

THE UNION OF CAUSE AND EFFECT IN ARISTOTLE: *PHYSICS* 3. 3

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1. Introduction

THE long history of philosophy has seen many formidable attempts at the analysis of causation. Necessary connection, counterfactual dependence, nomological subsumption, statistical correlation, and other core conceptions have been used in seeking to account for the relation between a cause and its effect. In view of the centrality causation has enjoyed in metaphysics on the one hand, and the immense amount of exegetical study that has been devoted to Aristotle's works on the other, it is surprising that Aristotle's unique analysis of causation has not been recognized as a chapter in the history of this concept. His analysis is fundamentally different from any other that has left its mark; and because his account has remained hitherto latent, it might even provide a promising new starting-point for us in tackling this elusive metaphysical notion.

Aristotle takes causation to be the occurrence of a complex entity. The entity comprises a physical process grounding two natures (e.g. building and being built). The two natures are ontologically interdependent, requiring a mutual process of realization. But the potentialities for the two natures belong, respectively, to two different substances, the agent and the patient, and so, in consequence, do the two natures themselves—it is the builder that builds, and it is the house (or its materials) that are being built. Thus, there is an underlying activity that grounds two natures, but there is no single subject that possesses both of these natures. Rather, they belong to

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two different subjects, but they are mutually interdependent in a complex and innovative way that bridges the ontological distinctness of the two substances. The interdependence of the two natures, which I shall explore in detail in what follows, is what explains the unity of the interaction between agent and patient, and the peculiar causal realism of Aristotle's account.

According to Aristotle, then, the property realization binds the substances together into a net of ontological dependencies that delineate the boundary of the causal entity. The distinctive element in his account is that the agent's potentiality is realized in the patient—which I shall call an 'ectopic' realization. Thus potentiality, actuality, and ontological dependence unite the two substances causally through a type of ontological overlap between them, without introducing any additional metaphysical causal cement to do the job.

Aristotle examines the relation between cause and effect by analysing the relation between mover and movable, in his discussion of *kinēsis* (change, motion) in *Physics* 3. Although his definition of *kinēsis* (see e.g. 201^a9–10, ^a27–9, ^b4–5; 202^a13–14) allows for a very wide span of instances to come under the mover–movable relation, including such cases as ageing or ripening, central to Aristotle's discussion are cases that we would readily treat as instances of causal relations, such as building, heating, curing, etc. I shall therefore talk of the relation of a mover to the movable as a causal relation, despite the fact that for Aristotle it also includes what we would consider untypical cases of such a relation.

Fundamental to Aristotle's search for an understanding of motion is the assumption that an ontological account of motion will not require a new, primitive category of being:

There is no such thing as motion over and above the things. It is always with respect to substance or to quantity or to quality or to place that what changes changes. But it is impossible, as we assert, to find anything common to these which is neither 'this' nor quantity nor quality nor any of the other predicates. Hence neither will motion and change have reference to something over and above the things mentioned; for there is nothing, over and above them. (200^b32–201^a3)¹

This programmatic stance will play a role in directing Aristotle's account of the ontology of causation. In particular, instead of in-

¹ For this and other passages from the *Physics* I use the translation in *The Complete Works of Aristotle: The Revised Oxford Translation*, ed. J. Barnes (Princeton, 1984), sometimes lightly modified.

roducing new ontological items he will make use of his three principles: the form, the privation, and the substratum that remains through change. Furthermore, he will use his distinction between being in potentiality and being in actuality, which is a primitive distinction of ways in which things are. But even though he will not posit new metaphysical building-blocks, causation will introduce something novel in his ontology. For Aristotle the account of causation requires a new type of entity consisting of an *underlying substratum that grounds two natures*, each of which belongs to a different subject. This is a surprise in the context of Aristotelian substantial essentialism, where a substance is a composite of a material substratum and a single substantial form. But in causation we are not concerned with the metaphysics of substances as such, but with the metaphysics of the causal interaction between them.

The central undertaking of the present paper is to give an account of the metaphysical relations that Aristotle uses in explaining causation. Such a metaphysical investigation has not previously been undertaken in the exegetical tradition. For, the vast majority of the commentators, from late antiquity (Themistius, Philoponus, Simplicius) to the Middle Ages (Averroes, Aquinas)² on to contemporary commentators (Ross, Gill, Waterlow, Hussey), puzzled by the position Aristotle takes in *Physics* 3. 3, read the crucial passage as merely referring to two descriptions of one thing. But the textual evidence supports, in my view, the introduction of two natures, not descriptions, out of which the causal interaction is built.

Aristotle explores causation in terms of the modifications the mover and the movable suffer in the causal process. He uses his aporetic method in developing the metaphysical details of his account. In *Physics* 3. 3 he presents a dilemma regarding the actuality of the mover and the movable. This is a long and intricate argument, which I shall call the Actualities of Motion Dilemma (202^a21–^b5). In the course of the dilemma, Aristotle rehearses various candidate accounts of what happens to the mover and the movable in causal circumstances. He rejects some of these accounts, while introducing positions he will include in his own. I shall use the dilemma eclectically in this exposition, drawing from it the elements that are useful for configuring Aristotle's own account; his own final position does

² In a later commentary such as Zabarella's, the issue of the identity of the two beings that have one and the same reality is not even raised. See J. Zabarella, *In libros Aristotelis Physicorum commentarii* (Venice, 1601).

not result from this argument, but we can better understand him in view of various considerations he introduces in the course of it.³ I provide an analysis of the reasoning in the dilemma in the appendix at the end of this article.

2. The Actualities of Motion Dilemma

In discussing the dilemma, I shall be concerned mainly with the way Aristotle understands the problem of the relation of a mover to a movable. I shall first identify the questions he thinks need to be addressed in giving a satisfactory answer to the problem, and then, in the following section, examine the solutions he gives, thereby developing his own theory of causation.

The starting-point of Aristotle's account is the cause of motion:

The mover will always transmit a form [εἶδος], either a 'this' or such or so much, which, when it moves [κινῆ], will be the principle and cause [ἀρχὴ καὶ αἴτιον] of the motion; for example, the actual man begets man from what is potentially man. (202^a9–12)

The core conception in Aristotle's account of causation is the transmission of the form from the mover to the movable, e.g. from the actual person to the potential one. During the causal interaction changes take place in the movable, but may also take place in the mover owing to its engagement in moving the movable.⁴ But the causal interaction is the transference of the form from the mover

³ Aristotle refers to the argument as an ἀπορία λογική. Interpreters disagree as to how to understand this characterization. The way I understand it is closest to Philoponus' reading: 'By "logical" he means one worthy of logical scrutiny' (Philoponus, *In Phys.* 376. 6 Vitelli, trans. M. Edwards, *Philoponus: On Aristotle, Physics 3* (London, 1994), 46). Aquinas' and Hussey's remarks are more descriptive than explanatory when they comment, respectively, that: 'the difficulty is dialectical, i.e. logical. For there are probable arguments on both sides' (Aquinas, *In Phys.*, trans. R. J. Blackwell, R. J. Spath, and W. E. Thirlkel, *Thomas Aquinas: Commentary on Aristotle's Physics [Physics]* (London, 1963), 157); and 'the arguments used are of a very general kind' (E. Hussey, *Aristotle's Physics, Books III and IV [Physics]* (Oxford, 1983), 67). The main alternative reading of λογική in the tradition, with which I shall find myself in disagreement, is reported first by Simplicius ('he calls this verbal . . . because its plausibility arises only from the words and it is not supported by the facts' (*In Phys.* 440. 21–2 Diels, trans. J. O. Urmson, *Simplicius: On Aristotle, Physics 3* (London, 2002), 58), and voiced among contemporary commentators, e.g. by Ross: 'the question is a superficial or dialectical one, turning on the verbal difference between ποιήσις and πάθησις' (W. D. Ross, *Aristotle's Physics: A Revised Text with Introduction and Commentary [Physics]* (Oxford, 1936; repr. 1979), 540).

