

NO TIME FOR POWERS

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(A mamma e papà)

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INTRODUCTION

1. BROAD TOPIC OF THE THESIS

This thesis focuses on two related though different topics: first, the metaphysics of dispositions; second, the relation between dispositionalism and time. For this reason, the thesis is divided in two main parts: the first part concerns the first topic, and the second part concerns the second. The aim of the project is to argue that dispositionalism faces two different problems: first, there is no viable metaphysics for dispositional properties; second, there is no viable theory of time that can fit in a dispositional framework.

A remark: by ‘dispositionalism’ I mean two different things: in the first part of the thesis, I refer to a more general conception of dispositionalism. In the second part of the thesis, I refer to a specific version of dispositionalism, one that brings with it a theory of causation and a theory of modality, and that has been defended by Mumford and Anjum in their *Getting Causes From Powers* (2011).

In the first part of the thesis I set out the view of properties that the rest of the thesis will rely on, I then present a first issue for dispositionalism. In the second part I will explore the relation between the accounts of causation and modality that the version of dispositionalism presented in the first two chapters brings with it, and the various models of time.

I will divide my thesis into seven chapters. In the first chapter, I introduce in very general terms the dispositional theory of properties. I compare and contrast it with different views of properties and argue that, at least *prima facie*, dispositional monism (or pandispositionalism)¹ is the view that should be preferred. In the second chapter, I explore the ontology and the metaphysics of dispositional properties. Here I argue that there is no viable metaphysics for dispositional properties by showing that Aristotelianism, tropism and Platonism fail to satisfy principles that are at the heart of dispositionalism. The conclusion of this chapter will then pose a first issue that dispositionalists have to face.

Then we move to the second part of the thesis, which is made of four chapters. The third chapter focuses on the accounts of causation and modality that this particular theory of properties gives rise to (that is Mumford and Anjum's theory of causation and modality). From chapter 4 to chapter 6 I address different consequences of these accounts in relation to time. In chapter 4 I argue that dispositionalism is at odds with both eternalism and the moving spotlight view (that I consider to be a version of eternalism). In chapter 5 I argue that dispositionalism and the Growing Block theory of time cannot be combined. And, in chapter 6, I argue that there is no way to reconcile dispositionalism with presentism. What sits behind my arguments is that Mumford and Anjum require particular models of causation and modality that cannot be accommodated by those models of time. Last, in a brief concluding chapter (chapter 7), I will draw together my conclusions.

¹ The view that all properties are dispositions.

With that very quick sketch in hand, it will prove useful for me to provide a slightly more in-depth characterization of the contents of each chapter, to allow the reader a fuller sense of what it to come.

2. CHAPTER BY CHAPTER OVERVIEW OF THE THESIS

PART ONE: DISPOSITIONS

CHAPTER 1

DISPOSITIONS: FROM COMMON-SENSE TO PHILOSOPHICAL INQUIRY

The chapter begins with a general discussion about dispositions. Dispositionalism is the view that properties are dispositional. Dispositions (also called “causal powers”) are those properties which are characterized by the causal behaviour of the particulars that instantiate them - they are causally powerful properties. As their name suggests, these properties are taken to dispose towards something – they are tendencies towards further properties: their manifestations.

Although all dispositionalists agree (to an extent) about the nature of dispositional properties, there are different accounts of dispositionalism. Ellis (2001) and Molnar (2003), for example, hold that some but not all natural properties are dispositional; Martin (1997) and Heil (2003, 2012) claim that all properties have both a qualitative aspect and a dispositional aspect (identity theory of properties); Mumford and Anjum (2011), instead, hold dispositional monism, an account in which *all* (natural) properties are irreducibly dispositional.

In this chapter, I spell out the relevant aspects of the main dispositional theories, concluding that, given the arguments we have before us, dispositional monism should be preferred to the other varieties of dispositionalism. Building on that conclusion, dispositional monism will be taken as the metaphysical foundation for the rest of the thesis.

CHAPTER 2

DISPOSITIONS: ONTOLOGY AND METAPHYSICS

In the first part of the chapter, I focus on the ontology of dispositions, discussing what we are actually quantifying over when we talk about them, and then seeing how predicates (the terms we use to describe the features of the objects) and properties are related. The aim of this first part of the chapter is mainly to make clear why it is wrong to think that all of our thoughts and language perspicuously describe reality and pick out what exist. More straightforwardly, the aim of this first part is to reject the idea that the world is exactly the way we think and talk about it.

Then we move to the metaphysics: what kind of entities are dispositions? Usually, dispositionalists adopt either an Aristotelian view or a trope view of properties. Ellis (2001) and Mumford (2004), who claim that properties are immanent universals, hold the Aristotelian view. Heil (2003, 2012), Molnar (2003) and Whittle (2008), instead, hold a trope view of properties. There is also a Platonic version of dispositionalism. According to Tugby (2013), both the Aristotelian and the trope view of properties are not consistent with what he calls the central and intrinsicness platitudes - two

principles that, according to Tugby, every dispositional theory should be consistent with. He then articulates and defends a transcendent (Platonic) view of properties, one that is consistent with these two principles. In this second part of the chapter, I show that, although Tugby's Platonism is consistent with the two principles above mentioned, it fails to be consistent with other key principles of dispositionalism. I then argue that dispositionalism is left with no viable metaphysics of properties and that this problem needs a solution. Again, I believe pandispositionalism to be the best theory of powers, but I also believe that it suffers from this problem. We lack a coherent metaphysics of powers.

PART TWO: DISPOSITIONALISM AND TIME

In the second part of the thesis, I will consider some of the metaphysical implications for our philosophy of time, given the dispositional theory of properties, causation and modality (as presented in chapters 1, 2 and 3).

CHAPTER 3

DISPOSITIONALISM: CAUSATION AND MODALITY

The first part of the chapter focuses on the theory of causation that dispositional monism of the sort argued for in chapter 1 gives rise to. According to this account of causation, a cause and its effect are not distinct entities that bear some kind of relation to each other. There is no temporal gap between them and causation is not an extra element that connects two distinct changeless entities. According to this theory, causation involves just one thing: a single process in which one thing gradually turns

into another. Causal processes are seen as irreducibly dynamic: the change is undergone throughout the process - it has to be found in every part of it, and it thus cannot be broken down into a sequence of changeless parts (Mumford and Anjum 2011, Heil 2012).

The second part of the chapter will deal with modality. One of the most fundamental aspects of this powers ontology is the new grade modality it gives rise to. Dispositional modality has been proposed and defended, for the first time, by Mumford and Anjum (2011). Dispositional modality can be conceived as “natural possibility”: a *tending* modality that can be located half way between necessity and possibility. I outline and discuss this grade of modality, drawing on material developed by Mumford and Anjum.

CHAPTER 4

DISPOSITIONALISM AND ETERNALISM: POWERLESS POWERS IN A FIXED FUTURE

Some dispositionalists seem to favour of an eternalist framework of reality (see, for example, Mumford 2009, Heil 2012), putting together an ontology of properties as causal powers and a fourdimensional conception of the universe. As we have seen, dispositionalism is the view that natural properties are causal powers, and are essentially and irreducibly so. These causal powers are *tendings towards* further powers. Eternalism is the view that past, present and future entities are spread throughout the manifold and ontologically on a par. In this chapter I argue that dispositional monism and eternalism are at odds.

I introduce Diekemper's (2007) distinction between fixity (of the future), causal determinism and fatalism. I show that, although eternalism does not imply either causal determinism or fatalism, it implies the fixity of the future, so an "actual closed future". I then deploy this notion to argue as follows. In an eternalist framework, change through time is like spatial variation. In a dispositional framework, change through time results from dispositions' *tending towards* manifestations, and we would not say that spatial variation is like a tending. Change thus cannot be the same as spatial variation within an ontology of powers.

CHAPTER 5

DISPOSITIONALISM AND THE GROWING BLOCK VIEW: PRODUCTION WITHOUT TRANSFORMATION

Since Eternalism does not fit well with a powers ontology, in this chapter, I will explore an alternative view. What happens if a dispositionalist adopts the Growing Block view of time? Growing block theorists usually hold that the past and the present are real, whereas the future is unreal; the present is the boundary line between the past and the future. It seems possible to hold such a view within a dispositional framework, since it seems a natural fit with the idea that dispositions tends towards (still) unmanifested future states. It thus seems unproblematic to adopt this apparently dynamical view: the future is open and this is consistent with dispositional modality. Sadly, I then show that things are not that straightforward.

In the Growing Block (GB henceforth) framework, the problem is generated by the fact that past entities keep existing while the new ones are coming into existence. This

seems to be at odds with the causal principle of dispositionalism according to which powers have to transform in order to produce further powers. The fact that powers keep existing in the block and new powers come into existence is at odds with this causal dispositional principle. Also, I will demonstrate that by existing *simpliciter*, powers lose their powers to act: they keep existing but they fail to pass the Eleatic test of reality. In this chapter, I will also make a brief digression on time travel, showing that dispositional GB is inconsistent with the possibility of time travel.

I will finally consider a common objection to GB: the epistemic objection. I will argue that the attempt of Forrest (2004) to reply to this objection would create further problems for a dispositional GB framework.

I will conclude this chapter by claiming that dispositionalists cannot adopt the GB theory of time.

CHAPTER 6

DISPOSITIONALISM AND PRESENTISM: TEMPORAL DYNAMISM VS. DISPOSITIONAL DYNAMISM

In this chapter I will explore the last on the table: presentism (roughly, the view according to which only present objects exist). The aim of this chapter is to explore the prospects of the union of a powers ontology and what I will call ‘standard presentism’. I will argue that there is no way to reconcile the two views. In fact, I will show that, although standard presentism can accommodate the dispositional requirements regarding causal production (that afflicted GB) on the one hand, and the

openness of the future (that afflicted eternalism) on the other, it cannot accommodate a further requirement of dispositionalism. Presentism cannot account for the fundamental dynamism of reality typically defended by powers ontologists.

I take presentism to be the conjunction of four theses: an ontic thesis, two metaphysical theses and a semantic thesis. I will show that standard presentism can accommodate, respectively, the dispositional principle about production and the dispositional principle about the openness of the future. (The latter section will be quite quick, since we will find that the same argument given to demonstrate that the growing block view of time can satisfy the dispositional principle about the openness of the future works for presentism as well.)

I will then focus on a different issue. I will show that although standard presentists consider dynamism to be a real and irreducible feature of the world, this is not the same kind of dynamism required in a dispositional framework. Temporal dynamism, in fact, appears to be different from and incompatible with dispositional dynamism. I will then consider three possible replies to this second worry, by considering a non-standard presentist view due to Hestevold (2008), Lucretianism about properties, and Temporal Distributional Properties (Cameron 2011). I will show that also this non-standard views are at odds with dispositionalism.

7. NO TIME FOR POWERS (YET?)

In this brief chapter, I will first reiterate the main feature of the version of dispositionalism adopted as the metaphysical foundation of the thesis, with particular

focus on the metaphysics of dispositional properties and on the two principles about causation and modality that I individuate and that I take to be central to dispositionalism. I will then remind the reader that dispositionalism needs to answer what seems to be still an open question: which is the best metaphysics for dispositional properties? In this first part we are left with three options:

1. All metaphysics of properties are wrong and we need a new theory of properties.
2. This version of dispositionalism should be completely rejected.
3. Dispositionalism needs to be revised.

I will then reiterate why dispositionalism cannot be reconciled with *any* of the recognized theories of time. The problem lies in the intrinsic or fundamental dynamism of reality, that seems to require both that time not be extended that time be extended. Dispositionalism is inconsistent with all “standard” theories of time. I will then leave the dispositionalist, again, with three options for responding to this problem:

1. All theories of time are wrong and we need a new theory of time.
2. This version of dispositionalism should be completely rejected.
3. Dispositionalism needs to be revised so as to drop its commitment to the ‘intrinsic dynamism’ that causes the conflict (so a modified version of dispositionalism).

PART ONE

DISPOSITIONS

1

DISPOSITIONS:

FROM COMMON SENSE TO PHILOSOPHICAL INQUIRY

Chapter Overview

In this chapter I:

- *Introduce dispositional talk and dispositional properties from the common-sense point of view and raise a problem (dispositions as occult powers) for the common-sense conception (section 2 and section 3).*
- *Consider a common way to understand dispositions - the conditional analyses of dispositions - and show the problems that arise for it (section 4).*
- *Consider dualist and monist account of properties and the problems (overdetermination problem and causal contingency problem) that arise for them (section 5).*
- *Argue that dispositional properties are real properties (section 5.2).*
- *Make a case for pandispositionalism, the view that all properties are dispositional, as the best options among the ones presented (section 6 and 7).*
- *Give a flavour to the reader of where to locate pandispositionalism within the literature of properties.*

1. INTRODUCTION TO THE CHAPTER

This chapter has three aims. The first aim is to persuade the reader to be a realist about dispositional properties. The second aim is to establish a case for pandispositionalism, and get the reader to agree that pandispositionalism is *prima facie* the best of the theories of properties. The third aim is to give the reader an idea of where to locate pandispositionalism within the literature on dispositions.

I will start by talking about dispositions from a very intuitive point of view. In the first section I will briefly describe the way we talk about dispositions (more precisely, how we make disposition ascriptions) in everyday speech. Although it seems straightforward to assume that dispositions are real properties of objects, in the second section I will show that treating disposition ascriptions in this way gives rise to a potential problem. For, on closer inspection, when we ascribe dispositions to objects, it may seem (in fact, to some it *does seem*) that we are talking about some occult and ethereal powers of these objects. For this reason, it will become clear that we require much greater detail as to what it is for something to be a disposition. I will focus on this issue in section 4 and in the following sections. Different philosophers have argued for different accounts of dispositions. Some of them (Ryle 1949 and Quine 1974, among others) have argued that dispositions do not exist and that dispositional language is a mere *façon de parler* (that is, a way of talking about possible events) (section 4). They thus developed a conceptual analysis of dispositions, arguing that when we use dispositional language we do not refer to real properties. This position is quite controversial, as we will see.

Other philosophers (Goodman 1954, Armstrong 1968, for example), in order to dismiss the existence of dispositions, have held that there is just one type of properties: the categorical properties. As we shall see (chapter 1, section 5.1) this view suffers from problems. There is a further view, according to which dispositions exist, but there is also a more fundamental type of properties (the categorical properties). This account is controversial, too, and in section 5.3 I will argue that we should reject it. Building on the problems raised for these analyses and raising difficulties for rival realist views of dispositions, I will conclude that there is a *prima facie* case for regarding the pandispositionalist theory as the best option on the table (section 6). I will then draw my conclusions.

2. DISPOSITIONS AND COMMON SENSE

In this section, I will mainly focus on our natural ways of using dispositional language. In other words, I'll focus on the way we ascribe dispositions to objects in our everyday speech. The reason for starting here is simple. I believe that the best way to introduce the concept of a disposition is to start from the way we intuitively and commonly talk about what surrounds us. In what follows, I will show that we use dispositional language very often, that we do it unproblematically, and, ultimately, that the way that we use such dispositional language should incline us towards pandispositionalism. This section will thus not only provide us with an introduction to the topic, but it will also help to provide the evidence that I will use to motivate my preferred theory (pandispositionalism).

