it seems that even an irresistible case for anomalous dappling would not provide a particularly powerful argument for C&A. What it would do is to deprive the fundamentalist camp of one argument, the argument that physics deserves disproportionate

funding because it will provide the Theory of Everything. But I suppose that the fundamentalist has better arguments than this in any case, and that the weaknesses of the argument from a Theory of Everything can be exposed more easily than through the deep and difficult metaphysics of dappling. But those metaphysical depths fascinate some of us quite independently of any methodological morals, and we are in Nancy Cartwright's debt for encouraging us to dive deeper and for prodding us to face up to the possibility that the universal reach of physics might be little more than a prejudice.¹

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