⁴ 'Every mover too is moved, as has been said—every mover, that is, which is

to the movable. Since causal efficacy consists in the transmission of the form, whatever happens to the mover in transmitting the form, the mover does not suffer its own causal agency, because the mover is not transmitting the form to itself; the causal efficacy of the mover impacts only on the movable.

The metaphysical mechanism of the transference of form is innovative and complex. To reach Aristotle's metaphysical innovation we need first to examine what occurs in the mover and what in the movable during the causal interaction. The mover moves in actuality, and the movable is actually moved. These two actualities are not casually coincident. The occurrence of the first requires the occurrence of the second, so their coincidence needs to be ontologically explained.

Aristotle explores the elusive relation between the two actualities (of the mover as a mover and of the movable as movable) in his dialectical puzzle about the Actualities of Motion. In brief, he considers two possibilities: that the two actualities are different, and that they are one and the same. If they are different, either both actualities occur in one of the two—either the mover or the moved—or one occurs in each. If both the actualities occur in one of them, then, first, one of them will not have its own actuality realized in it: for example, the actuality of the mover will occur in the moved, not in the mover; but how could that be? And secondly, whatever has both actualities in it will change in two different ways in relation to one form.⁵ If, on the other hand, the actuality of the mover is in the mover, and the actuality of the movable is in the movable, then either the causal agency of the mover will impact on the mover itself, not on the movable, or it will impact on nothing, in which case it is not being a mover in actuality. Finally, if the actualities of the mover and the moved are the same, then we reach absurdity, since agency and patiency cannot be the same. I shall selectively discuss certain points in this argument which relate to important issues for the metaphysics of Aristotle's account of causation.

I shall begin by considering the role of the form (*eidos*) in Aristotle's account of causation. There are three interrelated subthemes.

capable of motion . . . To act on the movable as such is just to move it. But this it [the mover] does by contact, so that at the same time it is also acted on' (202^a3-7). This remark explains the motion of the mover as a reciprocal impact it suffers by the necessary contact with the movable.

⁵ For example, it will become more and less hot at the same time.

First, there is the transmission of the form from the mover to the movable (202^a9–12). Secondly, the actuality of the mover and the actuality of the moved are in relation to one form, the transmitted one.⁶ And finally, these two actualities are of different types.⁷ The form that is the principle and cause of the motion is the form that is transmitted from the mover to the movable. For example, the causal efficacy of fire consists in its transmitting the form of heat to the pot. It follows that the motion suffered by what is movable consists in the reception of the form that is transmitted to it. So the mover's being a mover and the movable being moved will be achieved in relation to one form. But since the mover transmits and the movable receives the form, their achievements are of different types,⁸ because they relate to the same form differently. Thus the actuality of the mover as a mover *is* the transmission of the form, and the actuality of the movable as movable *is* the reception of that form.

The second issue that arises out of the Dilemma of the Actualities of Motion is the distinction Aristotle makes between the subjects the actualities occur in and the subjects they belong to. Here, as we shall see, Aristotle's metaphysical intuitions are tested to the extreme, and he finally opts for an account that opens new ground in the area of causation. Aristotle raises the issue of where the actualities *of* the mover as mover, the action, and *of* the movable as movable, the passion, are, i.e. whether they are *in* the mover or *in* the movable (*ἐν τίνι*; 'in what?', 202^a25). By asking *in what* the action *of* the agent and the passion *of* the patient are, he distinguishes in one and the same question two metaphysical relations: the one is

⁶ This tenet is presupposed by the rhetorical question Aristotle asks: 'How will there be two alterations of quality in *one* subject towards *one* form?' (202^a35–6). See P (5.2) in the dilemma in the appendix below.

⁷ See *Phys.* 3. 3, 202^b1–5. Here Aristotle distinguishes teaching from learning, not because the content of the lesson is different, but because the one activity is teaching, and the other is learning, the same lesson. Contrast e.g. Themistius (*In Phys.* 78. 9–23 Schenkl), who in his interpretation confuses the content of teaching and learning and the common underlying substratum for both. Themistius talks about the very same theorem being taught and learnt as an example of the common substratum of teaching and learning, and assimilates it to the stretch of path for the routes from Athens to Thebes and from Thebes to Athens. But this mistakes what is common in the forms of moving and being moved with what underlies the activities of moving and being moved.

⁸ 'It is contrary to reason to suppose that there should be one identical actualization of two things which are different in kind. Yet there will be, if teaching and learning are the same, and agency and patiency' (202^b1–3). See P 15 in the appendix below.

'belonging to a subject' and the other is 'occurring in a subject'.⁹ We need to examine why this distinction arises here, and how it can be understood.

Let us first look at Aristotle's own attempt to justify the distinction. He says:

Since, then, they are both [the agent's action and the patient's passion] motions, we may ask: in what are they? (202^a25)

It is not absurd that the actualization of one thing should be in another. Teaching is the activity of a person who can teach, yet the operation is performed in something—it is not cut adrift from a subject [the teacher], but is *of* one thing [the teacher] *in* another [the learner]. (202^b5–8, emphasis added)

The first passage makes a general point, too broad to be illuminating in the present circumstances. It tells us that in relation to motions we can ask where they take place. Thus, my walk can take place in the park, and my tanning at the seashore. But in neither case am I doing something (at least in any way significant) to, or changing, that in which my motion takes place. My walk and my tanning are external to the park and the seashore. They are 'in' them in a local sense, which must not be what Aristotle means here, if he is not to conflate e.g. my tanning taking place at the seashore from its taking place in me, who tans.¹⁰ The second passage gives us a clearer idea of the type of distinction that Aristotle has in mind. He concentrates on one of the two actualities, the agent's, and says that teaching is performed by the teacher in something. If this is to be more illuminating than the first passage, we must take Aristotle to be saying something other than that teaching takes place in a classroom. Indeed, he does tell us that teaching takes place in the learner. But how is this to be understood, and generalized?

A clue as to what Aristotle means by talking of where an action takes place can be found in a subargument in the dilemma (P 9–12 in the appendix), in the following dialectical move:

[Suppose] the agency is in the agent and the patiency in the patient.

⁹ Being 'in a subject' in the context of *Physics* 3. 3 should not be understood along the lines of inherence in the *Categories*, as, for instance, red inheres in an apple. The reason is that the *Categories'* inherence in the substance entails belonging to that substance as subject; whereas here, as we shall see, heating something (for example) belongs to the fire but occurs in the pot.