In our everyday speech, we frequently describe and predict the behaviour of objects and people around us. A few examples: “The glass that is on the table is fragile – don’t touch it!”, “If you put another sugar cube into your cup of tea it will become too sweet!”, “They are brave, and I am pretty sure they will win the fight.” From these few examples we can see that we use dispositional language in at least two different ways. We do it either overtly or covertly. Roughly, we overtly use dispositional ascriptions when we say something like “the glass that is on the table has the disposition to shatter when struck”. This is a sentence where we refer both to the manifestation of the disposition of the glass (breaking), and to the circumstances (or stimuli) that that disposition needs in order to manifest itself (falling). In such cases we are explicitly discussing the disposition(s) had by an object *and* how the disposition will lead to the object behaving.

We covertly (or elliptically or conventionally) ascribe dispositions when we say something like “the glass on the table is fragile”. In such cases we use a single predicate to describe the potential behaviour of the glass, so locutions of this second type do not explicitly refer to the manifestation of the dispositions and to the stimuli they need to manifest.² In such cases, though we are speaking about the disposition(s) had by an object, we are not saying anything *explicit* about how the disposition will lead to the object behaving.

Let’s now take a step further. Seemingly, when we describe and predict the behaviour of the objects around us, we do it by ascribing to them properties that seem to be

² According to some philosophers the covertly dispositional locutions are translatable into overtly dispositional ones. The locution “the glass is fragile” can in fact be translated in the locution “the glass has the disposition to shatter when struck”.

somehow powerful. What does this mean? To put it simply, when we say that, “the glass on the table is fragile”, it looks as if we are saying that that glass has a property: fragility. This property, fragility, seems to be/have the power to produce some change in the world: it seems that fragility is the property responsible for the breaking of the glass when it hits the floor. This kind of property we appear to ascribe when describing and/or predicting the behaviour of objects seems to be at least somewhat special. Think about the examples that I have given above. Those properties seem to have the power to produce some further state of or behaviour in the objects that possess them when certain conditions obtain. We commonly talk about glasses being disposed to break if they fall on the floor *because* they are fragile. We talk about sugar cubes being disposed to dissolve when immersed in some tea *because* they are soluble. We talk about soldiers being disposed to act bravely in a fight *because* they are brave. I think it is natural, in these contexts, to see each of fragility, solubility and bravery as properties. Moreover, because these properties seem to be ones that have the power to produce some further state or behaviour, they appear, intuitively, to be *powerful*.

Though a clean contrast isn't easy, these properties at least intuitively seem a little different to properties like 'sphericity'. This property - the property of being a sphere - seems a property that an object could instantiate. But, at least at a first pass, it is not wholly clear what *power* such a property would bring with it. Such a property seems (again, only at a first pass) to be one that is not powerful.³

³ I'll have more to say about this alleged distinction in section 5 of the current chapter.

The conditions in which these powerful properties would come to be manifested could be: a fall to a floor, an immersion in a cup of tea, being in a fight. And the further states produced by the combination of the dispositions and those circumstances are the breaking, the dissolution, and acting bravely. Given all this, it would seem natural enough to infer that dispositions are properties possessed by objects that make objects behave in certain ways when certain conditions are met (e.g. again, when a sugar cube that is soluble is put in a cup of tea, that sugar cube manifests its solubility).

I believe that is now clear why I said that these properties seem to be somehow powerful: they seem to have a “causal oomph/biff”⁴, something that makes them able to produce some real change in the world. Fragility is able to produce breakage, for example, provided we put it into particular circumstances. So, apparently, fragility is a power to change something in the world: it can bring about a different state in the world (breakage, in this case). Solubility manifests itself by producing dissolution (given certain circumstances), and so solubility is also a property that, when manifesting, produces some change in the world.

My next claim is as follows: these apparently powerful properties are possessed by all objects that inhabit the world. We describe and predict the behaviour of what surrounds us and we do so by talking about what these entities do and what they have the power to do. For instance, when performing an experiment in the laboratory using ethanol, a scientist should be very careful since she knows that under certain circumstances the ethanol can easily catch fire (it is flammable, in fact). The scientist

⁴ A causal “push”: something that is able to bring about other things.

then predicts the behaviour of a certain substances (ethanol, in this case) under certain circumstances (if heated to about 26° and being ignited, for example), and carefully avoids them. For another example, when a mechanic tries to fix a car, she makes sure that the batteries are charged, since batteries that (along with other components of the car) tend to start the motor.

It is, therefore, very easy to see that dispositional concepts are very “flexible”. The notion of a disposition is one that can be ascribed to very different kinds of things, as we have just seen. We commonly ascribe dispositions to people (bravery); to glasses (fragility); to substances in laboratories (flammability), to cars (startability⁵). And again, at least intuitively, these concepts seem to individuate genuine properties, properties that inhabit the world. Bravery; fragility; flammability; startability: all of these are putative properties that we seem to ascribe to bearers.

Keeping in mind the examples that I have given above, it’s worth noting that dispositions can be ascribed to both individual objects, as well as *kinds*:

1. Objects: Dispositions are ascribed to objects: e.g., a wineglass is fragile, a sugar cube is soluble, a particular rubber band is elastic.
2. Kinds (or substances): Dispositions are also ascribed to *types of thing*: for example sugar is soluble, and a certain chemical, mercury, for example, is volatile.

⁵ The Oxford Dictionaries defines “startability” as follows: “of an engine or motor vehicle: the degree to which it can be reliably started.”

All of these putative properties appear dispositional.

So, if it is true that dispositional concepts individuate properties of entities that inhabit the world, then dispositions seem to be widespread properties that we can ascribe to almost everything. In fact, as I briefly mentioned above, it is very tough to find an entity that does not instantiate a property with at least some dispositional aspect. And although fundamental particles are not among the items to which we attribute dispositions in ordinary everyday talk, the fundamental properties of physics, such as spin, charge and mass, appear to be dispositional.⁶ Charge, for instance, looks as if it might well be a disposition to repel or attract other charged particles. Thus, there is no reason to think that our everyday dispositional discourse lacks a home in our fundamental physics.⁷

To sum up, dispositional ascriptions are very common in everyday language. We intuitively and apparently unproblematically use them to describe and predict the behaviour of items around us. And if it is true that these ascriptions pick out real properties of things, then these properties seem to have some effect upon the world, since when some conditions obtain, they are able to produce further states, some change in the world. It then looks like we naturally suppose these dispositions to have a “causal oomph”, a “causal biff”, or a “force”.

⁶ Here I borrow from Mumford 2011: 1.

⁷ It's worth making this point since, on occasion, those who oppose metaphysical theorising that starts with our everyday use of language will claim that such language has no place in our best physics (Ladyman and Ross (2007) might be a good example here). Whilst I take no stand on the general methodology, I see no reason to think that similar remarks will apply to our dispositional language. It seems reasonably plausible to think that the properties of our fundamental physics *are* dispositional.

But things are not so easy and it will become clear that a criterion for establishing whether a property is a disposition or not, is needed.

In the next sections, I will look at one of the problems that dispositional ascriptions give rise to. Dispositions are intuitively possessed by all the objects in the world, but how can we say that this is really the case if these dispositions do not manifest themselves? These properties (fragility, bravery, solubility) have to manifest themselves in order to be “observed”. If they do not manifest these properties seems to be just occult and mysterious powers that objects possess. To this problem different philosophers have found different answers and have established different criteria of the dispositional. Some of them (Ryle 1949, Quine 1974) argued that dispositional ascriptions do not refer to real properties in the world, and have claimed that these ascriptions can be analysed in terms of conditionals (as we shall see in section 4). I will start by focusing on this “negative criteria” (I will explain why I call it “negative”) that leads us to eliminate dispositions from our ontology, and then move to more positive criteria that admit the existence of dispositions. I shall start with the apparent problem that ascribing dispositions gives rise to (i.e., do we refer to some occult power?).

3. A MYSTERIOUS ASPECT: A FIRST CHALLENGE TO DISPOSITIONS

Here is a tricky question: how can we say that a glass is fragile if we do not see *it* breaking, or that a sugar cube is soluble if we do not see *it* dissolving, or that a soldier is brave if we do not see her fighting? As we have seen in the previous section, we

may naturally be tempted to say that such objects as those just mentioned possess dispositional properties, even though these properties are not visible to us. I may not see a sugar cube dissolve, but nonetheless know perfectly well that it would, were it placed in water.

But this seems strange, at least to some (Goodman 1954, Quine 1974, for example). It seems that although we talk unproblematically about the dispositional properties of these objects, we are actually talking about some hidden and ethereal powers that they possess, as these powers are not visible when not manifested. After all, we cannot see the bravery of a soldier who is comfortably sitting on a sofa and thus not manifesting her bravery. It may seem that we are talking about some potential state in which the entities mentioned could possibly find themselves in, rather than real properties that they possess. But, still, although we do not see them breaking, we put precious China cups far from children's reach, because they can very easily break; we believe that all the sugar cubes in the box in front of us are soluble, even if we pick just one of them to make our tea become sweet, and we take it for granted that soldiers are brave even though they are not fighting right now. And so, again, although "invisible", these features seem to be somehow real.

To make this problem clearer, let me give an example that illustrates the difference between an apparently invisible property (a disposition) of an object and a visible (observable) one (a quality or categorical property). I cannot see fragility until a particular mug breaks, but I can always see its being cylindrical⁸. This second

⁸ This can be considered to be a disposition too, but for the sake of the current discussion, let's do what some philosophers would, and consider it to be a (non-dispositional) quality.

property of *being cylindrical* does not need manifest itself to be visible, as its fragility would. The fragility and the “cylindricity” seem then to be two different kinds of properties: one visible and then unproblematically ascribable to an entity, and the other a more mysterious property (if a property at all) that is invisible until it manifests. And this second invisible (or unobservable) property may never manifest (a glass may never break!) How can we then keep describing the glass as fragile? One more example: when we say that ‘the sugar cube is soluble’, it seems that we are ascribing to that sugar cube an “occult power”, because while we can see that it is opaque, we cannot see that it is soluble until we put it in our tea. But we may never put that sugar cube in our tea, and so its solubility may never manifest. How can we then keep describing it as soluble? Ascribing fragility to a glass or solubility to a sugar cube has to do only with its *possibly* shattering or dissolving in certain conditions and we cannot see *that*. We cannot see the *possibility* of a glass shattering or a sugar cube dissolving in certain conditions. Indeed, there is a fairly intuitive sense in which the glass isn’t *doing* anything. What, then: is this a powerless power? And how are we to make sense of this?

These are among the reasons why many philosophers have tried to dismiss (Ryle, Quine, among others) the existence of dispositions. Indeed, dispositions have been sometimes considered as ethereal properties that, to use Mumford’s words,

seem to lurk in a mysterious realm intermediate between potentiality and actuality. (1998: 4)

And here also Goodman, who outlines the problem of these seemingly invisible properties (1954: 40) as follows:

Besides the observable properties it exhibits and the actual processes it undergoes, a thing is full of threats and promises. The dispositions or capacities of a thing – its flexibility, its inflammability, its solubility – are no less important to us than its overt behaviour, but they strike us by comparison as rather ethereal. And so we moved to inquire whether we can bring them down to earth; whether, that is, we can explain disposition-terms without any reference to occult powers.

Be that as it may, many philosophers (Molnar 2003, Ellis 2001, Mumford 1998, for example) have tried to show, in different ways, that in spite of this apparent difficulty, these ‘invisible’ dispositions are real entities that inhabit the world (and that can be brought down to earth and made “legitimate and scientific”, as Mumford claims (1998)).

We are then left with a couple questions: do the predicates we use to describe or predict the behaviour of the objects around us denote real dispositional properties? And if these predicates denote real dispositions, are all properties dispositional or just some of them? If our answer to the first question is in the affirmative, then we may simply have to tolerate any lingering worries we have about these putative properties being ‘invisible’ or ‘ethereal’. In order to answer these questions, setting a “dispositional criterion” becomes necessary: a criterion that enables us to assess which predicates (if any) denote genuine dispositional properties.

The answers of philosophers to these questions have generated different theories of properties. To give you a flavour of the dispositional literature and to locate the view I will adopt in the rest of this thesis, I will briefly outline some of these different theories of properties in the following sections. Let's start with a "negative story". My overarching aim is to show that the negative story raises various difficulties (section 4), and that, for this reason, we should opt for a more positive one. The positive criteria commit us to the existence of dispositional properties.

4. A NEGATIVE DISPOSITIONAL CRITERION: THE CONDITIONAL ANALYSIS

In this section, I will describe a "dispositional criterion", and I describe it as "negative", since it eliminates dispositions from our ontology, by analysing disposition ascriptions in terms of conditional statements. Thus, on this view, the answer to the question 'do the predicates we use to describe or predict the behaviour of the objects around us denote real dispositional properties?' is 'no'.

Usually, those who do not admit dispositions in their ontologies are those who have empiricist intuitions. According to the traditional interpretation⁹, Hume, for example, believed that things do not possess any hidden powers. Rather, those "apparent" powers things seem to possess just represent the probability that those things may behave in a certain way. To give an example: if we say that a glass is fragile, we are not really saying that the glass instantiates a genuine property, that of fragility. Rather

⁹ I am aware that this description of Hume's position is disputed.

we are saying that there is a probability that that glass would break if stressed enough (and that we learn this from our previous experiences involving glasses and stress).

Philosophers who have this “Humean background” have usually attempted a conceptual analysis of dispositions, arguing that dispositions can be analysed in terms of conditionals (Ryle 1949, Lewis 1997, among others). On this view, dispositional properties are logical fictions, and what really exist are regularities between events.

To put it differently, according to these Humeans, to seemingly ascribe a disposition to an entity is not to ascribe a property to a thing; rather it is to say how that thing would likely behave in certain circumstances. So, saying that a glass is fragile is not to say that the glass instantiates the property of fragility, rather it is to say that if it fell on the floor, the glass would break. As is clear, these analyses start from the assumption that for any disposition we can identify its stimulus conditions and manifestations. In fact, as Choi and Fara claim:

(...) analyses of dispositions usually proceed on the assumption that, for any disposition, we can identify its stimulus conditions and manifestations. It is typically said that dispositions would exhibit their ‘characteristic manifestations’ under some ‘stimulus conditions’. (2016, section 1.1)

In what follows I will describe the simplest analysis of dispositions due to Ryle (1949), and show why it gives rise to some problems. I will also consider a more sophisticated analysis due to Lewis (1997), and show that this one too is problematic. Just as a reminder: the literature on this issue is wide, and it is not possible for me to

consider all the revised analyses of disposition ascriptions.¹⁰ Nonetheless, although the discussion of the dispositional analysis will not be exhaustive, at the end of this section it should become clear enough why all analyses suffer from the same kind of problems. (This will become even clearer when in chapter 3 I will introduce dispositional modality, a *sui generis* modality that makes impossible to reduce/eliminate dispositions.) Let's start with the first analysis of disposition ascriptions that is due to Ryle.