¹⁰ Contrast Hussey ad loc., who holds that 'there is nothing to suggest that anything other than a local sense of "in" is intended' (*Physics*, 65).

[Then] . . . the motion will be in the mover, for the same account will hold of mover and movable. Hence either *every* mover will be moved, or, though having motion, it will not be moved. (202^a26–31)

The key ideas in this argument are that where the actuality of the mover as a mover is will also be where the motion is; and the thing the motion is *in* is set in motion. Aristotle's justification for the first claim, that motion follows the actuality of the mover as mover, is that the rationale here must be the same in the case of the movable. Because if, as per the initial hypothesis, the action of the mover moves the movable, then it must be that the action of the mover generates motion. But if the action of the mover is in the mover, the generated motion will, for that reason, also be in the mover. But then the mover will be in motion, for otherwise 'though having motion, it will not be moved', which is treated as absurd and closes this branch of the argument. So the motion is where the actuality of the mover as mover is, and where the motion is, it sets that thing in motion.

In that case we can interpret the question *ἐν τίνι*; ('in what?', 202^a25) as asking 'Where does the motion bring about the change?' Teaching is in a learner, as heating is in a colder object, because it is these objects that are set in motion by the movers. So the actuality of the mover as mover is in the patient, generating the motion in it. The way it is in the patient is like the way the form is in matter.¹¹ On the other hand, the actuality of the patient as patient is always in the patient because the patient always suffers the caused motion. The picture which emerges from the distinction of the two metaphysical relations, 'belonging to a subject' and 'occurring in a subject', is that there is a motion that is the coincidence of two activities, the agent's and the patient's, in the patient. We shall explore this metaphysical picture in the following section.

Before we come to this, a clarification is needed regarding whether the mover itself is in motion. Aristotle distinguishes the motion of the mover, due to necessary contact with the movable, from the motion in the movable due to the mover's causal efficacy. The first is in the mover and the second in the movable.¹² During the causal

¹¹ See *Phys.* 4. 3, 210^a20–1.

¹² In the subargument of the dilemma examined above (p. 209) the falsehood that closes one of the branches is that 'every mover will be moved' (202^a30). See **P (10.1)** in the appendix below. This follows from the assumption that the mover's actuality, as a mover, is in the mover itself. Then, owing to their self-inflicted causal efficacy,

interaction the mover and the moved become actually such without this involving an additional change in either of them besides the ones mentioned above.

3. Aristotle's account of causation

Immediately following the Actualities of Motion Dilemma, Aristotle denies three of its premisses.

[1] It is not absurd that the actualization of one thing should be in another. . . . [2] There is nothing to prevent two things having one and the same actualization . . . [3] Nor is it necessary that the teacher should learn, even if to act and to be acted on are one and the same, provided they are not the same in respect of the account which states their essence . . . but in respect to that to which they belong [ψ *ὑπάρχει ταῦτα*], the motion. (202^b5–21)

This leads directly to the discussion of his own position, which he had already sketched, just before entering the dilemma, as follows:

The solution of the difficulty is plain: motion is in the movable. It is the fulfilment of this potentiality by the action of that which has the power of causing motion; and even the actuality of that which has the power of causing motion is not other than the actuality of the movable; for it must be the fulfilment of *both* . . . it is on the movable that it [the mover] is capable of acting. Hence there is one and the same actuality of both. (202^a13–18)

I shall first briefly outline Aristotle's solution to the problem of causation before discussing it in detail. Causal interaction consists in the transmission of a form from an agent to a patient. The agent's causal activity consists in transmitting the form, and the patient's activity, which is the causal effect, consists in receiving the form. So, causal interaction results in the actualization of properties in both objects: being the cause in the agent, and being the effect in the patient. The actualization of these potentialities is a physical process facilitating the transmission of the form, e.g. the movements

all movers would move, which is treated as a falsehood, and so it is denied that the mover's actuality is in the mover. But although 'every mover will be moved' is treated as a falsehood in the dilemma, Aristotle has earlier stated that 'every mover is moved' (202^a3). The difference between the statements is that the second ranges over movable movers only, while the first ranges over all movers, including god, who is immovable, which falsifies the statement. Of course this argument does not block the possibility of self-directed motion, as in the case of a doctor healing herself, where the mover and moved are the same.

of the sculptor's arms and chisel on the wood. This process is at one and the same time grounding the natures of the two actualized potentialities, the agent's as agent and the patient's as patient (e.g. sculpting and being carved into shape, heating and being heated, teaching and learning). So the process is both a causing and a suffering, which are different, interdependent, and asymmetrically realized. Their asymmetry lies in the fact that the activity of the agent is realized in the patient, producing the effect on the patient. It is a dislocated, or *ectopic*, realization of the agent's activity in the patient. The interdependencies of the two natures are multiple, binding them inextricably together into a complex whole which cannot be divided into distinct activities. This complex whole is generated by the mutual, interdependent actualization of properties of the two objects, which is their causal interaction. This is the causal 'bond' between the objects that could be more accurately understood as an overlap between the constitutions of the two substances, afforded by the ectopic realization of the potentiality of the one in the other.

We have already seen that causation is the transmission of form from the mover to the movable: 'The mover will always transmit a form . . . which, when it moves, will be the principle and cause of the motion' (202^a9-12). This is the core conception which explains further fundamental features of Aristotelian causation, such as its incompleteness and its asymmetry. The causal interaction begins with contact between the agent and patient (202^a5-7). The contact facilitates the transmission of the form from the mover to the movable. But the transmission is a process that takes place in time. While it lasts the transmission has not been completed. The unfolding of the stages of transmission marks the incompleteness of the causal process (e.g. building a structure). The process of the reception of the form by the patient is the causal effect. Once the transmission is completed, the causal interaction is not taking place any more. The agent is not acting on the patient, which now possesses the transmitted form. So the process of realization of the agent's capacity to transmit the form and the patient's capacity to receive the form is the causal process which lasts until the transmission is completed. The realization takes place through time, during which period the process is driven by the not yet entirely fulfilled potentialities of the agent to transmit the form and the patient to receive it. So the causal process of transmission is actual while these potentialities are

being realized, and only before they are fully realized. In that sense the causal process is actual only when the potentialities that drive it are incompletely actualized: 'motion is thought to be a sort of actuality, but incomplete, the reason being that the potential whose actuality it is is incomplete' (201^b31-3).

But more important than the explanation of the incompleteness of causation is the role that the transmission of the form plays in *selecting the cause*. We already saw that the agent is involved in different motions in the course of the causal interaction, owing to the contact with the patient which is necessary for the transmission of the form. All of these motions are required for the effect to occur—if not these particular tokens, at least their functional types. But although all of them can thereby be thought of as belonging to the causal field of this causal act, not all of them, or any arbitrary selection from them, are the cause. Some of what happens to the agent is only the means for the transmission of the form.¹³ This distinction between the cause and the means towards its realization is already found in Plato's *Phaedo* (99 A 5-B 4).¹⁴ But what Aristotle makes explicit here is the criterion that determines the cause, distinguishing it from the means. The form that is transmitted is the principle and the cause of the motion. Everything else that happens in the process, or even the conditions of its happening, is the means for the transmission of the form. Thus the heat from the fire, or from the match, or from the particle fission, is the cause of the explosion, while such factors as the presence of oxygen, or the striking of the match, or the uncovering of the reactor rods, are the means towards the transmission of the form, or even the generation of the form to be transmitted.