4.1 THE SIMPLE CONDITIONAL ANALYSIS

Ryle (1949) is the first who attempts an analysis of disposition ascriptions in terms of subjunctive conditional statements. Ryle is then followed by Goodman (1954) and Quine (1960, 1974). As I have mentioned in the previous section, the main idea, here, is that disposition ascriptions do not refer to the properties of an entity, but instead to the potential (or actual) behaviour of that entity (see Mumford 1998: 39). Dispositions as real properties are thus eliminated from the list of what exists.

In more detail, here's Quine (1974) idea: dispositional expressions are pre-scientific terms that are explained away with the progress of science. Dispositional terms are just "place-holders", to use Mumford's words (1998: 4): we use them when we are ignorant of the real physical properties (molecular structure, weight, shape etc.) of a thing. Each dispositional term just refers to "a physical state or mechanism." (1974:

¹⁰ The aim of this chapter is not to find the conclusive argument against all the rival theories of pandispositionalism, but rather to make a (*prima facie*) case for pandispositionalism and, also, to give a flavour of where to locate the theory of dispositions that the rest of the thesis will rely on.

10), and, at some point, science will uncover these mechanisms. In so doing, science will demystify disposition ascriptions, which on Quine's view are just inaccurate intensional idioms, and it will replace them with accurate scientific explanations. Discourse involving dispositional language will eventually be eliminated. Objects have a certain physical structure and that physical structure is responsible for the behaviour of that object. And, of course, the structure is there even though the disposition of that object to do something is not manifested. Disposition terms are used as 'promissory notes' that wait for advances of knowledge in science (cf. Mumford 1998: 62). An example: to say that something is soluble means to say that something has a suitable structure for dissolving. And if an entity's disposition is untested (not stimulated), we can truly say that it has that particular disposition because other entities with the same structure behave in a certain way.¹¹ Nonetheless, for the Quinean this talk of 'structure' is not talk of a genuine property that the object has. Rather, all that the disposition ascription commits us to is that: object O has structure S, and were such an object to be conjoined to its manifestation conditions, then it would manifest. But this is all that there is to a disposition ascription: structure and subjunctive conditionals.

With that basic Quinean idea in the background, let's now consider the conditional analysis of disposition ascriptions. The cursory note I gave just a moment ago is far from the full story. As I said at the beginning of the current section, Ryle suggests that disposition ascriptions have to be analysed in terms of subjunctive conditional statements, and when we ascribe a disposition to some entity we are just asserting the

¹¹ This is problematic because something may have the same structure of something that manifested that disposition and behave differently. (For further discussion, see Mumford 1998: 62).

truth of a subjunctive conditional. Contrary to “qualitative” ascriptions, to ascribe dispositions thus seems to merely predict possible behaviour of what possesses them. For example, when we say that a marble is spherical, we can actually see its shape (a quality), and we are apparently ascribing and referring to a real property of the marble. By contrast, when we say that the same marble may roll down if put on an inclined plane (and this is again a dispositional ascription), we are merely predicting the marble’s possible behaviour under certain circumstances: its power to roll down is invisible to us until the marble is put on an inclined plane. That being so, when it comes to talking about objects differing from one another with respect to their dispositions, it seems that we are talking about nothing more than a difference in what those objects would do in particular circumstances (so, about two related events rather than the properties of those objects).¹²

Ryle then argues that disposition ascriptions are “lawlike statements” and these are “variable” or “open”. This means that when we ascribe fragility to a glass, we are just saying that that glass would break if suitably dropped on the floor (and assuming that the floor is suitably firm, etc.). So, there are certain conditions that can “test” (to use Dummett’s words – 1978: 150) the disposition of an object, and the object reacts in a certain way.¹³ When some conditions are met, the item reacts in a certain way. This is our putative test for whether an object can correctly be ascribed a putative disposition.

¹² And this is the difference between categorical properties and dispositional properties on which I’ll focus in the next section.

¹³ All of these analyses start from the assumption that for any disposition we can identify its stimulus conditions and manifestations.

To use Ryle's (1949: 123) words:

To say that this lump of sugar is soluble is to say that it would dissolve, if submerged anywhere, at any time and in any parcel of water. To say that this sleeper knows French, is to say that if, for example, he is ever addressed in French, or shown any French newspaper, he responds pertinently in French, acts appropriately or translates it correctly into his own tongue.

Again, when we ascribe dispositions to objects, on this account we just refer to a possible (or actual) future behaviour of a certain entity, and not to a real property. The possible behaviour manifests when some conditions are met. To put it differently: there are events, such as breaking, dissolving, bending, that depend on other types of events, which are the "tests" (or stimuli), the circumstances in which the former events would happen (in this case, falling on the floor, immersing in water, stressing). More schematically, the idea is captured by the Simple Conditional Analysis (SCA):

$$\text{SCA: } \forall x(Dx \leftrightarrow (Sx \rightarrow Mx))$$

Where x is an entity, D is the disposition we ascribe to that entity, S are the stimuli/conditions/tests for the disposition, and M the appropriate manifestation(s) of that disposition. To give an example: if I say "the sugar cube (x) is soluble (D)", this just means that if placed in a liquid (S), it will dissolve (M). If a conditional like this is satisfied (if the disposition passes the test), then it is sufficient for the disposition ascription to be true. But note: SCA then exhausts the dispositional core of the property, D . There is nothing more to the property, D , than the satisfaction of SCA.

Although this analysis appears to be very intuitive, at least for those who have empiricist (and anti-realist) intuitions, for a range of reasons it is not a good one. In the following section I choose a few counterexamples¹⁴ that have a common core.

4.2 COUNTEREXAMPLES TO THE SIMPLE CONDITIONAL ANALYSIS

A first counterexample to the SCA is due to Martin (1994), who claims that the conditional analysis is problematic because there are cases where dispositions can be lost and gained, and the analysis cannot accommodate such cases. Martin's example of an electro-fink will help. The example relies on the following idea: an entity can have a disposition, then lose it, then gain it again without ever manifesting it. And this would make the conditional statement (and SCA) false. Here is Martin's example. We may make a disposition ascription such as "the wire is live" which could, supposedly, be analysed into some such conditional as "if the wire is touched by a conductor then electrical current flows from the wire to the conductor." But it could be the case that the wire is connected to an electro-fink, and this electro-fink (which is a device that) detects when the wire is about to be touched, and instantaneously renders the wire dead. So, the fink is an interferer that subtracts a disposition of the wire. The conditional "if the wire is touched by a conductor then electrical current flows from the wire to the conductor" would be false throughout the time when the wire was live.

¹⁴ Although there are more, see Mumford 1998, pp. 37-63.

The disposition is a ‘fink’ because it is lost when the conditions for its manifestation obtain.¹⁵

A second counterexample can be found in the works of Johnson (1992) and Bird (1998). They respectively talk about maskers and antidotes. For example, a glass protected by packing material would not break if shattered, even though it is fragile. The packing material would prevent the disposition (fragility) from manifesting, but it does not eliminate it. So, again, the conditional would be false.

Smith (1977), Prior, Pargetter and Jackson (1982), Lewis (1997), and Armstrong (1997) raise similar objections. They say that there could be an interfering factor in virtue of which the object *x* mimics the manifestation of a disposition without possessing it. This interfering factor makes an entity manifest a disposition that it does not have: it *mimicks* the manifestation. To use Choi and Fara’s outline of Lewis’ example (1997):

when a Styrofoam dish is struck, it makes a distinctive sound. The Hater of Styrofoam is within earshot of it. What if it were struck? The Hater of Styrofoam would hear the distinctive sound and tear the Styrofoam dish apart. It seems evident that the dish is not disposed to break when struck. If struck,

¹⁵ This device can also work on a reverse cycle: “(...) attaching to a naturally live wire but removing its property of being live if ever it is touched by a conductor. In this case, although the wire is disposed to conduct electricity when touched by a conductor, ‘the reverse-cycle’ fink ensures that the associated counterfactual conditional is false.” (Choi and Fara, 2016, section 1.2)

however, it would break due to the interference of the Hater of Styrofoam, which goes against SCA. (Choi and Fara, 2016, section 1.2)

In this case, the mimicker of the disposition (the disposition of break when struck) is the Hater of Styrofoam. To be clearer, in this case, it's not the striking that directly causes the breaking; it's due to the interference of the Hater of Styrofoam. Again, this raises problems for the SCA.

Fink dispositions, antidotes, maskers, and mimickers are all sort of *interferers* that render conditional statements, supposed to analyse disposition ascriptions, false.¹⁶ For this reason, SCA faces a difficulty. Given that the simple conditional analysis faces this apparently difficulty, some philosophers have attempted to defend a more sophisticated version of the analysis. In what follows, I will briefly outline one of these attempts and show that also revisited analyses suffer from problems similar to those of SCA.

¹⁶ There are other counterexamples to SCA that I do not mention here. See for example Mumford (1998) who makes a counterexample a disposition that has not yet been encountered and consequently may not even be conceived. Mumford makes the example of X-ray photography: in the time before its invention objects existed which were disposed to show up under such a test even though the test was not yet devised or even conceived. (1998: 56) The dispositions were there, though. "... it seems reasonable to assume that there are some dispositions of some things of which we are not aware because we have not yet discovered the way to get these dispositions to manifest (...) something can have a disposition for which we have no concept and hence we are incapable of forming a proposition that ascribes that disposition." (1998: 57)

4.3 A REVISED ANALYSIS

Since the simple conditional analysis is subject to a wide range of counterexamples, some philosophers have attempted to revise SCA, and develop a better and more sophisticated analysis of disposition ascriptions. One of the most popular is revised conditional analysis (RCA) due to Lewis (1997), but other versions have been offered by Prior (1985), Mellor (2000), and Fara (2005), among others. I cannot consider all the revised conditional analyses available in the literature. Rather, in this section I will just show that the sophisticated analysis put forward by Lewis is affected by similar problems to those that affect SCA.

The revised conditional analysis due to Lewis¹⁷ aims to circumvent the “finkishness problem”. Schematically:

$$\text{RCA: } \forall x(Dx \leftrightarrow ((Bx \ \& \ Sx) \rightarrow Mx))$$

Lewis adds a causal basis of the disposition (B). This is supposed to help because finks work by removing the basis of the disposition (as we can see in Martin’s counterexample in the previous section). This analysis specifies that B is a basis that remains from the time that the disposition is stimulated through to the time that the disposition manifests itself. Thus, on the revised analysis, the conditional would be satisfied and the disposition ascription would turn out to be true. By using Choi and Fara’s words, let me briefly explain this with reference to Martin’s example of the electro-fink:

¹⁷ Other revised analysis usually take the cue from Lewis’ one.

Martin's live wire connected to the reverse-cycle fink, for example, is correctly predicted to be live. For the wire has an intrinsic property – the property of having free electrons, say – such that, if it were touched by a conductor, *and if it were to retain that property* for a sufficient time, then the wire would conduct electricity (because of being touched and having the property. (Choi and Fara, 2016, section 1.4)

That being so, we have a solution to the problem of finkish dispositions.

Although this analysis solves the problem of finkish dispositions (which are subtractive interferers, so interferer that “take away” some powers of the object), it ultimately fails. It does not work against maskers/antidotes and mimickers. For example, think about the glass protected by the packing material that I have mentioned in the previous section. The basis of the disposition (fragility), that could be the molecular structure of the glass, remains when the glass falls on the floor (so when the conditions for the disposition to manifest occur). Nonetheless, the packing material (the masker) prevents the manifestation from occurring (by adding something. This is, in fact, is an additive interferer). Thus, even on the more sophisticated analysis, it's clear that there are going to be some very serious problems to be faced.

As I have said, there *are* other attempted analyses¹⁸; these more sophisticated analyses have been developed from the ones mentioned. For what it's worth, I do not think

¹⁸ See Prior (1985), Malzkorn (2000), Mellor (2000) Fara (2005), Manley and Wasserman (2008).

that there are counterexamples to all of the putative accounts.¹⁹ Nonetheless, working through these is not my aim here.²⁰ As I explained above, my ultimate concern will be that a conceptual analysis of disposition ascriptions does not help us to understand what dispositions are. Drawing on some of the ideas that we noted above (section 2), later in the dissertation (chapter 3, section 2), I will suggest that the lack of ‘oomph’ in the conditional analysis, combined with the fact that we should treat dispositional modality (that I will introduce in chapter 3, sections 5 and 6) as a *sui generis kind* of modality, means that no conditional analysis *can* succeed.

In the next section, I will describe another attempt to rule out dispositions from our ontology, though it is an attempt that pursues a very different strategy to try and reach that goal. As we shall see, it too suffers from problems and will eventually be dismissed.

5. THE DISPOSITIONAL-CATEGORICAL DISTINCTION

Let me start by recalling a distinction I have made, albeit only very roughly, in the previous sections. This is the much discussed distinction between categorical properties (qualities) and dispositional properties (powers). Such a distinction is often used to rule out dispositions from ontology (this is the aim of categorical monists), but, as it will become clear, these attempted uses of the distinction do not succeed.

¹⁹ For further discussion, see Mumford 1998 (pp. 36-63) and Mumford and Anjum 2011 (pp. 190-193).

²⁰ In a couple of chapters, it will become clear that there is another, more important reason why such analyses should be rejected. I am talking about the primitiveness of dispositional modality (chapter 3, sections 5 and 6).

As we have already seen, intuitively, it seems that when we ascribe sphericity to a marble we are ascribing a quality, a non-dispositional property of that marble. In contrast, when we ascribe the power to roll down an inclined plane, we are describing/predicting how an object may behave, and so *really* we are (seemingly) describing a possible event. Given this example, it is easy to see why most theories of properties rely on the distinction between two different types of properties: dispositional properties and categorical properties. A rough definition of both dispositional and categorical properties is the following:

Categorical properties are qualities of objects, while dispositional properties are their powers to do something under certain circumstances.²¹

Although this distinction between categorical and dispositional seems intuitively straightforward, it is not. Let's see why by considering an example due to Mumford (1998: 65). As before, there are cases where it *seems* very easy to distinguish the two types of property: 'fragile', 'magnetic', 'soluble' seem to be dispositional; while 'opaque', 'broken' or 'triangular' seem to be categorical. What the dispositional properties have in common is that when not manifested, these properties are invisible (unobservable). These just seem to be power to do something, but rather occult, ethereal. What the categorical properties have in common is that they are visible and then apparently real properties.

²¹ Cf. Heil, 2003: 85.

But now consider this property: “moltenness”. This is a property that can be ascribed to both rocks and metals. The moltenness of a rock or a piece of metal is visible (the rock or the metal is molten right now), but it also seems dispositional, because it says a lot about how these materials would behave under some circumstances (streaming down the side of a volcano, for example). For this reason, moltenness appears both categorical and dispositional, so the distinction is not so clear-cut. The same general point holds for colour concepts: colours cause sensations in the perceivers, but also seem to be like categorical properties in that they can be observed directly. Though these examples need not be taken to be fatal to the distinction, it is clear enough that they put some pressure on the intuitive distinction that we tried to draw above.

The way philosophers have dealt with this distinction and difficulties that arise from it has give rise to different theories of properties. In what follows, I will consider three different accounts: categorical monism, the view that all properties are categorical (qualities); dualism, the view that there are both categorical and dispositional properties; and the identity theory of properties, according to which categorical and dispositional properties are identical. I will show that these three views, for different reasons, should be dismissed and that a fourth view, pandispositionalism (section 6), is the best option on the table.

5.1 CATEGORICAL MONISM

Let’s start with categorical monism. This is the view that there is just one type of property: the categorical (qualitative) properties. On this view, properties are qualities and these qualities bestow their causal powers only contingently. This view is held,

among others, by Armstrong (1968, 1989). The main idea, common to all categorical monist accounts, is that all putative dispositional properties, can, in one way or another, be reduced to categorical properties, which are more fundamental than their putative dispositional brethren. To better explain what categorical monists hold, I will take Armstrong's account (that is a version of categorical monism) as an example.

Armstrong begins by distinguishing laws of nature from first-order properties. On his view, laws are second-order properties. Properties (first-order properties), which are categorical, bestow powers upon their bearers, but only because of the addition of the laws of nature. According to Armstrong (2004), *properties* are just qualities, so they do not have any power/disposition intrinsically; rather objects have powers only in virtue of the laws that govern their behaviour. This relation between properties (that are categorical, on this account) is external and contingent. And, on Armstrong's view, dispositions are not higher-level properties. Rather, powers are *given* to properties by laws of nature and it is contingent which powers categorical properties have. To use Heil's words:

Properties and laws might vary independently: the same qualitative properties combined with different laws yield different dispositionalities." (Heil, 2003: 120)

Roughly, to again use Heil's words, the view is the following:

An object is fragile in virtue of its possession of a qualitative property, F, in concert with some law of nature, L. L is contingent in the sense that F could

be present in a world lacking L. Thus it is contingent what powers, if any, F bestows on its possessors. (2003: 90)

This means that, for example, in the actual world a glass is fragile because it has certain structural (categorical) properties, which are “governed” by some laws of nature. But in a possible world where there are different laws of nature, the very same glass, with the very same structural properties, behaves in a different way (i.e. it is not fragile, but it is (perhaps) soluble). And this means that the same structural (categorical, qualitative) properties have different causal powers in different worlds. To put it differently, on this view, the causal roles of properties can vary.

So much for the view itself. Here is why I think that we should be minded to follow Mumford (2004) and reject it.

To start with, we should note that Armstrong’s view gives rise to a counterintuitive result.

The property of having a certain mass m_1 plays a causal role in that having m_1 determines some of the things an object can and cannot do. One of the things that could be done by such an object, in virtue of its mass m_1 , is to gravitationally attract another object with a certain force, as described by the inverse square law. But now let us make a counter-nomic supposition, permitted by the theory. The laws that govern the causal roles of massive things now differ. Assume, what Armstrong’s combinatorialism permits, that no laws other than those involving mass differ. The theory would seem to

allow that the value of m_1 might now bear no relation to the object's degree of gravitational attraction, and yet still be a value of mass. Or it might allow the attraction produced by mass m_1 was now produced by mass m_2 and vice versa, and yet m_1 is still m_1 (and m_2 is still m_2). (Mumford, 2004: 104)

This case illustrates the problem that categorical monists face. If the causal role of a property changed, would that be the same property? For example: if a glass changed its causal role of being fragile, and it is now soluble, that is a property that a sugar cube had, why the glass is not now a sugar cube but still a glass? On Mumford's view, the only answer to this question could be that the categorical property has a "quiddity" over and above the causal powers it has (where a quiddity is the essence of the property that is constituted just by its own nature (cf. Choi and Fara, 2016, section 3)). Let me remind you that laws on this view are contingent. It is then contingent how properties are related to one another (so, for example, being fragile is related to being broken, but being fragile could have been related to being dissolved). On the categorical monist view (plus laws), then, two properties may swap their causal roles and still be "the same properties that they were" (Mumford, 2004: 104) (I call this 'the contingency problem').

This seems absurd and shows why the categorical monist (plus laws) view is untenable.²² According to Mumford (2004: 104), this view makes properties passive and static: given that laws are contingent, properties' causal roles are not intrinsic to them. The argument against such view is not conclusive, but it definitely damages it.

²² See Mumford, 2004: 103-104 and 149-153.

But there is a further difficulty for categorical monism and is a further reason to reject it. As I have already said at the beginning of the current section, categorical monists argue that for each disposition there is a categorical base. There are properties at the subatomic level, though, that appear to be pure dispositions. If these properties are *pure* dispositions, they do not need a categorical basis.²³ And if *this* is true, then it would lead to dispositional realism (that is the view that dispositions are real entities in the world). Let's have a look at the argument that sustains this claim in the following section.

5.2 THE UNGROUNDED ARGUMENT

Aside from the alleged failure of conditional analyses, how can we motivate a belief in the existence of dispositional realism? The ungrounded argument (UA) is believed to be the ultimate argument between Humean and anti-Humean (see Ellis 2001, Mumford 2006). The UA (Mumford 2006) has been variously defended by Blackburn (1990), Molnar (1999, 2003, ch.8), and Ellis (2001, 114 and 2002, 74-5). The argument aims to demonstrate that dispositions are essentially dispositional (or, in other terms, that causal powers are essentially powerful). It supposedly demonstrates the existence of “ungrounded dispositional properties or causal powers.” (Mumford, 2006: 471) And this is an argument against what is called “universal or *global groundedness*; namely, that every dispositional property is grounded in some property other than itself.” (Mumford, 2006: 471)

²³ There are other objections to categorical monism. For example, as I mentioned at the beginning of section 5 (see the example), the notion of categorical properties is rather obscure. The distinction between the categorical and the dispositional is not so clear-cut as categorical monists seem to believe. For further discussion, see Mumford 1998, 2004.

Here's the argument:

1. There are subatomic particles that are simple;
2. That which is simple has no lower-level components or properties.
3. The properties of subatomic particles are all dispositional.
4. The grounds of a dispositional property can be found only among the lower-level components or properties of that of which it is a property.
5. Therefore, the dispositional properties of subatomic particles have no ground.
6. From which it follows by existential generalisation that, there exist some ungrounded dispositions.

Here's a defence of the premises of the argument.

Premise 1: this is a theoretical claim of physics (this, of course, may be false, but it is acceptable that at least some subatomic particles are structureless (they lack of a mereological structure) and that is all needed for UA (see Molnar 1999)). All that UA requires is that something simple instantiates properties.

Premise 2: this is a necessary truth. Mumford discusses two different kinds of "lower-level", but he then claims that this is irrelevant, because what "is simple has no lower-level, of whatever nature" (2006: 475).

Premise 3: this is supported, on Mumford's view, by physical theory (2006: 475). All the properties of subatomic particles (spin, charge and mass) appear to be

dispositional (this is argued also by Ellis 2002, and Martin 1993). Charge is the power to attract or repel, to produce electromagnetic field, for example. Mass is the power to generate a gravitational field. Spin is the power to of a particle “to contribute to the total angular momentum of a system” (Ellis, 2002: 47). All these properties seem to be causal powers that act in the world.

Premise 4: keeping in mind that something is ungrounded if and only if it is not grounded in anything other than itself, here the idea is that dispositions are not grounded in some base (a causal base for Prior, Pargetter and Jackson 1982, a categorical base for a Humean), where the base is the real cause of the manifestation of that disposition.

Mumford argues (1998: 116-117) that dispositions are powers, and so causally potent. If such dispositions had a base, then they would require some internal or lower level structure. But, as we saw above, the putative bearers of these properties are such that they lack any lower-level realisers and they lack any internal structure. That being the case, there is nowhere for us to locate the relevant base, and so the dispositions in question must be ungrounded.

From these premises we may then derive 5 and 6 that hold that the properties of subatomic particles have no grounds and that there are some ungrounded dispositions in reality.²⁴ And if there are real dispositions, this means that either some properties are dispositional and some other properties are categorical, or that all properties are

²⁴ There are other arguments that show that exist ungrounded dispositions (or pure powers). See, for example, Marmodoro 2010 (pp. 27-40).

dispositional. I will explore the first of these two options in the next section, showing that it is not a good one. I will then describe an account (the identity view of properties) that is halfway between dualism and dispositional monism (and that I will take to be a pandispositional view). Finally, I will introduce pandispositionalism: the account of properties that, as I have already said, the rest of this thesis will rely on.

5.3 DUALISM

If there *are* ungrounded dispositions, this means that these properties constitute a distinct and independent ontological category. Philosophers who accept their existence have developed different theories to account for them. If one accepts the existence of dispositional properties, then one must be either dualist (and defend the existence of both dispositional and categorical properties) or monist (and defend the claim that there are *only* dispositional properties). In the current section I will describe a dualist position and show why it is not a good option.

As I have said above, the intuition behind dualism is that dispositional and categorical properties are (ontologically) different from one another, and belong to two different ontological categories (cf. Mumford 1998: 64-65). In this section, I will treat dualism as the view that properties are either categorical or dispositional (*never both*) and I will describe a dualist account (I take as an example a functionalist view due to Jackson, Prior and Pargetter (1982)) in order to then explain why I think that dualism should be rejected.

The most common variant of this dualist view is the one that holds that dispositional properties have categorical bases. On this view, dispositional properties are seen as

functional properties that are “multiply realizable”. For instance, sugar and salt have different microstructural properties, but both are water-soluble. In this case, the microstructural properties are categorical, while the higher-order property “being water soluble” is dispositional and can be realized by different microstructural properties, its realizers (again, salt and sugar have different microstructural *categorical* properties). Also, the connection between categorical and dispositional properties, on this account, is contingent. There is a possible world where the microstructural properties of sugar are not water-soluble. In Heil’s words:

Perhaps, then, an object’s being water soluble is a matter of its possessing some categorical property coupled with certain laws of nature. If these laws are contingent, it is not surprising that the dispositionalities bestowed on objects by their possession of particular categorical properties are contingent. (...) Were the laws different, the very same properties would bestow (indirectly) different powers on their possessors, or even no powers at all. (2003: 86-87)

This is a type of dualism that has been defended by Jackson, Prior and Pargetter (1982) and treats dispositional properties as functional properties. Dispositions are neither reducible nor identified with categorical ones (cf. Heil, 2003: 88). Dispositions are grounded/realized by their qualitative bases. For example, many objects are fragile: my grandma’s China cup, the screen of my laptop and the mug on my desk; all of these objects have different “lower-level” structural (categorical) properties, but they all have the “higher-level” property of being fragile, which cannot be reduced to the various “lower-level” ones.

This view has glitches. First of all, it is hard to see what role there is for dispositional properties in causal relations (problem of causal relevance: “a problem that has plagued functionalist accounts of mind” (Heil, 2003: 88)). The concern is that higher-level properties, on this view, would be causally inert.²⁵ We can easily see this intuition by considering the following example:

If the vase should shatter, however, this is not, strictly speaking, because it is fragile, but because it possesses a certain lower-level qualitative property. Why not dispense with the higher-level dispositional property altogether? This would leave us with a qualitative property the possession of which would *itself* amount to the possession of a power. Now, however, we are back to a conception of properties as powers! (Heil 2003: 89)

Jackson (1997: 202), himself a dualist, claims it is “a curious and ontologically extravagant kind of overdetermination”, that “every causally operative qualitative property is accompanied by an epiphenomenal dispositional property.” (Heil, 2003: 89)

Mumford agrees that there is a problem of causal efficacy and the possible overdetermination of effects. “If a physical theory provides a complete causal explanation of events in terms solely of categorical properties, then the causal efficacy of dispositions on the same events can be allowed only at the cost of the overdetermination of those events.” (Mumford, 1998: 20) On these grounds, dualism can then be rejected.

²⁵For further discussion, see Heil 2003: 88-89.

But we should also keep in mind what I have mentioned at the beginning of section 5: the distinction between categorical and dispositional properties is not very clear, and this also makes dualism a rather obscure view. This unclarity is an additional concern for dualism. In order to be a dualist we must say which properties are dispositional and which are categorical. However, there is no clear and obvious way to tell, in all cases, which properties are dispositional and which are categorical (e.g., “molteness” is a property that is neither completely categorical nor completely dispositional). That being the case, it’s going to be an uphill struggle to maintain the dualist position.

That will suffice to reject dualism. I will now consider a third and more peculiar view: Martin and Heil’s identity theory. As will become clear, on Heil’s view (2003, 2012), this is *not* a dualist view since dispositions and qualities are considered to be identical to each other.

6. IDENTITY THEORY OF PROPERTIES

The third view I want to look at is Martin and Heil’s. This view is based on what Heil calls a “surprising identity” (2003: 111). Heil (following Martin, 1997) defends an identity theory (IT) of properties, and it consists in the following:

IT: If P is an intrinsic property of a concrete object, P is simultaneously dispositional and qualitative; P ’s dispositionality and qualitativity are not aspects or properties of P ; P ’s dispositionality P_d , is P ’s qualitativity, P_q , and each of these is P : $P_d=P_q=P$. (2003: 111)

This means that when we consider the properties of a certain object we can consider them both as categorical properties (or qualities) *and* as dispositional properties (or powers). Either way, Heil believes, we are considering the very same property in two different ways, and not two different types of property.²⁶ This is not dualism: here we have just one property that “functions” both as a disposition and as a quality.

So, on Heil’s view, every property of a concrete spatiotemporal object is both dispositional *and* qualitative. The whiteness and the sweetness of a cupcake are both (categorical) qualities *and* powers. For example, “being white and being sweet are powers of the cupcake to affect us in particular ways. The mistake (...) would be to conclude from this that whiteness and sweetness are *mere* powers.” (Heil, 2003: 113) And, talking about an electron mass, he adds: “(...) the quality associated with the mass of an electron is strictly identical with the power associated with that mass. Neither is ‘reducible to’ nor grounds the other.” (Heil, 2003: 115) Without analysing it in more depth, the reason why Heil thinks all properties are “simultaneously” qualitative and dispositional is that

a pure quality, a property lacking in dispositionality, would be undetectable and would, in one obvious sense, make no difference to its possessor. (2003: 118)²⁷

²⁶ Cf. Heil, 2003: 124.

²⁷ “There are no purely qualitative properties; there are no pure powers.” (Heil, 2003: 124) For further discussion, see Heil 2003.