Since the causal interaction is the transmission of the form, at the

¹³ A clarification needs to be made regarding the motion of the mover. One kind of motion is the one resulting from the mover's contact with the movable, which is required to transmit the form to it. But there is a further type of motion that may be required for the transmission of the form. It may be that to achieve contact at all, or to achieve the requisite contact, the mover needs to move itself, as e.g. in the case of a sculptor or a builder. These motions are neither the transmission of the form nor the result of contact with the movable, but the preparation for it. But this does not make them uncaused motions. They are motions that are for the sake of transmitting the form to the movable. They could be caused by chance motions, such as the falling of a tree, or be part of the mover's plan, if the mover is capable of planning, to engage in a more complex causal activity, e.g. hitting the ball in a game of tennis, which involves component motions. Aristotle does not set them apart here.

¹⁴ See in particular 99 B 1-4: 'Imagine not being able to distinguish the real cause from that without which the cause would not be able to act as a cause.'

time of transmission the causal form must be present in the agent not only in actuality, but in a *transmissible state*. The teacher may possess knowledge, but this does not make her into a teacher until she embodies this knowledge in her lecture that transmits it to the students. The knowledge in her memory is the non-transmissible form, while that in her lecture is the transmissible one. (The memory knowledge is non-transmissible in the sense that the agent must come to possess the knowledge in a different form before it can be transmitted.)¹⁵ But the mover need not possess the form in any way other than in a transmissible state at the time of the transmission. This is the least requirement of possession of the form by the mover. The mover may also possess the form in non-transmissible ways, but this is not necessary for it to be or become a mover. Moreover, even if it does possess the form in a transmissible state—for example, the teacher has prepared the lecture—it is not a mover until the conditions are such that they allow the form to be actually transmitted. And finally, even if it possesses the form in a transmissible way, it has to be transmissible for the type of patient at hand.

What metaphysics is involved in the *transmission* of the form from the mover to the movable? There is the actuality of the mover as a mover and the actuality of the movable as movable, both being realized in the transmission of the form from the mover to the movable, which is the motion caused and suffered. How are these actualities related? The metaphysical account of their relation is Aristotle's answer to the problem of causation. The challenge is to explain the nature of the special bond between two objects engaged in causal interaction. The challenge is made harder for Aristotle because he restricts himself to the ontology so far developed in his system, which does not make any provisions for such entities as necessary connections between objects, which later philosophers sought to find in causal interactions. But neither does he question or deny the existence of a type of connectedness between the interacting objects. So he has to build the connectedness from the materials of his ontological warehouse of substances and their properties, which they possess either actually or potentially.

¹⁵ Of course, it is the memory knowledge that is transmitted, and in that sense it is transmissible too, but only by being the origin of the further, transmissible state of that knowledge, which the teacher comes to possess before transmitting it to the student.

Although I agree with Waterlow¹⁶ that accounting for causation strained Aristotle's system, I disagree with her analysis of the problem and of Aristotle's solution in the following respect. According to Waterlow, the challenge for Aristotle comes from the fact that the world-view he operates with (and the language available to him) seemingly creates a need for a metaphysical justification of a bond between causes and effects that has no place in his metaphysics.¹⁷ By contrast, in my view the challenge comes from the metaphysical problem of how to account for the union of cause and effect, which Aristotle assumes exists, without introducing ontological entities such as necessary connections.

Waterlow's interpretation of Aristotle's account of causation relies on the reading she offers of *Physics* 3. 3, which I shall discuss in detail below (pp. 221 ff.). For the moment I want to register in outline where our interpretations agree and where they disagree. There is agreement in understanding that Aristotle sees agent and patient as enjoying a special type of unity. There is disagreement in the understanding of Aristotle's account of that unity. For Waterlow agency and patiency have the same end and are from the same principle, and this is why they are one. But *contra* Waterlow, it is clear from the texts I have commented on so far that agency and patiency have different ends, one being the transmission of the form, the other its reception. Agency and patiency have different natures, being the realization of different potentialities which belong to different substances. Yet causation binds agent to patient through a complex entity.

¹⁶ S. Waterlow, *Nature, Change, and Agency in Aristotle's Physics* [*Physics*] (Oxford, 1982).

¹⁷ Waterlow attributes to Aristotle an 'anthropomorphic' view of causation and change, where 'the point of view of the voluntary agent is one from which the "halves" [sc. agent and patient] already present themselves as distinct' (*Physics*, 203), while in fact by his own metaphysical account there are not two distinct 'halves' to causation. See further points in her argument:

Aristotle's retention of the language of agency and patiency has nothing to do with any postulation of a mystical (and mythical) transaction tying agent to patient or to its effect in the patient. (200) . . . Why should we not regard the artifex and his material as forming, in the change, a concrete organic unity, as if the material were an extension of his own body? What happens in the one and what happens in the other have the same end and are from the same principle. (201) . . . In the change as a concrete unitary event there are not different entities to be agent and patient. The active and passive of the verb, from this point of view, are used of the change itself only derivatively, on the basis of an actual distinction existing only *ante* and *post eventum*. (202) . . . Since there are not two beings to connect, there can be neither problem nor solution about the nature and status of the connection. (202)

Substances move. Aristotle's solution to the problem of causal union is to make the motion of the causally interacting substances the same. Their motion, being one and the same but belonging to both substances, links the two substances together. But here a challenge emerges: how can the motion of the agent be the same as the motion of the patient?

It is contrary to reason to suppose that there should be one actualization [*ἐνέργεια*] of two things which are different in kind. Yet there will be if teaching and learning are the same, and agency and patiency. To teach will be the same as to learn, and to act the same as to be acted on—the teacher will necessarily be learning everything that he teaches, and the agent will be acted on. (202^b1–5)

Aristotle does not draw back from his solution in view of this problem, but is led to innovate. He will keep the oneness of the motion, but account for its twoness in a metaphysically novel way, which follows different principles from the essentialism established in his theory of substances.

Aristotle tells us that the motion that is in the movable, brought about by the mover,

is the fulfilment of this potentiality [of the movable as movable] by the action of that which has the power of causing motion [the mover]; and the actuality of that which has the power of causing motion [the mover] is not other than the actuality of the movable; for it must be the fulfilment of *both*. (202^a14–16)

The terms translated as 'fulfilment' and 'actuality' are *entelecheia* and *energeia* respectively, which are used interchangeably in this context.¹⁸ Clearly, so described, the solution faces the *prima facie* objection we encountered above, that teaching will be the same as

¹⁸ Gill offers a very informed discussion of the etymology of *ἐντελέχεια*, its possible translations, and the debated issue of its synonymy with *ἐνέργεια*. She devotes particular attention to the textual observation that 'Aristotle's argument . . . proves that the *ἐντελέχεια* of the agent and the patient is one, but in the argument Aristotle does not explicitly claim that motion is the *ἐντελέχεια* of both'. Gill finds it an 'attractive suggestion' to explain the textual observation thus: 'the claim would be that the *ἐντελέχεια* of the teacher and the learner is the same but what it is to be that *ἐντελέχεια* for the teacher is an activity, namely a teaching of the teacher in the learner, and a change in the learner, namely a learning of the learner by the teacher'. But she dismisses this as Aristotle's view in the light of 202^b19 ff., because she finds no indication of an ontological asymmetry between agency as activity and patiency as change (M. L. Gill, 'Aristotle's Theory of Causal Action in *Physics* III 3' ['Causal Action'], *Phronesis*, 25 (1980), 129–47 at 134–5).