His identity theory relies on the idea that we cannot have a variation in the powers of an object without having a variation in its qualities, and vice versa. Here is an example to demonstrate the *prima facie* plausibility of such a view. Consider a marble, its shape is spherical. On Heil's view, if the shape of the marble (that seems to be just a categorical property, a quality) changes, it also changes its power to roll down on an inclined plane. If the marble became a cube, then it would lose its power to roll down an inclined plane. In the same way, if the marble's power to roll down an inclined plane were altered, then also its shape would be altered. For this reason, on Heil's view, qualities and powers are identical.

Heil is also keen to add what, according to him, is an important remark. He does not defend a view according to which the dispositional and the categorical are two different aspects of the same property, or where the disposition is a higher order property. Rather, he defends the thesis that the categorical and the dispositional are identical: it's the very same property considered in two different ways.²⁸ Also, at least according to Heil, this is the most straightforward and simplest account on the table.

Note, first, that it solves the problem of overdetermination, since we are talking of just one property (which is a quality *and* a causal power, and it would be the only property involved in a causal relation), rather than two distinct ones.

A further point is that on this account, powers are not conceived as relations between entities, rather "(...) the identity theory (...) builds powers into properties." (Heil, 2003: 120) A comparison with Armstrong may help to understand this claim, here.

²⁸ Cf. Heil, 2003: 112-117.

Contrary to Armstrong, who is Humean in this respect, since he regards powers as contingent (remember that the fact that a property makes a particular contribution to the dispositions of its possessors is a contingent matter), Heil sees the connection between categorical and dispositional as necessary:

Balls *could* fail to roll, sugar *could* fail to dissolve, matches *could* fail to light, not because powers are contingent, but because the manifestation of a power can be affected, often dramatically, by the presence or absence of other powers. (Heil, 2003: 93)

Here's an example on the difference between the two conceptions. In a Humean framework (where laws of nature are contingent, so where properties bestow their powers only contingently), the very same fragile glass falling on the floor and breaking could fail to do so in the very same circumstances. If laws of nature had been different, then the glass' property could have produced different behaviour in the very same glass. While in a dispositionalist framework, the glass may fail to break because there is an interference while falling (someone may put a cushion on the floor, for example), but it is never the case that fragility may produce different behaviours of the glass (and this is dispositional essentialism).

I believe that Heil's view is very close to the view that I will present in the next section. I won't resist Heil's view nor I will further argue for it, since I think it is identical to pandispositionalism (all properties are dispositional).²⁹

²⁹ If all properties are both categorical and dispositional, then all properties are causally powerful. I believe the identity view can be taken as a pandispositional view of properties.

7. PANDISPOSITIONALISM

Let's now turn our attention to pandispositionalism (or dispositional monism³⁰). What pandispositionalism amounts to is that all properties are powers. In Heil's words:

The material world is wholly made up of what (...) Harré and Madden were to describe as 'an interacting system of powerful particulars (1975: 7) ... The world is viewed as a network of powers rather than as a system of self-contained interacting substances (...) A dynamic conception of reality replaces the static seventeenth- and eighteenth-century conception of inert substances propelled by external forces. (Heil, 2003: 97-98)

Pandispositionalism is, thus, a realist theory of natural properties according to which all natural properties are dispositions (or causal powers). It is a realist view, because contrary to nominalism³¹, it defends the existence of dispositional properties in our ontology. This means that properties are real entities in the world and they do not depend on our mind and language (we aren't analysing away what it is to be a disposition via some clever story about subjunctive conditionals). Pandispositionalism is a view about natural properties, so about those properties possessed by concrete things, rather than by abstract entities. Natural properties, it may be said, are those properties of entities studied in the empirical sciences.³²

Pandispositionalism is, then the union of two claims:

³⁰ There are people who distinguish the two terms (Tugby 2010), I won't adopt this distinction.

³¹ Roughly, the view of properties contrary to realism, according to which properties are not real.

³² Cf. Mumford 2004, Mumford and Anjum 2011, Tugby 2010.

1. Dispositions (or causal powers) are real and irreducible³³ features of the world.
2. All natural properties are irreducibly dispositional.

The nature and identity of these dispositional properties is determined by the causal potential that they bestow on the entities that instantiate them. The nature and identity of fragility, for example, is its capacity to produce breakage (this is, in fact, the causal potential that it bestows to a glass, for example).

On this view, not only are powers essentially powerful, but all (natural) properties are powers: this is pandispositionalism.

A further principle that is at the heart of pandispositionalism is the Eleatic principle³⁴. It is a test that only *real existing* entities pass. Armstrong states this principles in the following way:

[E]verything that exists makes a difference to the causal powers of something.
(1997:41)

³³ That is to say that dispositions are essentially powerful/powerful in nature.

³⁴ From Plato's *Sophyst*. Here, the Eleatic stranger suggests that causal power is the mark of the real (or of being). (Plato, 1935, 247d–e). It has also been called “Alexander’s Dictum” by Kim (1993: 202).

This principle claim that something is real only if it can make a difference in the world, or in other words, something is real only if it is causally powerful (or, at least, this is the dispositionalists' interpretation of it).³⁵

Variations of this view are held by a number of philosophers: Mumford (2004), Bird (2007) and Tugby (2013). On their view, the identity of dispositional properties is given by the causal potential that properties bestow to their bearers and that they have necessarily.

Contrary to Armstrong's view, for example, that qualities have certain powers only contingently (so in a possible world the same quality may have different causal powers), pandispositionalism holds that the identity of a property is (of necessity) given by its causal efficacy (again, this is dispositional essentialism); so, what the property disposes its bearer *to do*. This means that there does not exist a possible world where a property makes its possessor behave differently. This means that given the right conditions, the same property will always produce the same behaviour in its possessor. For example, given the right conditions (the right amount of oxygen, the right amount of water, etc.) a soluble sugar cube will always dissolve (unless there is some interfering factor). On this view, properties do not need to be "empowered" by some higher-order relation (as in Armstrong's account); rather, they are "internally

³⁵ I am aware that this principle is controversial. Different arguments have been given to support this test (not only by dispositionalists). See, for example, Armstrong (1978), Ellis (1990: 22), Field (1989: 68), Hacking (1983). Others have engaged with arguments against it. See, for example, Colyvan (1998), Oddie (1982). Others, most of dispositionalist, have taken it as an assumption within their theories (Heil 2012; Molnar 2003; Mumford 2004; Mumford and Anjum 2011). Here I won't engage with a discussion regarding its validity. I will assume it as most dispositionalists do.

powerful”. This suggests that part of the identity of the property is given by its manifestation, which in turn is a disposition for a new manifestation (which, of course, is itself a dispositional property). This leads to a “picture of the world in which all properties are interrelated, generating a huge holistic web.” (Mumford, 2004: 182). For example, *fragility* is directed towards *breakage* that is directed towards *cutting flesh* that is directed towards *bleeding* that is directed towards some other property, that in turn is directed towards some other property, etc.

This view faces objections, which, in the literature, have already been responded to. The main problem is what Molnar calls the “always packing, never travelling” objection (2003: 173-181). This is an objection endorsed by Armstrong (1997); Lowe (2006: 138) also complains about this. The worry is that it seems that a power’s identity can never be fixed in a world of pure powers. This is a kind of regress objection: there is a chain of properties that is never blocked by a categorical one, since on this view categorical properties do not exist. Each disposition, when it manifests itself, becomes a disposition for something else (fragility disposes to breaking that disposes to cutting flesh, that disposes to bleeding that disposes to ... etc.) So, the main complaint is that “it seems a journey from potency to act” that never gets actually realized, because each manifestation is in turn a disposition. Here’s what Armstrong says about this regress:

Given a purely Dispositionalist account of properties, particulars would seem to be always re-packing their bags as they change their properties, yet never taking a journey from potency to act. For ‘act’, on this view, is no more than a different potency. (1997: 80)

This objection has been addressed by Mumford who says that this problem is based on categoricalist intuitions and so such arguments are question begging. The objections it starts from the assumption that powers are only potential and become real when they manifest themselves. But, as Mumford argues (2004: 174), if a power becomes real only when it manifests itself, then it is not a power any more. Being a power, though, is not being a potential, rather being a power is to be *potent* (fragility is an actual property even if it never manifests). And, in order to be potent, something has to be actual. So, the travelling (manifesting, or “passing around”, to use language that will become clearer in the first part of chapter 3) of powers is accepted by the pandispositionalist, but that is a travelling (manifesting) of actual entities (an not mere potentialities).

Also, according to a (pan)dispositionalist, in order to be real, something has to be powerful (for the Eleatic test of reality), have to power to produce some change in the world, to affect other entities that inhabit the world. And powers do, of course, pass this test, while categorical properties are “by definition intrinsically impotent” (Mumford, 2004: 175). In fact, Mumford claims:

The very thesis of dispositional monism is that pure potencies are actual. Substantial existences, rather than “mere potentialities” (...) The Armstrong-world” in which all properties are categorical, is animated only by the addition of laws. Without laws, nothing happens because properties are only extrinsically powerful.” (2004: 174-5)

To conclude, on the pandispositionalist's view, dispositions are real and actual also when they do not manifest. If the China cup is fragile, it is fragile even though it will never manifest this property. Why do we care about ancient objects and protect them? Because they are *really/actually* fragile.

In the next chapter we will have a closer look at the ontology and metaphysics of dispositions. There I will argue that pandispositionalism, although very appealing, needs to face a problem: apparently, there is no viable metaphysics of properties (Aristotelianism, Platonism and tropism) for a pandispositional theory. This is the first issue that I individuate and pose to pandispositionalists.

8. CONCLUSIONS

In this chapter I have made a case for pandispositionalism: I explained why we should be realist about properties and that pandispositionalism (or dispositional monism) seems to be the best option among theories of properties. I have argued that we should be realists about dispositions because both a conditional analysis of dispositions and the defence of categorical monism face problems that make these approaches unattractive. The conditional analysis of dispositions fails because it cannot completely account for the complexity of dispositions. Categorical monism fails because it generates odd scenarios (categorical properties are causally impotent and become (contingently) potent only when some laws are added. In a different world where there are different laws, the *very same* categorical properties have different causal powers.) For this reason, it is clear that we should accept the existence of real dispositions in the world. I have also explored Mumford's Ungrounded Argument that

aims to demonstrate the existence of ungrounded dispositions (or pure powers). I have suggested that the argument is convincing.

After having rejected the conditional analysis of dispositions and categorical monism, and showed that there are dispositions in reality (via the UA), I have considered a further view of properties: dualism. There are problems for the view (such as overdetermination and the unclear distinction between categorical and dispositional properties) that make it unacceptable. I then described a view which is (apparently) halfway between dualism and dispositional monism. The identity theory of properties holds that each property is both categorical and dispositional, we can refer to the very same properties both in a dispositional or in a categorical way. I believe this to be just a version of dispositional monism. I then presented pandispositionalism as the last and best option on the table. Pandispositionalism does not face either the problem of overdetermination that affects dualism about properties (section 5.3) or the problem of “contingency” that affects categorical monism (section 5.1). The reason why pandispositionalism overcome these two problems is because: first, dispositional properties *are* the only existing properties and these properties *are* causal powers (so only these properties are responsible for the causal behaviour of their bearers). Second, dispositional properties are essentially causally powerful, so their causal role is essential to the nature and identity of properties (it is their causal role that makes them the properties they are).

Finally, I think that by describing the theories of properties above mentioned, I have given the reader an idea of where to locate pandispositionalism within the literature of properties.

**DISPOSITIONS:
ONTOLOGY AND METAPHYSICS**

Chapter Overview

In this chapter I:

- *Focus on the ontology of dispositions, concluding that for a dispositionalist only natural properties exist (section 2 and section 3).*
- *Focus on the metaphysics of dispositions by considering two objections that Tugby moves against the Aristotelian and the tropist conception of dispositional properties (section 5 and section 6.1 and 6.2).*
- *Consider Platonic Dispositionalism (defended by Tugby) (6.3), raise two objections against it (section 7) and consider possible replies (sections 8 and 9).*
- *Conclude that dispositionalism needs to find an answer to such objections to be a viable metaphysics for dispositional properties (section 11).*

1. INTRODUCTION TO THE CHAPTER

In the previous chapter I argued that there are some grounds for thinking that pandispositionalism is the most attractive theory of properties (although I don't suggest that these grounds are conclusive). In this chapter I raise a difficulty for this otherwise attractive theory: apparently, there is no suitable metaphysics of properties

for pandispositionalism. All the candidates seem to be vulnerable to objections. From here on out, unless I make it explicitly clear, when I speak of a ‘dispositional theory of properties’, or similar, I mean our now-to-be-preferred pandispositionalism.

This chapter is divided into two main parts. The first part is about the ontology of dispositions, and it is intended to persuade the reader to agree that the only properties that exist are the natural sparse ones (sections 2 and 3). The second part is about the metaphysics³⁶: here, partly following Tugby (2013), I raise the difficulty mentioned above (sections from 3 to 9) that there is no viable metaphysics of properties for a powers ontology. The conclusion will be aporetic: although I won’t answer it, the objection that I raise against pandispositionalism needs an answer (section 10).

I. ONTOLOGY

This first part of the chapter aims to answer the following question: which predicates denote properties? And the aim of this first part of the chapter is to show that, given dispositionalism, the only existing properties are the natural (sparse) ones. I will try to convince the reader of this by showing how, in the dispositional literature, philosophers (such as Ellis 2001, Molnar 2003, Heil 2003 and 2012, Tugby 2013,

³⁶ Even though I am aware that there are people who treat ontology as a branch of metaphysics and people that treat ontology as prior to metaphysics (see, for example, Varzi 2011), here, I will follow Quine (1948), and I will distinguish ontology from metaphysics. On Quine’s view, ontology aims to answer the question of what entities exist (its aim is to make a complete list of all the existing entities in the world), while metaphysics is interested in what those entities are (their “ultimate nature”). See Varzi 2011, for further discussion.

Bird 2016) have usually adopted this sparse view – both defending it (Heil 2003, 2012, Bird 2016) and taking it for granted by considering it the natural way to go for a dispositionalist account (Tugby 2013).

2. TWO REMINDERS AND ONE REMARK

Given the scope of the current chapter, it is important to keep in mind two claims I have defended in the previous chapter. First, I am realist about properties. I take realism to be ‘mind-independence’³⁷: to be a realist about x means to believe that x exists independently of mind. To use Heil’s words:

You are a realist about a given domain – material objects, say, or numbers, or minds – if you regard that domain as mind independent: the domain is what it is quite independently of how we take it to be. (2003: 11)

We now have good reason for thinking that dispositional properties are entities existing in the world. I have argued for this by rejecting the conditional analysis of disposition ascriptions (an analysis that aims to reduce (and eliminate) dispositional properties by analysing disposition ascriptions with conditional statements (chapter 1, section 4), and by presenting and supporting Mumford’s Ungrounded Argument (an argument that aims to demonstrate that there are real and ungrounded dispositions in nature) (chapter 1, section 5.2).

³⁷ I am aware that this is not the only sense. For a discussion on realism, see Miller 2014.