learning and that the teacher will learn what she teaches. So Aristotle proceeds to refine his answer by a series of examples. Before examining these, I should mention that it is only elucidation by example, rather than a change in the answer, that he offers. This is surprising in view of the fact that, as we shall see, we would have expected his answer to be given using different terminology in the light of the clarification he makes. But Aristotle does not change the terminology of his solution, despite the fact that he has the opportunity to do so when he repeats it (at 202^b5–9) immediately following the discussion of the *prima facie* objection. His solution, enriched by the examples, does avoid the objection, as I shall argue below. But one would have expected a fresh description of his solution that did not claim the (objectionable) sameness of the two actualities, a sameness which his solution does not require and is in fact misleading for the reader. As we do not get a fresh description, we need to conclude that Aristotle is using the terms *entelecheia* and *energeia* broadly here, to mean by ‘actualization’ the *activity* of the agent and patient, rather than the *natures* of their activities.

Aristotle gives four examples to elucidate his solution to causation. He sets up the problem by stating the explanandum: ‘A thing is capable of causing motion because it *can* do this, it is a mover because it actually *does* it. But it is on the movable that it is capable of acting’ (202^a16–17). The action of the mover can be realized only by acting on the movable. This requires Aristotle to explain how the mover’s capacity is bound up with the movable. Immediately following his statement of the problem, he proceeds to offer his explanation by restating his solution and elucidating it with the first two examples:

Hence there is one and the same actuality [*ἐνέργεια*] of both [the mover and the movable] alike, just as one to two and two to one are the same interval, and the steep ascent and the steep descent are one. (202^a18–20)

The first example is ambiguous. On the one hand the interval from one to two can be taken to be *the same* as the interval from two to one, being either an arithmetical unit of value one, or a geometrical magnitude of value one. On the other hand, the two intervals can be taken to be *different*, such as vectors with opposite directions, or the positive and negative values of the number one. I take the example in the latter way because, as we shall see, the metaphysics

of the two intervals require them to have *different essential natures*, as opposite vectors do, or as the positive and negative unit values do; whereas taken in the former way the two intervals are one and the same, *described in two different ways*—from one to two, and from two to one.

The ancient and medieval commentators interpret this example in two ways, both of which belong to the one-entity-two-descriptions family of interpretations. They vacillate (often indiscriminately) between two readings within the one-entity-two-descriptions family: either one interval described in two different ways in terms of its end-points, or one relation described from the point of view of either relatum.¹⁹ I believe that the reason for the commentators' vacillation between the two readings is that at 202^b17–19 Aristotle describes the example, speaking loosely, both as an interval (*diastasis*) between two points and as the relation of distance (*to dihistasthai*) of either point from the other, as if they were equivalent ways of formulating the example. The modern commentators do not fall prey to this possible confusion, yet most of them follow the one-entity-two-descriptions interpretation.²⁰

The second example offered by Aristotle is also ambiguous, between the stretch of land being the same inclined road for both ascent and descent, and there being two routes, the route up and the route down, which, as any cyclist knows, are not only essentially, but dramatically different!

Aristotle proceeds to offer an explanation of the sameness involved in these examples:

¹⁹ Reading the example as one interval described differently in terms of its end-points is found, for example, in Simplicius (446. 31–2 Diels); Philoponus (370. 7; 375. 26–376. 5 Vitelli); Aquinas (*Physics*, 147 Blackwell *et al.*). Reading the example as one relation that has two relata, and accordingly two descriptions (e.g. the relation of procreation, with father and son as the two relata, and 'being the father of' and 'being the son of' as the two descriptions), is found, for example, in Simplicius (439. 34^{bis}–37; 448. 30 ff. Urmson; on this reading of Simplicius see also C. Luna, 'La relation chez Simplicius', in I. Hadot (ed.), *Simplicius: sa vie, son œuvre, sa survie* (Berlin, 1987), 113–48 at 126); Averroes (*Aristotelis De physico auditu libri octo. Cum Averrois Cordubensis variis in eosdem commentariis [Physica]*, in *Aristotelis opera cum Averrois commentariis* (Venice, 1562–74; repr. Frankfurt a.M., 1964), vol. iv, fos. 92^v I–L, 94^r E, 95^r A).

²⁰ See e.g. Ross, *Physics*, 361, 362, 540; Gill, 'Causal Action', 140; 143; Waterlow, *Physics*, 182, 191; Hussey, *Physics*, 69–70. Waterlow and Hussey share the view that Aristotle has some insight into Frege's distinction between sense and reference. I shall come, at pp. 221–2, to the arguments they offer in support of their interpretation.

For these are *one and the same*, although their definitions [λόγος] are *not one*. So it is with the mover and the moved. (202^a20, emphasis added)

This is important, but not complete. It is important because it blocks the objection that teaching would end up being the same as learning, by stating that they have different essential natures. But if they have different essential natures they are not one and the same entity described in two different ways. Whatever it is that is one and the same between the two intervals or between the ascent and descent must have two different definitions/natures.

Commentators who read *logos* as 'account/description' rather than 'definition' take the examples to be introducing a common single entity in each case, e.g. unit value one, or the inclined road (or the non-directional relation between the extremes). This view is held by the majority of the commentators, ancient and modern. I have already discussed the position of the ancient and medieval commentators, and I shall limit myself here to presenting two recent and very interesting accounts that have been offered for the same-entity view; one is by Waterlow (*Physics*, 180–2), the other by Hussey (*Physics*, 66).

Waterlow,²¹ in analysing the analogous case of hearing and sounding, identifies the multiply described entity as a single event, a single change that is both teaching and learning:

His [Aristotle's] argument proceeds on the following assumption: the only reason anyone could have for supposing that being a changer (an actual changer) entails change in that changer, rests on a false view of the difference regarding these (in some given instance, such as teaching and learning) as different concrete events, that one could be misled into thinking that the changer as such undergoes a change. But once it is seen that these are different ways of describing the same event, the problem disappears, leaving only one change, which is to be located in the patient . . . The point of crucial importance that Aristotle emphasizes again and again . . . is that X's teaching is not a different concrete event from Y's learning. These are one and the same actuality under two descriptions. (*Physics*, 180–2)

Waterlow associates this single event that is the entity to which the two descriptions apply with

a neutral verb-stem determinable by active and passive voices . . . we may say (a) that teaching is a predicate of Y as well as of X; and (b) that

²¹ And also L. A. Kosman, 'Perceiving that We Perceive: *On the Soul* III, 2', *Philosophical Review*, 84/4 (1975), 499–519 at 514.

'teaching' applies to Y in a determinate form (the passive) which is perfectly consistent with the statement 'Y does not teach'. (*Physics*, 182)

My argument is that the ontology of causation for Aristotle is more complex than that of one event under two descriptions.

Hussey, who also holds the one-entity-two-descriptions view, considers that

Aristotle's positive argument to show that the changes [of the agent and patient] are the same . . . might be just that an operation must be something that *happens* over a period of time, and that if we look at the minimal case of change, in which the agent is completely unaffected, there is 'nothing happening' except the change(-intransitive) of the patient. Hence, the operation of the agent must be the change(-intransitive). (*Physics*, 66)

I do not agree that, because the agent's transitive change of the patient happens over time, within a small period of time the agent does not suffer any change. To put it in Aristotelian terms, some but not all of the form that is being transmitted will be transmitted within a short interval. According to the analysis I am developing here, the change is not one in so far as two essential natures are involved in its occurrence, agency and patiency. The change involves the transference of a form, and Aristotle finds this to be an irreducibly complex activity of give and take; there are not two distinct activities, nor only one: an indivisible physical process grounds two essential natures of action and passion. So even in the minimal case described in the quotation above, the agent transmits and the patient suffers the form. The changes in the agent depend on what is required in each instance for the form that will be transferred to be possessed by the agent in a transmissible mode, which is the causally active factor.

More generally, by contrast with the majority's view, my reading of Aristotle's examples and explanation directs me to take *logos* at 202^a20 to mean 'definition', and so I disagree with those which read the examples as involving one entity under two descriptions. Neither the complex of the two directional intervals and its respective ground nor the complex of the two routes and its respective ground constitutes any familiar type of entity of the Aristotelian ontology, although their components are. Aristotle is here engaging in a novel exploration of ontological dependence, not of matter and form or subject and property or potential and actual, but of two interdependent natures.

When Aristotle says that there is a single actuality (*energeia*) of both the mover and the movable (as there is between the two intervals or the two routes), he must be telling us that the mover and the movable are so related in their activity as to be *one* in some sense, but *not one* in the definitions that describe what each of them does or suffers. What makes the definitions of the vector lines two are opposite directions; but what is it that makes these vector lines one? It is the non-directional interval between one and two that is the same for both vector lines. The interval would not be the same, for example, between vector lines one to two and four to three (on a line). Similarly with the uphill and downhill routes: they are different because of their opposed directions but are both the same stretch of land, as opposed to two routes on different sides of the hill that share no common stretch of land. Although these examples and this explanation go some way towards accounting for what Aristotle means by claiming that the actuality of the mover and the movable is the same, his position is not as explicit as in the explanation we shall find in his next set of examples, to which I now turn.

After the dilemma Aristotle states his own position, resolving the puzzles encountered in the course of the dilemma itself. On the issue we are examining here, he says:

Nor is it necessary that the teacher should learn, even if to act and be acted on are one and the same, provided that they are not the same in respect of the account [*λόγος*] which states their essence [*τὸ τί ἦν εἶναι*] (as raiment and dress), but are the same in the sense in which the road from Thebes to Athens and the road from Athens to Thebes are the same, as has been explained above. (202^b10–14)

The use of the technical expression, coined by Aristotle himself, for essence, *τὸ τί ἦν εἶναι*, settles the issue as to whether by ‘account’, *logos*, he means description or definition of nature.²² This is further supported by his immediate example of things that have the same account, namely raiment and dress. ‘Raiment’ and ‘dress’ are one thing, under two names or descriptions, but with one definition which expresses its essence. At *Top.* 1. 7, 103^a25–7, Aristotle says

²² No doubt is recorded in the modern editions concerning the expression *τί ἦν εἶναι* at 202^b12; only the two immediately preceding articles *τὸν τὸ* have a less firm transmission in the manuscripts, as Ross documents in the apparatus ad loc.: we find only *τὸν* in IJ; only *τὸ* in E; neither in F. It was easy for one or the other article to drop out by haplography during the copying process. Bonitz prints both articles *τὸν τὸ* as part of the text; Ross chooses to print *τὸ* as a supplement necessary to complete the sense.

that whatever is one in essence is one in the primary sense (*kuriōs*), and indeed we find there the very same example of 'raiment' and 'dress' to illustrate this type of oneness; this is not the case with the routes, but it would be if the descriptions were 'the road from Athens to Thebes' and 'the road we travelled on last week'. The route from Thebes to Athens differs in definition from the route from Athens to Thebes since they are not, as Aristotle tells us, like raiment and dress. The reference back to what 'has been explained above' in the last quotation is to the passage we just examined, 202^a19–20, on the relation of the uphill route to the downhill one that differs in account, *logos*; hence there too Aristotle intends *logos* to be the definition of essence.

But there is further evidence that here *logos* is the definition of essence, and not a mere description. This comes in an unexpected metaphysical observation that Aristotle makes immediately afterwards. This observation also makes it evident that Aristotle's aim in the two passages we are examining, in which he says that mover and movable are 'one and the same', or that one 'actuality . . . must be the fulfilment of both', or that 'to act and to be acted on are one and the same',²³ is to introduce a sense of *qualified sameness*, a sense different from identity:

For it is not the case that all the same properties belong to [ταῦτά πάντα ὑπάρχει] those things which are in any way the same; rather, this is the case only for those things to be which is the same [τὸ εἶναι τὸ αὐτό]. (202^b14–16, my translation)

The expression ταῦτά πάντα must be referring to attributes of substances, and not to the substratum underlying a substance; for it would be extremely unnatural for Aristotle to say that the underlying substratum belongs to (ὑπάρχει) a substance. Furthermore, although he talks only of things to be which is the same (literally, that have the same being, τὸ εἶναι τὸ αὐτό), I take it that he means things whose constitution is the same. One could take this to be limited only to forms, since their being exhausts their constitution, and so same being entails same properties. But one could take it more liberally to mean embodied being, so that substances whose embodied form is the same have the same properties.²⁴ There are

²³ ἐντελέχεια γὰρ ἐστὶ τούτου [καὶ] ὑπὸ τοῦ κινητικοῦ. καὶ ἡ τοῦ κινητικοῦ δὲ ἐνέργεια οὐκ ἄλλη ἐστὶν (202^a14–15); μία ἢ ἀμφοῖν ἐνέργεια (202^a18); οὔτε μίαν [sc. ἐνέργειαν] δυοῖν κωλύει οὐθὲν τὴν αὐτὴν εἶναι (202^b8–9).

²⁴ Of course, if being picks out only the universal form, the entailment would not

other possible readings, but for our purposes the safe reading of mere forms gives us a clean contrast to the cases we are examining.

It is a cornerstone of Aristotelian substantial essentialism that if the essences are of different kinds, their substrata (at the same time) are different too, e.g. being a wolf and being a rabbit. But this is not the case with the causal agent and patient, which is why Aristotle is at pains to explain their unique metaphysics. What it is to be an agent is different from what it is to be a patient; their definitions are different (202^a20, ^b22), and with them their kind (202^b1). But what makes the metaphysical situation of agency and patiency unique is that although the definitions stating their essence are different (202^b12), 'to act and to be acted on are one and the same' (202^b11).