Second, I have argued that all properties are dispositional in nature, and thus that all properties are causally powerful and irreducibly so (pandispositionalism). I supported this position by rejecting two rival views. I rejected categorical monism (chapter 1, section 5.1) that is a view according to which all properties are categorical (qualities); and I rejected dualism (chapter 1, section 5.3): the view that there are both dispositional and categorical properties.

I argued that Platonic Dispositionalism could solve the problems that afflicted both views. To put it simply, at this point we have good reasons to think that there are real properties in the world and that all these existing properties are dispositional in nature.

Before starting with my arguments in favour of a sparse ontology of dispositions, a remark about the terminology I use: predicates are language dependent things. That is, predicates are linguistic expressions that we use to describe the world. To be more precise, let me quote Armstrong, who defines predication as:

“Given a sentence having the form “*Fa*”, and given that the thing *a* actually exists, we can say that “*F*” is predicated of *a*.” (1978: 2)

In accord with this, what is predicated is a predicate. And a predicate “*F*” applies to *a* only if “*Fa*” is a true proposition $\langle p \rangle$. So, for example, suppose that “*F*” is the predicate “being fragile” and *a* is my mug, then “*Fa*” (“my mug is fragile”) expresses

a true proposition; thus we can say that the predicate “being fragile” *applies to my mug*.³⁸ In so doing, we leave upon whether what is predicated is itself a property.

3. WHAT ARE WE QUANTIFYING OVER?

Having said what predicates are, and following Heil (2012, chapter 1), I wish to stress the importance of, “distinguish[ing] metaphysics from philosophy of language. Talk about talk about the universe is not talk about the universe.” (Heil, 2012: 3) I say this because, as I said at the beginning of this section, my aim is to show which predicates denote dispositional properties, and in order to understand that, we cannot simply read our commitments off our language. Thinking that *all* predicates individuate real properties in the world, at least on the view I am adopting, is the wrong way to go.

Let me show why by considering the following examples: my mug is fragile, the screen of my laptop is fragile, the ancient Greek vase exhibited at the British Museum is fragile, the glass of a window is fragile. I could keep on listing fragile objects, since the predicate ‘fragile’ seems to apply to a huge number of very different things. Again, we are talking about the very *same* predicate that applies to a huge number of *very different* things. On first inspection it seems that the predicate ‘fragile’ truly applies to all these different objects because it individuates a property that all of them instantiate: fragility - the very same property, common to a lot of very different objects. Or, at least, our language leads us to think this: there is but one property common to many objects. But, again, this is misleading. For, on a closer look, the way my laptop’s screen is fragile seems to be different from the way my grandma’s China

³⁸ For further discussion, see Armstrong 1978: 1-9.

cup is fragile. We say they are both fragile, but actually they are made of different materials. If we threw the same stone at each of them, with the same force, they would both break, but they would do so in different ways: my laptop screen would break into very tiny pieces, while the mug would not. This situation seems to suggest that the fragility-predicate fails to correspond to a unique physical property, and applies instead to a range of different properties. Often, philosophers misled by our language, have explained this by returning to the thesis of multiple-realizability (a view that I described in chapter 1, section 5.3): different structures (the structure of the vase is definitely different from the structure of my laptop's screen) with lower level (presumably physical) properties realize the same higher-level property; fragility, in this case. In Heil's words:

We expect to find a property corresponding to every predicate we take to apply literally and truly to the world. If no physical property fills the bill, we posit a tailor-made higher-level property. This is a property somehow dependent on, but distinct from, lower-level 'realizing' properties. (Heil, 2003: 7)

On this view, then, one should say that "fragility" is a higher-level property that somehow "emerges" from a bunch of lower-level properties.

We discover that most of the predicates we routinely use to describe the world fail to line up with distinct basic-level physical properties or collections of these. We conclude that the predicates in question must designate higher-level properties. Now we have arrived at a hierarchical conception of the world, one

founded on the inspiration that there are levels of reality. Higher levels depend upon, but are not reducible to, lower levels. (Heil, 2003: 7)

But the idea that there are different levels of reality is, plausibly, just a reflection of the way we talk about the world. The conception of reality as constituted by different levels leads to problems.³⁹ To mention just one of them (that I also described in chapter 1, section 5.3): higher-level properties would be causally inert, since the causal work is done by lower-level (structural) properties; and thus we would have an odd case of overdetermination.⁴⁰

There is a second option, though. We could treat predicates as our ways of describing the world, but not as “ontologically” reflecting it. An example: we could say that fragility is not a property; rather, “fragility” is just a predicate we use to describe the behaviour of a bunch of “fundamental properties”, and that this predicate (truly) applies to different objects because they behave *similarly enough*. In this last case, the fundamental (natural) properties do all the work (causal or otherwise) that needs to be done.

I chose this option: I believe that only fundamental natural properties or, to say it with Lewis’ words, only “sparse properties” exist. This is a move that (ideally) requires further defence, but it is also a move that dispositionalists take almost

³⁹ See Heil, 2003 chapter 4. But also Varzi 2013.

⁴⁰ For further discussion, see chapter 1, section 5.3. Also, this is not the only problem that “level-reality” would give rise to. Heil discusses this at length in his 2003 and 2012.

unproblematically. Here I will have to do the same. I will follow Bird, who is a dispositionalist and who says:

(...) we need to be clear what we are talking about when we use the term 'property'. We are liable (...) to use the term liberally, so that (almost) any predicate defines a property: 'the property being such that o' is a property for any predicate o. Yet we do not think that every property in this sense is an entity, a component of our ontology of properties.

So our discussion should be limited to properties in a more heavyweight sense of 'property' that does have ontological implications. Some use the terminology of 'sparse' properties to indicate this, but those who do so typically think of the sparse properties as the natural properties, those that would be mentioned in a correct complete science. (...) Powers theorists take themselves to be advocating a novel ontology of properties. If a theorist were to tell us that there are powers but they are predicatory properties, then the theory would lose much of its interest. In particular, it would not be a theory that makes a striking contrast to, for example, Humean ontologies. Predicatory properties come cheap and a Humean can happily accept them without inconsistency. (2016: 344-345)

Sparse properties are those properties that Lewis defines as follows:

The sparse properties (...) Sharing of them makes for qualitative similarity, they carve at the joints, they are intrinsic, they are highly specific, the sets of

their instances are *ipso facto* not entirely miscellaneous, there are only just enough of them to characterise things completely and without redundancy.

Physics has its short list of ‘fundamental physical properties’: the charges and masses of particles, also their so-called ‘spins’ and ‘colours’ and ‘flavours’, and maybe a few more that have yet to be discovered.

(...) So we may as well say that the sparse properties are just some – a very small minority – (...). We need no other entities (...). When a property belongs to the small minority, I call it a *natural* property. (1986: 60)

And to use Molnar’s words:

(...) one should adopt what David Lewis aptly calls a *sparse theory* of properties: what properties there are is not determined by what predicates apply to objects, but on a posteriori grounds, most likely by current best science. (Molnar, 2003: 27)

We can truly say that objects are some way or another, but this does not mean that with our speech about the world, about objects we pick out/designate/identify real entities. Along with Heil, I believe that:

Truthmakers – *truthmakers* – for judgements about billiard balls and their colours and shapes are particular arrangements of the fundamental substances. (2012: 4)

So, for example, we can truly say that both my mug and the vase exhibited at the British Museum are fragile, and we can truly say that both the sea and the sky are blue; but both the fragility of the vase and the mug are due to fundamental properties at work and the bluenesses are just the results of an arrangement of fundamental natural properties. Therefore, the mug and the vase, and the sky and the sea do not share common properties designated by the respective predicates.

In short, a bunch of fundamental properties make true several claims about the world; and not every predicate designates a property. Using Ellis's words:

(...) In the view that is being advocated here, not every grammatical predication is the attribution of a natural property, even if the resulting sentence is true. (Ellis, 2001: 93)

To reiterate, this is just to say that, for example, even if we can truly say that this paper is white, this does not mean that 'being white' (whiteness) individuates a real entity (a property, in this case) in the world. And all this can be further emphasized with a few dispositionalist's words:

There is an important distinction between properties and predicates that needs to be emphasized. Properties are universals of some sort, and so exist independently of language. Predicates are linguistic entities that may sometimes be used to attribute properties to things. There are properties that have no name – for example, because they have yet to be discovered – and there are predicates that truly apply to things, but do not name properties. (...)

Genuine properties are (...) things that exist independently of language and independently of human knowledge. Predicates, on the other hand, are parts of sentences. They are embedded in languages, and would not exist if the languages in which they are predicates did not exist. (Ellis, 2001: 89)

We should not think that our (linguistic) representations of reality perfectly correspond to it. We cannot find out what properties are by focusing on the way we talk about the world. As Molnar claims:

Word-making is not world-making. (2003: 28)⁴¹

Before turning to the next section, I want to make clear that, although I believe in the existence of natural properties only, for the sake of simplicity I have used and will continue using “macroscopic” properties in my examples; nothing of philosophical significance will turn on this choice of example. Let’s now consider some metaphysical issues.

II. METAPHYSICS

⁴¹ But there is something more I would like to add (although it won’t be developed further). If properties are causal powers, and the “causal powers related to the fragility” of my mug are, even if slightly, different from the causal powers of the vase (because of made by different material, for instance) – how can one and the same predicate designate one and the same property? If properties are causal powers and the causal powers of different objects are different, this means that these are different properties?

Having said which properties exist (the natural ones), there is another issue to deal with. What kind of entities are properties? Are they abstract or particular? This second part of the chapter will address these questions. I will argue that there is no viable metaphysics for dispositional properties: Aristotelianism, tropism and Platonism all fail to satisfy key principles defended by dispositionalists.

4. PARTICULARS AND UNIVERSALS

To the question “what kind of entities are properties?” there are, at least, two different potential answers. One of them is that properties are particulars; the other is that they are universals. Particulars occupy a spatiotemporal location⁴² and they differ from one another, but are similar in some respect. To illustrate with an example: the brownness of the chair I am sitting on is a particular, and the brownness of the one on the other side of the table is another particular; they occupy two distinct spatiotemporal locations, so they are numerically distinct; nonetheless they are very similar to one another. On this view, the properties in question are tropes.

On the other hand, we have universals which are repeatable entities; the same universal can be instantiated in different places at the same time. Again, in the case of our two brown chairs: the brownness of the first chair is (literally) the same as the brownness of the second; the two chairs share one and the same property.

⁴² I recognize the limitation of this claim: it is controversial as a claim about *all* particulars. Notoriously, some substance dualists think that individual souls (for example) are particulars, but have no spatial location.

There are various reasons why one should choose universalism⁴³. For example, Armstrong has defended it with extended arguments: “the gist of these arguments is that universals promise a significant explanatory pay-off.” (Heil, 2003: 137)

According to him:

1. If properties are universals, we have a solution to the one over many problem: objects can share common elements. They could be the same at least in one respect. (The whiteness instantiated by this page is the same as the whiteness instantiated by next page. Two different pages share the same property: the universal whiteness.)
2. If properties are universals, it’s easy to explain why objects are similar. Similarity is grounded in strict identity. (Why is this page very similar to the next one? Because they instantiate the very same universal: the whiteness of this page is identical to the whiteness of the next one.)
3. Strict identity enables us to give an answer to Hume’s scepticism: why should we expect that similar things behave similarly? (Being the same property make their bearers to behave similarly. This is why this page and the next one reflect light in a very similar way: they share the very same property.)

Although these reasons are very attractive, we must ask: are we ready to accept in our ontology entities of this kind? It is difficult to accept entities that exist outside space-time (in the Platonic version of universalism), or entities “wholly present” in more than one place at different times (in the Aristotelian version of universalism).⁴⁴

⁴³ Here I say “universalism” because these are aspects that both Aristotelianism and Platonism share.

⁴⁴ The difference between the two will become clear in the next few sections.

Dispositionalists usually adopt either an Aristotelian view or a trope view of properties; very few of them hold or claim that also a Platonic view of properties is compatible with dispositionalism. To mention a few examples: Ellis (2001) and Mumford (2004), Lowe (2006), think that properties are immanent universals, and hold the Aristotelian view; Heil (2003, 2012), Whittle (2008) and Molnar (2003) think properties are tropes; Tugby (2013), something of an outlier, believes that a Platonic view of properties is needed within a powers ontology.

In the next sections (5, 6) I briefly present the different views of properties that dispositionalists adopt and see how they fit with the powers ontology. I will argue that Platonism, Aristotelianism and tropism are all at odds with a powers ontology. At present, I am not able to find an answer to this objection, but I believe that pandispositionalism needs to answer it. As a reminder, this chapter raises a first issue for dispositionalism.

5. PLATONISM AND PLATONIC DISPOSITIONALISM

Platonists hold that universals exist independently from their instances: universals themselves have no spatio-temporal location at all, and exist outside space and time. They are instantiated by concrete objects; these ‘instantiations’ are instances of universals. For example, the apple is both spherical and red, since it instantiates the universal redness and the universal sphericity, which are both properties that are distinct from their instances. In addition to being instantiated by the apple, both

Platonic universals exist ‘outside’ space and time. And these instances “participate” (usually the term that Platonists use) in the corresponding Platonic universal.

An example of Platonic Dispositionalism is the version developed and defended by Tugby (2013). In his recent article on Platonic Dispositionalism (2013), Tugby claims that the two views of properties usually adopted by dispositional theorists, the trope view and the Aristotelian view, are inconsistent with what he identifies as the “central platitude” (CP) and the “intrinsicness platitude” (IP) (2013: 454), two platitudes common to all dispositional theories. Tugby then develops a particular account of dispositionalism: he articulates and defends a Platonic or transcendent view of properties, one that accommodates both CP and IP.

In section 7 I argue that, although Tugby’s account accommodates both the platitudes just mentioned, it, too, is at odds with a dispositional ontology, since it fails to accommodate two other fundamental platitudes that I describe: the “temporal asymmetry platitude” (TAP) and the “powerful platitude” (PP). This second part of the chapter therefore has two aims. The first aim is to show that Platonic Dispositionalism fails. The second aim (that in part follows from this) is to show that, given Tugby’s wider arguments against the trope view and the Aristotelian view, it seems that *no* extant (realist) view of properties is compatible with dispositionalism. Let us now turn our attention to Tugby’s arguments.

Although dispositionalism comes in slightly different forms⁴⁵, all dispositional theories share common features (which are needed if one wants to adopt a “dispositional view” of reality). I follow Tugby in focusing on these features. Let us make two assumptions.

First assumption: dispositions (or causal powers) are those properties characterized by the causal behaviour of the particulars that possess them, and are irreducibly so. As their name suggests, these properties dispose towards further properties: their manifestations. In addition, dispositions are intrinsic to their possessors and real, even when unmanifested: these two claims are respectively identified by Tugby (2013: 454) as the “intrinsicness platitude” (IP) and “central platitude” (CP).

IP: Many disposition instantiations are intrinsic to their possessors.

CP: A particular can have a disposition even if it never manifests that disposition.

Tugby claims “as with most platitudes, not much argument, if any, is needed to see that this claim is plausible.” (2013: 456) For example, a sugar cube is soluble even if it will never manifest its disposition to dissolve. Also, this property of solubility is intrinsic to it. The fact that the sugar cube is soluble does not depend on any

⁴⁵ There are mixed views, according to which there are both dispositional properties and categorical ones (see, for example, Ellis 2002 and Molnar 2003); dispositional monism that holds that all properties are dispositional (see Bird 2007 and Mumford 2004); there are also identity theories, according to which categorical and dispositional properties are one and the same type of property (see Martin 1993 and Heil 2003). I have discussed these varieties in chapter 1.

circumstances ‘external’ to the sugar cube and its properties. And, although the notion of “intrinsicness” is controversial⁴⁶, Tugby says that “For our purposes, however, the following rough definition will suffice to capture the main intuition about intrinsicness.”⁴⁷ (2013: 465) As I have already said, according to Tugby these platitudes are common to all dispositional theories, and failing to accommodate them is decisive against a dispositional theory. This is our first assumption.

Second assumption: the nature and identity of dispositions are, at least in part, determined by their manifestations (Tugby 2013: 457). A disposition *is* that particular disposition *because it is directed towards* a particular manifestation. As Tugby writes “(...) irreducibly dispositional properties are by their very nature oriented towards certain causal manifestations.” (2013: 452). And Tugby seems quite right that this position is widely held. To use Molnar’s words: “(...) having a direction to a particular manifestation is constitutive of the power property.” (2003: 60) For example, the vase exhibited at the British Museum instantiates the disposition of being fragile and fragility is a tending towards breakage, “ (...) a power of an object to break” (Marmor, 2010: 31). This means that a viable account of the “directedness” of dispositions towards their manifestations is necessary for a dispositional theory.

6. TUGBY’S OBJECTIONS AND HIS ACCOUNT

⁴⁶ See Langton and Lewis 1998, and Denby 2006.

⁴⁷ Tugby defines intrinsicness as follows: “P is an intrinsic property of *x* if and only if *x*’s having P is independent of the existence of distinct particulars and *x*’s relation to them”. (2013: 465)

Dispositionalists are usually either Aristotelian or tropist about properties. Aristotelians (e.g., Mumford 2004 and Ellis 2001) claim that properties are immanent universals in space and time. These universals are strictly tied to their spatiotemporal instantiations. The same property can be instantiated in different locations at the same time: properties are where their instances are and all instances of a certain universal are instances of the very same property. Tropists (e.g., Molnar 2003, Whittle 2008, Heil 2003) hold that every property instance is a particular. Properties cannot exist apart from the objects that instantiate them. Tugby thinks that both views fail as neither satisfies both CP and IP.⁴⁸

In what follows, I briefly sketch the two objections that Tugby raises against the trope view and the Aristotelian view of dispositional properties, and show how the two views fail to satisfy the two platitudes that, according to Tugby, only a Platonic view of properties can satisfy.

6.1 OBJECTION TO TROPE ACCOUNTS

Dispositions are “directed properties”: they tend towards their manifestations. An obvious way to account for this directedness is to appeal to some sort of asymmetric

⁴⁸ Tugby claims that a couple of dispositionalists, Fales (1990: 215-219) and Bird (2007: 205) have “tentatively argued that the transcendent view of universals brings certain benefits which the immanent views does not. However, the main argument they appeal to is not conclusive (...), and so they do not place a great deal of emphasis on the Platonic aspect of their views. For example, in his discussion of Platonism, Bird says that 'such a view is not mandatory on my account' (Bird, 2007: 205). At another point in his book, Bird concedes even more, arguing that it 'is perfectly coherent to take an Aristotelian view of potencies' (2007: 55).” (2013: 453) For further discussion, see Tugby 2013, p. 463. Tugby is then the only real defender and developer of Platonic Dispositionalism.

relation between the disposition and its manifestation (a “manifestation relation” (Tugby, 2013: 457)) that grounds the nature and the identity of dispositions. This is fatal (at least according to Tugby) to a dispositional trope theory. When the trope manifestation never comes about, the trope disposition does not relate *to* anything. If it does not relate *to* anything, then we cannot ground the nature and identity of the disposition *in* the manifestation or manifestation relation. For example, the Greek vase exhibited at the British Museum instantiates the dispositional trope of fragility, but this disposition will likely remain unmanifested, because the vase is protected. The fragility of the vase, on this view, is a particular (a trope), and if it does not manifest itself, it is not directed towards another property (the manifestation, that would be another particular, another trope) that should determine (at least in part) the nature and identity of the disposition of fragility. Of course, the nature and identity of the fragility of the vase cannot be determined by something that does not exist. As Tugby puts it, this would render “the identity of the dispositions indeterminate” (Tugby, 2013: 457).

We can generalize. Relations (typically) hold (at least) between two entities, and if the manifestation of a certain disposition never comes about, the trope theorist would be left with just one *relatum*: the disposition itself. Dispositions are directed towards specific types of manifestations. Those manifestations *determine* (at least in part) the identity of the dispositions; and if tropism is true and a particular disposition does not manifest itself, its identity would be indeterminate (2013: 457). Thus, Dispositional Tropism does not accommodate CP. And since CP is platitudinous for a dispositionalist, so Dispositional Tropism is to be rejected.

What we learn from this is that in order to satisfy CP we must find some way of grounding the identity and nature of a disposition and that, at least according to Tugby's argument, CP is such that the trope theory is unable to provide us with the necessary resources.

6.2 OBJECTION TO ARISTOTELIANISM

The problem that affects tropism about dispositions does not affect Aristotelianism. In fact, even though a particular disposition does not manifest itself, there are plenty of other instances of the manifestation of that disposition. For instance, the fragility of the vase mentioned above will probably never manifest, but this is not a problem in an Aristotelian picture, given that fragility (a universal multiply instantiated) is directed towards a *universal* manifestation (breakage, for example) and that there will be plenty of instances of breakage in the world. A different problem affects the Aristotelian view of dispositions.

In illustrating this, two points are important. First, roughly, dispositionalists think that many disposition instantiations are intrinsic to their possessors. Second, immanent universal theories of dispositions account for directedness in terms of genuine relations between universals at the second-order (Tugby 2013). To use an example: the nature of the property of fragility will, on the universalist's view, be determined by the property's directedness towards breakage (a universal). The universal corresponding to breakage is widely instantiated in our world. There are no problems for the Aristotelian, as we have seen, in dealing with the problem from 6.1. The nature and identity of dispositions is grounded in genuine relations between universals at the second-order level.

Tugby claims, however, that this rules out the possibility of a particular instantiating a disposition that is wholly intrinsic to it and that this leads to an unacceptable rejection of the IP. To see this, suppose first that the circumstances external to the ancient Greek vase exhibited at the British Museum had been different and, as a matter of contingent fact, nothing in the world has ever broken and nothing ever will. This would mean that the universal corresponding to breakage does not exist; it has no spatiotemporal instantiation. Thus there would not be any second-order manifestation universal towards which the disposition universal of fragility could tend. Remember, though, that the nature and identity of a disposition is grounded in those genuine relations between universals at the second-order. Absent that second-order manifestation, the disposition (purportedly of fragility) lacks a nature and identity for it is not grounded. Thus, the ancient Greek vase cannot be said to be fragile. Tugby says that (2013: 457), at best, the vase's fragility would have an "indeterminate" identity. So, the property of fragility cannot be intrinsically instantiated by the vase. Aristotelianism, then, does not accommodate IP.

6.3 PLATONIC DISPOSITIONALISM

I concede to Tugby that both tropism and Aristotelianism fail to satisfy respectively CP and IP, and that these two views of properties should not be adopted in a dispositional ontology. Now to his positive story. Tugby develops and defends a Platonic dispositional theory, one that, on his view, satisfies both CP and IP.⁴⁹ He says (2013: 455):

⁴⁹Again, Tugby is the only one who really defends a Platonic theory of dispositions.

On the specific version of Platonism to be proposed, dispositional properties are taken to be transcendent universals which are internally related at the second-order level to further manifestation properties.

According to the Platonist, property instances are instantiations of transcendent universals that are independent of the spatiotemporal realm. Dispositional directedness, on this view, is “secured regardless of the contingent circumstances that possessors of those dispositions find themselves in.” (Tugby, 2013: 467) The nature and identity of a disposition is grounded in second-order relations between transcendent universals. Tugby claims that the disposition/manifestation distinction is not ontologically relevant, since it “merely reflects whether we are thinking about a property in terms of its forward-looking or backward-looking causal features.” (2013: 474) This clarification helps us to see how, on Tugby’s view, dispositional properties are linked to each other in a transcendent “holistic metaphysical scheme” (2013: 474) - they form an internally connected web in which the identity of each disposition is determined by its position within the overall structure.

Crucially for what follows, Tugby claims that the identity and nature of a disposition is grounded in a second-order transcendent relation. This means that this transcendent relation is somehow prior to the instantiated properties. In fact, he writes: “ (...) the nature and identity of fragility is secured by the second-order relations between universals which transcend the spatiotemporal realm.” (2013: 468) It is this thesis that I propose to reject.

Noteworthy for our purposes is the following thought: “(...) these manifestations must be transcendent entities”. Also, since Tugby believes in the existence of alien properties (2013), properties that exist in the Platonic realm and that have never been instantiated, it is easy to see that at least some properties exist *only* transcendentally. This means that, on Tugby’s view, dispositions do not need to be instantiated in order to exist.

7. TWO WORRIES

Although Tugby’s theory accommodates the two platitudes of dispositionalism *he has identified* (CP and IP), it fails to satisfy other key platitudes of dispositionalism – what I call the “temporal asymmetry platitude” (TAP) and the “powerful platitude” (PP). We can find both, widely held, in the literature. As a reminder, my first aim is not to give an argument against Platonism in general. Rather my aim is to show why Platonism is at odds with dispositionalism. My second aim is to show that, since tropism and Aristotelianism fail, it seems that we are left with no viable metaphysics of powers.

7.1 THE TEMPORAL ASYMMETRY PLATITUDE

To reiterate, a disposition is a property that tends towards a further property, its manifestation (e.g. the property of being fragile disposes/tends towards the property of being broken), according to the pandispositionalist account of properties, and each manifestation is in turn a disposition that tends towards further properties (e.g., the

property of being fragile tends towards the property of being broken, which in turn tends towards the property of cutting flesh).

A quick recapitulation:

1. Tugby claims that “the disposition/manifestation distinction has no deep ontological significance, and merely reflects whether we are thinking about a property in terms of its forward-looking or backward-looking causal features” (2013: 474).
2. Tugby claims that the identity and the nature of these dispositional properties are grounded in genuine relations between dispositions and their manifestations, which hold in a transcendent realm (2013: 475).
3. Since dispositional properties exist even if not manifested, Tugby claims that this realm is outside space-time (they are found in a transcendent/Platonic realm).

Consider now the following situation: the glass that is on my desk is fragile. I have to write a paper and I don't feel inspired. I get frustrated and hit the glass which falls on the floor and shatters. I decide to remove the broken glass and it cuts my finger. So, the glass is fragile at t_1 , broken at t_2 and it cuts my finger at t_3 . Suppose that the nature and identity of these properties (being fragile, being broken, cutting flesh) are grounded in genuine relations that hold in the Platonic realm. Keep in mind that the property of being fragile tends towards the property of being broken, which in turn

tends towards the property of cutting flesh, and that it cannot be the other way round – it is never the case that being broken tends towards being fragile, or that cutting flesh tends towards being broken. The relation between being fragile and being broken is asymmetric. It also seems that the property being broken comes always after the property of being fragile, and the property of cutting flesh always follows the property of being broken – it is temporally asymmetric. Being broken and cutting flesh have to be “future directed properties”. So, it seems that the nature of dispositional properties needs to include some sort of temporal directionality, and that it is part of the nature and identity of a disposition. We can sum up these claims in what I call the Temporal Asymmetry Platitude (TAP), which (I claim, though will not demonstrate) is true of all standardly discussed dispositions:

(TAP) Dispositions tend towards *future* manifestations.⁵⁰

Here is a quick sketch of my argument. TAP states that all discussed dispositions are dispositions for *future* states. This is a temporal asymmetry. This temporal asymmetry is built into the identity and nature of dispositions (like fragility). In Tugby’s transcendent realm, however, this temporal asymmetry cannot exist. *Abstracta* exist, if at all, outside spacetime. Temporality is a feature of the *instantiated* world, and so can’t be applied to the *Platonic* world; an intrinsically asymmetric temporal relation cannot exist in an atemporal world (and, recall, IP establishes that dispositions are intrinsic to their bearers). Thus, Dispositional Platonism fails to preserve TAP and so

⁵⁰ Although in different terms and in a different context, this a principle that also Vetter (2015: 186-194, 290-299) seems to defend.

should be rejected. To get to the heart of the concern, let us proceed by considering some potential replies.

A Platonist may say that my argument makes a category mistake. The Platonic realm isn't causal or temporal, but it somehow *explains/ensures/etc.* that the concrete world *is* (causal and) temporal. After all, says the Platonist, there is a rich history of accounting for the nature of the concrete realm by appeal to the nature of this transcendent abstract realm. What can I say in response?

One way to bring out my concern is to compare fragility – what I will call a ‘future directed property’ with a *merely possible* property – pastgility. This is the disposition to be such that if struck at one time, then the object instantiating pastgility will be disposed to *have broken* at an earlier time. Clearly, pastgility (again, which I only take to be merely possible) is nearly identical to fragility, to the extent that the only difference between fragility and pastgility is their temporal orientation. Thus we learn that it's a part of what it is to *be* the property of fragility, that the property in question be future oriented. This, and only this, differentiates pastgility from fragility. That being the case, the nature and identity of the disposition of fragility are temporally asymmetric and forward directed in time.

An atemporal (transcendent) property will lack *all* temporal characteristics (e.g. an atemporal God exists neither before, during or after time). And so it seems right to say that the (merely) Platonic disposition (as opposed to the instantiated disposition) of fragility will lack any temporal characteristics. But, as we have just seen, it seems to be built into the nature and identity of the instantiated property of fragility that it is

temporal (asymmetric and future directed). In that case, it does not seem that the Platonic disposition can ground the nature and identity of its instances. Schematically, then:

1. Dispositional properties have a temporal orientation.
2. In order to have a temporal orientation, a property has to be instantiated in a spatiotemporal realm.
3. The transcendent realm is atemporal.
4. Dispositional properties cannot exist in the atemporal realm.

Since 4 is incompatible with Platonism, Tugby's argument fails.

7.2 DISPOSITIONS: CAUSALLY POWERFUL PROPERTIES

As already said above (section 7.1), and as Tugby claims too (2013: 452), dispositions are often called 'causal powers'. Indeed, dispositions are causal powers that make their bearers behave in a certain way. And, on all dispositionalists' views, these properties are real and irreducible (see, among others, Bird 2007, Ellis 2001, Heil 2003, Molnar 2003, Mumford 2004).