But Aristotle's examples have already prepared us for understanding this statement. There is a kind of sameness that the route from Athens to Thebes has with the route from Thebes to Athens, because these routes are realized on the same road. The line from one to two is realized on the same interval as the line from two to one. In all such cases, their ground of realization is one and the same despite their essences being different in kind. Aristotle finally states this explicitly:

To generalize, teaching is not the same in the primary sense [κυρίως] as learning, or agency as patiency, but that to which those belong [ὧ ὑπάρχει] [sc. is the same for both], namely the motion [κίνησις]; for the actualization [ἐνέργεια] of this [teaching] in that [learning] and the actualization [ἐνέργεια] of that [learning] through the action of this [teaching] differ in definition. (202^b19–22)²⁵

follow. Aristotle says in *Metaph.* Δ 6: 'Some things are one in number, others in species, others in genus . . . in number those whose matter is one, in species those whose definition is one . . . The latter kinds of unity are always found when the former are; for example, *things that are one in number are also one in species, while things that are one in species are not all one in number*' (1016^b31–6, emphasis added). So for our present passage, 202^b14–16, we need to assume embodiment if this is the particularizing principle, securing the numerical identity of the individuals. If one attributes to Aristotle a particularizing principle different from matter, then that principle can be understood to be evoked in the present passage.

²⁵ Since there is disagreement between interpreters on the translation of this passage, I report here the original text:

ὄλως δ' εἰπεῖν οὐδ' ἡ διδασίς τῇ μαθήσει οὐδ' ἡ ποίησις τῇ παθήσει τὸ αὐτὸ κυρίως, ἀλλ' ὧ ὑπάρχει ταῦτα, ἡ κίνησις.

As Hussey notes, there are two ways of understanding the passage:

- (i) 'the change in which these things are present, i.e. of which it is true that it is an acting-upon and a being-acted-upon, is the same as the being acted upon';

The motion to which teaching and learning belong is the substratum of the two actualities. It is the exchange between the two substances which actualizes both the teaching and the learning. As such, the motion is the actuality of the agent's potentiality to teach and of the patient's potentiality to learn (202^a13–16), fulfilling both potentialities (202^a16, ^a18). Since the two potentialities differ in kind, their actualities differ in kind too.²⁶ We are now faced

- (ii) 'but that in which these things are present, i.e. that of which it is true that it is both an acting-upon and a being-acted-upon, is the change' (*Physics*, 71)

The latter, (ii), is the way in which the majority of interpreters, including myself, read the passage (e.g. Philoponus 383. 21–2 Vitelli; Ross, *Physics*, 362; Gill, 'Causal Action', 137). Hussey, though, opts for (i) (*Physics*, 6), as does Charles (D. Charles, *Aristotle's Philosophy of Action [Action]* (London, 1984), 14). For, Hussey remarks, in (i) 'the extra point is made that the change is indeed the same in definition as the being-acted-upon (for change has been defined as an actuality of the changing thing)' (Hussey, *Physics*, 71). Hussey does not develop this point further, but Charles does, as he grounds on these lines his interpretation of the chapter, differing from that of the majority. I shall devote the discussion here to the arguments in support of, and against, translation (i), and discuss Charles's interpretation later in n. 28. Both Hussey and Charles acknowledge that on linguistic grounds readings (i) and (ii) of the passage are equally possible; the reasons why they prefer (i) to (ii) are mostly interpretative. Charles writes:

I reject this translation [sc. the equivalent to Hussey's (ii)] because (a) it gives up the essential connection on which Aristotle elsewhere insists between the process and the suffering (202a14–6, b25–7); (b) it postulates a process which is non-directional (and non-relational) and thus conflicts with Aristotle's general view of the essences of processes as the realization of goal-directed capacities (201a16–8); (c) the grammar of 202b19–22 seems to require that the clause 'the process is the same in the primary sense' takes over both the notion in the primary sense from b20, and also the grammatical object with which it is the same in this sense: viz. the learning, suffering. (*Action*, 14)

In answer to (a), it is not true that by taking *κίνησις* as the ground of the instantiation for action and passion 'the essential connection . . . between the process and the suffering' is given up; rather, more than one essential connection is allowed, namely the relation to agency and also to patiency. In answer to (b), in my interpretation the nature of motion is to be found, not in the underlying physical activity, but in the two beings that this activity grounds, agency and patiency. Neither of its natures is truer of the motion than the other, any more than either direction of the route between Athens and Thebes is truer of the underlying road than the other. Aristotle's definition of change does not favour the one over the other. Change is no more the unfolding actuality of the potentiality of the patient as a patient than it is the unfolding actuality of the potentiality of the agent as an agent. In answer to (c), I defend my reading of the text on the ground that it is actually the most natural: it takes 'being one in the primary sense' to be retaining the same meaning throughout, and working as a predicate that has as its logical subjects on the one hand teaching and learning (as a pair) and action and passion (as a pair), and on the other hand 'that to which these things belong, namely the underlying process'.

²⁶ Because the agent's and the patient's capacities are *essentially different*, the

with three actualities, two of which are the third! The actualities of the two potentialities (for teaching and learning) are fulfilled in the interaction, the motion, which is their common actuality. No wonder Aristotle had difficulty expressing this; terminology let him down.

Teaching causes learning. Neither can happen without the other. The teacher is not teaching if the learner is not learning, and the learner (i.e. 'instructee') is not learning (being instructed) if the teacher is not teaching. These two potentialities can occur only together. Their interdependence is captured by the fact that they are actualized by one and the same activity, which cannot be separated into two. Both of them therefore characterize that activity, essentially, which in this case is an instance of teaching and learning. The activity bears the two forms in the way that matter bears the essential form in a substance, being en-formed by it. Except that here, the two forms come together in a package of interdependence; the activity is essentially both teaching and learning.

Neither oneness nor twoness can be sacrificed. The *oneness* of the activity reflects the interdependent actualization of the cause and the effect. The *twoness* of the activity preserves the polarity of the causal interaction; causes are born together with their effects. Is there a price to pay for this arithmetical versatility? What is lost is the unity of substance, or the autonomy of being a subject: neither teaching nor learning can stand on its own, the way substances do; they stand and fall together. Nor do we have quite two subjects, either, since neither is autonomous—changes in the internal properties of the one result in changes in the internal properties of the

one being the capacity of transmitting the form and the other being the capacity to receive the transmissible form, the realization of the two different capacities is also essentially different. Charles shows on the basis of an investigation of various passages of the *Physics* that

A process is one in number only if it is one in essence . . . but the essence of each thing is defined when one says what it is to be that thing (1017b21-3). If so, processes are one in number only if the definitions of what it is to be that thing are identical. (*Action*, 10)

Aristotelian processes are essentially realisations of given capacities of given subjects: their essential properties include the subject of change and the end point of the type of change (i.e. its goal). They are distinct if they do not share all essential properties. (*ibid.*, 18)

It follows that in III 3 teaching and learning must be numerically distinct processes since they differ in essence. (*ibid.*, 18)

other, as would readily follow if the teacher taught a slightly different lesson. Together, they comprise a *new type of entity*, which has an ontological status of its own.

The new type of entity—call it a *two-in-one* entity—consists of two natures grounded on an underlying physical activity. The activity supports both natures together because of the relation that these two natures have to each other. They are interdependent in different ways, such as being coexistent and covariant, which is secured by their mutual dependence on the underlying activity.²⁷ And of course, the entity itself is further dependent on the two substances to which the two actualized potentialities belong. The one type of activity is the agent's actualized potentiality and cause, and the other type of activity is the patient's actualized potentiality and effect; the two are bonded together by interdependencies through their grounding on the underlying physical activity. Thus, for example, the physical movement of the carpenter's hands and chisel on the hard wood constitutes the carpenter's carving, and the log's being shaped into a statue.

Although the same type of dependencies binds together causal and non-causal complexes, e.g. teaching and learning but also the overlapping routes, there is a fundamental difference between them. Non-causal two-in-one entities are ontologically autonomous complex entities, such as two opposite overlapping vectors, while causal two-in-one entities, such as teaching and learning, are ontologically dependent on the substances which they causally unite.

Having examined the nature of the causal interaction between the two substances, I conclude by commenting on an explanatory remark Aristotle makes regarding the mutual actualization of the cause and the effect. In describing his own position on the oneness of the actualities of the agent and the patient (202^b8–22), where, as we saw, he explains that they share the same substratum, he introduces it by saying:

There is nothing to prevent two things having one and the same actualization (not the same in being, but related as the potential to the actual). (202^b8–10)

²⁷ Determining the details of the ontological interdependence of the two natures, through their relation to their underlying activity, would take us beyond Aristotle's text into metaphysical considerations which can be built on Aristotle's examples, but which are not to be found explicitly in the text. For an account of the metaphysical structure of the two-in-one entity see A. Marmodoro, 'It's a Colorful World', *American Philosophical Quarterly*, 43/1 (2006), 71–80.

Here he is making the same point with which he concludes this section, that what is common between two coactualized potentialities is not their respective actualities, which are different kinds of being (e.g. teaching and learning), but their substratum, the underlying process. The way Aristotle introduces this position is by the potentialities of the agent and the patient having one and the same actualization, not by becoming one thing, not even by realizing the same type of being, but by having one and the same process actualize both of them, underlying them both 'as the potential to the actual'. So the potentialities for agency and patiency are actualized in a common process which underlies their two actualizations, the activity of agency (teaching) and that of patiency (learning). This common grounding process underlies the beings of the two activities as potential to actual. For example, the physical process of the embroidering hands and needle on the material is related to the (realized being of) embroidering and to the (realized being of) the decoration of the material in the way that the wood is related to the statue of Hermes. Thus, although in the dilemma Aristotle objected to two potentialities having one and the same actuality because teaching would end up being the same as learning (202^b1-5), here he avoids this objection by saying that what is the same is only their *underlying actualization process, not their actuality*. They are two mutually bound potentialities in that they can be actualized only together in an actualization process that is one and the same in the sense that it cannot be divided into two processes, despite the two activity beings that it grounds, e.g. teaching and learning, or sculpting and being carved into shape. Because of the brevity of the description at 202^b8-10, different readings of it can justifiably be given, leading to alternative understandings of the relation between the potential and the actual. In particular, it can be read as saying that the actuality of the patient is the potential for the actuality of the agent, related to it as matter to form.²⁸ But I have argued that the

²⁸ This is the interpretation suggested by Charles on the ground of his and Hussey's translation of 202^b14-19 (see above, n. 25):

Teaching and learning are numerically distinct, but are one in some sense because the teaching 'belongs to' the learning which 'underlies it'. Because Aristotle identifies the process strictly with the learning (the capacity of the patient: see also 202a14-16; b25-7), there is no non-directional process which underlies both teaching and learning . . . The learning is the underlying process which stands to the teaching in a relation akin to that of matter to form, because the latter 'imprints' on the learner the knowledge which he had possessed previously only

subsequent explanation Aristotle gives in the same passage, and his examples, support the common-underlying-activity interpretation.

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APPENDIX

The Argument in the Actualities of Motion Dilemma

In the structured representation of the argument below, the convention I follow is to indent under the conclusion the premisses or the subarguments pertinent to the support of that conclusion. The premisses justifying or objecting to a conclusion are grouped in the same level of indentation. I indicate in parentheses the premisses I have supplied for completeness in addition to what is found in Aristotle's text.

C The realization of the agent's and the patient's capacities are neither the same nor different. (Supplied.)

P 1 Because it is impossible that the realization of the agent's capacity is different from the realization of the patient's capacity. (Supplied.)

P 2 Because if the realization of the agent's capacity is different (in number) from the realization of the patient's capacity, one of the following disjuncts is true: **(2.1)** either both are realized in the patient; **(2.2)** or both are realized in the agent; **(2.3)** or one is realized in the agent and one in the patient: for example, the realization of the agent's capacity takes place in the agent and the realization of the patient's capacity takes place in the patient. (See 202^a25-7; **(2.2)** and **(2.3)** are supplied.)

P 3 But none of the disjuncts is true.

P 4 Because **(2.1)** is impossible. Namely, it is impossible that the realization of the agent's capacity and the realization of the patient's capacity are both in the patient. (Supplied.)

P 5 Because if the realization of the agent's capacity and the realization of the patient's capacity are both in the patient, then

potentially (202a9-12). (*Action*, 15)

Hussey finds the following in 202^b8-10:

Aristotle has in mind sophistic puzzles such as that about Socrates, who, at first unmusical, then becomes musical. The unmusical Socrates is potentially musical, the musical Socrates is 'operating' in respect of musicality. 'They' are one and the same man: yet different, incompatible things are true of the 'two Socrateses'. Accordingly, for Aristotle 'they' are not one in definition. (*Physics*, 72)

both consequences follow: (5.1) the agent's capacity will not be realized in the subject that has the capacity, the agent; (5.2) the same subject, the patient, will undergo the realization of two [opposite] capacities at the same time in relation to one form. (See 202^a33-6.)

P 6 But (5.1) is nonsense (202^a36).

P 7 And (5.2) is impossible (202^a36).

P 8 And *mutatis mutandis* for (2.2). (See 202^a29-30.)

P 9 And it is impossible that the realization of the agent's capacity takes place in the agent, and realization of the patient's capacity takes place in the patient. (Supplied.)

P 10 Because if the realization of the agent's capacity and the realization of the patient's capacity are each in each, then one of the following disjuncts is true: (10.1) either every agent will also be acted upon; (10.2) or the agent, having causal efficacy, will not be causally efficacious. (See 202^a28-^b1.)

P 11 But (10.1) is false, and leads to infinite regress. (Supplied.)

P 12 And (10.2) is false. (Supplied.)

P 13 And it is impossible that the realization of the agent's capacity is one and the same with the realization of the patient's capacity (202^a36-^b2).

P 14 Because then agency and patiency would have the same actuality, and so acting and being acted upon would be the same thing. (See 202^b2-5 for the example.)

P 15 But agency and patiency are not the same actuality. (Supplied.)

P 16 Because agency and patiency are different in essence. (Supplied.)

P 17 Because the agent's capacity to act and the patient's capacity to suffer are essentially different things. (See 202^a20 and 201^b1.)

P 18 And the essence of an actuality is the same as the essence of its capacity. (Supplied.)

P 19 And it is nonsense that two things different in essence, e.g. the agent's acting and the patient's being acted upon, have one and the same actuality (202^a36-^b2).

P 20 Because the actuality of something is the instantiation of its essence. (Supplied.)

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