My second worry concerns the non-causality of Tugby's Platonic web of properties and the fact that:

(PP) Dispositions are causally powerful properties.

As we have already seen (chapter 1, sections 6 and 7, and chapter 2 section 5), this platitude is non-negotiable. However, according to Tugby, the nature and identity of a particular's disposition is grounded in a genuine relation between two Platonic universals. Again, the nature and identity of the fragility of the Greek vase exhibited at the British Museum (which, we assume, will never break) is grounded in the relation between the abstract universal fragility and its manifestation, the abstract universal breakage.

Now, a particular's disposition is causally powerful; it actually disposes towards the manifestation of that disposition. This means that fragility disposes towards breakage, because *fragility* is a causally powerful property. Platonic universals, though, are abstract entities; and abstract entities, by definition, are not causally powerful. We can then see that:

5. The nature and identity of *a disposition* is grounded in a relation between Platonic Universals.
6. Platonic universals are abstract entities.
7. Abstract entities are not causally powerful.
8. The nature and identity of a disposition, that *is* causally powerful, cannot be grounded in a relation between entities that are not causally powerful.

Once again, then, we see that the nature and identity of instances of Platonic dispositions cannot be grounded in their purely abstract counterparts. Tugby's theory then fails to accommodate PP, that along with TAP is another key platitude of

dispositionalism. This means that Platonism, as well as Aristotelianism and tropism, is not a suitable option for power ontologists.

8. INTERIM CONCLUSIONS

In short I've argued that: dispositional properties are essentially causally powerful and essentially temporal; anything transcendent is neither causally powerful nor temporal. Therefore, dispositional properties cannot be transcendent entities.

I do not expect a Platonist to agree. I suspect that their primary response will be to draw parallels with other kinds of properties and argue that there is no unique problem here. After all, Platonists are well used to facing down concerns around the fact that the transcendent world is abstract. Granted, perhaps such arguments don't take place against the backdrop of dispositionalism, but it's hard to see (or so they may say) why they might not just carry across what they say about categorical properties, and apply that. Fill in the details given by your preferred Platonist, here.

But this objection misses the point. Tugby would have us *ground* the nature and identity of the Platonic dispositions. Non-dispositional theories need not make any claims about grounding the identity and nature of the properties that they posit. That being so, there is still a case to answer.

To make this point more forcefully, compare my arguments against Tugby with an argument that we might run against someone who prefers categorical properties to

their dispositional brethren. Here is a quick summary of my two arguments against Tugby, given above.

9. A dispositional property *p* is essentially both temporal and causal.
10. Platonic/transcendent properties are not temporal and not causal.
11. Thus, there cannot be dispositional, transcendent properties.

Now note that the argument doesn't carry over to categorical properties. Look at what happens if we try to reconstruct the previous argument by replacing dispositional with categorical properties.

12. A categorical property *p* is essentially both temporal and causal.
13. Platonic properties are not temporal and not causal.
14. Thus, there cannot be categorical, transcendent properties.

(12) is false. I see no reason to think that a categorical property *is* essentially both temporal and causal. Could an object have mass at a world that lacked time and causation? I see no reason why not. Could the property of redness exist, uninstantiated, without there being time or causation? Again, if the property is a *categorical* universal, I see no in-principle reason to think this problematic. Categorical properties are properties that, as Ellis (2001: 45) says, “characterize things independently of their dispositions to behaviour”. Without acting, behaving, these properties do no need to have any causal or temporal aspect. As I have suggested, suppose roundness is a categorical property: in order to be round (manifest

its roundness) a marble does not need either to be in time or undergo some causal process (or produce some change in the world).

A Platonic categorical property need only retain its nature, even though that nature will (presumably) be without any effect in an atemporal and acausal world. As a consequence, there is no reason to think that a categorical property might not exist in a transcendent realm. That being so, the argument doesn't go through against the categorialist and so there is no reason to expect categorialist strategies to help us here. This is a problem that the categorialist has simply never had to face.

This is in stark contrast to dispositional properties. The atemporal and acausal instance of the property must be sufficient to ground the identity of an essentially temporal and causal property. The atemporal and acausal entity can only do that by *being* a temporal and causal entity. In that case, an intrinsically temporal and causal entity must exist in the atemporal and acausal realm. As I've already said - and as Tubgy himself says - what it is to *be* a property is to *be* a disposition. And to *be* a disposition *is* to be directed towards some future or past state, and to be *causally* directed towards that state. It is thus essential to the dispositional property being the very thing that it is, that it be so-oriented in time.

Now, if transcendent dispositional properties are causally efficacious in the transcendent realm, then Tubgy must say that relations between properties in the Platonic realm are causal. That seems false. If anything is supposed to hold of the Platonic realm, acausality is. On these grounds, Platonism about dispositions should be rejected. Let's see how a Platonist could reply.

9. A REPLY

Here is a concern. Says my interlocutor: my argument rests on an equivocation, both of '(a)temporal' and of 'causally powerful'. Platonic universals are atemporal: they are not themselves situated in time. Nonetheless, they may well be 'temporal' in the sense that they require certain temporal features of their bearers. So, for instance, if there is a Platonic universal relation of 'being later than', then that relation will be temporal in the second sense (any pair of objects or events that instantiates the relation must be situated in time in a particular way); but it is not therefore temporal in the sense that the universal itself must be situated in time. Likewise, Platonic universals are not causally powerful, presumably, in the sense that they are relata of causal relations; but they may well be 'powerful' in the sense that they require their bearers to stand in certain causal relations. If there is a Platonic universal relation of 'causing', then that relation requires that its relata stand in a causal relation. But, again: the universal itself is not causal in the sense of being a cause or part of a cause.

I think that this reply fails. To see why, consider 'pastgility' once again. An instance of pastgility is not identical to an instance of fragility: each is intrinsically such as to have a different temporal orientation. In that case, the Platonic universal pastgility cannot be identical to the Platonic universal fragility. So far, so good.

As Tugby has matters, though, the identity of dispositions is fixed by universals that exist in a Platonic realm. The only difference between the two dispositions (pastgility and fragility) *is* their *temporal* orientation. These two universals must be non-

identical. However, we said, above, that the only difference between them concerned their temporal orientation. If this difference in identity and nature is to be grounded in the Platonic realm, then there must be some features present in the Platonic realm that serve to ground that difference in identity and nature. Which features? A mere asymmetry won't do the job. *Both* relations are intrinsically asymmetric. Merely (tenselessly) being a disposition *for* some state won't do the job: both pastgility and fragility are a disposition for some particular state. Thus, as before, there must be some difference in nature and identity between the respective relations. What candidates do we have? The only obvious difference between the two is a difference in temporal orientation.

So, it isn't merely the case that pastgility and fragility are 'temporal' in the sense that they require certain temporal features of their bearers. Their nature and identity seem to include some sort of temporality: in order to be the very things that they are they seem to require temporal features to be present - it is essential to them. Absent a temporal structure (either extrinsic or intrinsic to the disposition), it is hard to see that a disposition can have a temporal orientation at all. Assuming (as is the norm in cases involving Platonic universals) that these properties are atemporal, then pastgility and fragility cannot be Platonic universals.

Indeed, it rather seems as if this kind of problem ought to generalise to any dispositional intrinsic property. As Tugby (2013: 468) has things, "the nature and identity of fragility is secured by the second-order relations between universals which transcend the spatiotemporal realm". Thus, the *identity* of a disposition, D, is secured simply by relations between universals which transcend the spatiotemporal realm.

Any temporally asymmetric disposition has an actual or possible counterpart that is temporally asymmetric in the opposite orientation, D—. The *only* difference between D and D— consists in their temporal orientation. A property cannot have a temporal orientation absent a temporal structure (in exactly the same way, my compass can't be oriented due north in the absence of the relevant magnetic field). So it is that a temporally asymmetric disposition cannot exist in an atemporal world.

Once again, the Platonist may object that my argument purports to show too much—that, if successful, *all* Platonist theories (be they dispositional or no) are false. But, again, not so. As the categorialist has matters, what it is to *be* a particular property is to have some kind of categorical nature; a nature independent of any manifestation, and independent of any relation between the property and its manifestation. For Tugby, though, matters are otherwise. According to his Dispositional Platonism, the very identity and nature of a dispositional property is fixed and secured by the relation between property and manifestation. Seemingly, the only way in which we can then secure a difference between properties like fragility and pastgility is via their temporal orientation in an instance of the property manifesting, and for an intrinsically temporally asymmetric property, that requires time; fragility requires that the manifestation is *later than* the mere instantiation of the disposition, vice versa for pastgility. Since the abstract realm is not temporal, Tugby's position fails. Either that, or Tugby should tell us what it is that grounds the difference in nature and identity between pastgility and fragility.

10. LEWIS AND TUGBY ON ABSTRACTNESS

One way to try to fix Tugby's problem would be to consider different understandings of *abstractness* in order to make sense of what Tugby means by *universals*. That is, if we can locate some sense for what it is to be a Platonic disposition that renders them abstract, but somehow *unproblematically* abstract, then perhaps that would solve the problem. I explore this option by working through Lewis' analysis of abstract entities, and show that none of these helps.

Although the distinction between abstract entities and concrete entities seems to be uncontroversial, according to Lewis this distinction is not clear at all. He claims that usually philosophers draw the distinction between the two "fundamentally different kinds of entities" (1986: 82) in one of the four following ways:

1. Way of Example: "concrete entities are things like donkeys and puddles and protons and stars, whereas abstract entities are things like numbers." (Lewis, 1986: 82) According to Lewis, this is controversial – first, because it is controversial what numbers are; but even if there was an account of what numbers are, there would be too many ways in which they differed from donkeys and puddles etc.

Let's suppose that Tugby's universals are abstract entities like numbers. Numbers are acausal and atemporal, so this way would not solve Tugby's problem.

2. Way of Conflation: the distinction between concrete and abstract entities is just the distinction between individuals and sets or between particulars and universals.

Universals, on this view, are essentially atemporal. This way does not provide a solution and Tugby would be left with the same problem.

3. Negative Way: according to most philosophers, abstract entities are unlocated, but Lewis argues that some sets and abstract entities turn out to be located. A set is where its members are: the set of the kettle and the mug is partly where the kettle is and partly where the mug is. As for universals, if they are wholly present in of many located particulars, then the universal is where its instances are. This means that both set and universal can be “multilocated” rather than unlocated.

Not all of Tugby’s universals are instantiated; in fact he posits the existence of Platonic universals seeking to solve the problem of alien properties (those properties that are not instantiated in the spatiotemporal world) by making use of that very fact.⁵¹

⁵¹ Tugby tries to fix the Alien paradox by appealing to Platonism (Tugby 2015). Here is how Tugby formalises the paradox (2015: 30-31):

- 1) It is true that instantiations of alien properties are metaphysically possible (Possibility Principle).
- 2) Truths about what is metaphysically possible have truthmakers (Truthmaker Principle).
- 3) Truthmakers determine their corresponding truths (Determination Principle).
- 4) All truthmakers exist (Existence Principle).
- 5) Everything that exists is actual (Actualist Principle).

But about this kind of universal Lewis says: “Maybe a *pure* set, or an uninstantiated universal, has no location. However these are the most dispensable and suspect of sets and universals.” (Lewis, 1986: 83) The dispositions that Tugby would have us believe in are paradigmatically unlike sets and are certainly not to be regarded as dispensable. That being so, this does not help Tugby.

4. Way of Abstraction: “Abstract entities are abstractions from concrete entities” (Lewis, 1986: 84).

Tugby’s universals definitely are not captured by the Way of Abstraction. An abstraction is an abstraction from something concrete, while Tugby’s “concrete dispositions” are instantiations of something abstract. Roughly, while in the case of abstraction the particular instances of dispositions ground the universal, on Tugby’s view it is the universal that grounds the particular instances. With these options exhausted, I suggest that we should reject Tugby’s Platonic Dispositionalism, or Tugby should say much more about how acausal and atemporal Platonic entities can ground the nature and identity of essentially temporal dispositions. I tend to think it cannot be done.

We are then not left with a viable metaphysics for dispositions. Tropism, Aristotelianism and Platonism all fail for different reasons. We have now two options: either we reject dispositionalism or we find a viable metaphysics.

6) Truths about alien properties are not determined by what is actual (Alienation Principle).

11. THE FAILURE OF ARISTOTELIANISM, TROPE THEORY AND PLATONISM

As we have seen so far, within a dispositional framework, both the Aristotelian view and the trope view of properties fail to satisfy two key principles that are common to all dispositional theories. The trope view fails to satisfy the central platitude (CP), since it leaves the nature and identity of unmanifested dispositions indeterminate, whilst the Aristotelian view of properties fails to satisfy the intrinsicness platitude (IP), since it makes properties depend on external circumstances, so not intrinsic. This was what we found in sections 6.1 and 6.2. Platonism fails as well, since it does not accommodate two other principles of dispositionalism: the temporal asymmetry principle (TAP) and the powerful principle (PP), that hold that dispositions are essentially temporal and causally powerful (sections 7.1 and 7.2). If all of this is true, then the dispositionalist is apparently left with no choice: Aristotelianism, tropism and Platonism all fail to satisfy key dispositional principles. This was the conclusion we reached in section 10.

PART TWO

DISPOSITIONS AND TIME

**DISPOSITIONALISM:
CAUSATION AND MODALITY**

Chapter overview

In this chapter I:

- *Briefly contrast reductive analyses of causation and other theories of causation (section 2).*
- *Present the main features of the dispositional account of causation due to Mumford and Anjum in section 3.*
- *Explain the theory of modality developed by Mumford and Anjum (2011) (section 4, 5 and 6).*

1. INTRODUCTION TO THE CHAPTER

In this chapter, I will focus on the accounts of causation and modality generated by the version of dispositionalism described in the previous two chapters. I will do this because knowing how things interact in the world leads to thinking about time. After all, interactions take time, and my thesis (in chapters 4-6) is that the way that things must change, and the kinds of state that must be possible in order for (the kind of) dispositionalism (I've argued for in chapters 1 and 2) to be true, are not compatible with any of the main theories of time. The current chapter is thus crucial to my overarching project.

There are some important remarks to be made before starting. First remark the reader may have is that I concluded the previous chapter (chapter two, second part) by leaving an open question that needs an answer. The dispositionalist is left with no viable metaphysics of properties for dispositions. How can I then go on and talk about dispositional causation and dispositional modality if there is such a big issue? There are two reasons I chose to go on with a discussion of causation and modality. First, the theories of causation and modality advanced by Mumford and Anjum as parts of a novel project on a powers ontology are attractive and ongoing; for this reason I decided to test them. Second, in their theory there is no clear reference (or metaphysical commitment) to a metaphysic of properties. There is just a quick mention about the nature of these properties at the beginning of their *Getting Causes from Powers* (2011: 13-15) where they seem to accept Aristotelian universalism, but they are not explicitly committed to this view of properties.

Second remark: the reader may now be thinking that causation and modality are very controversial and complex topics, and that we cannot fix on the one true theory of either in just a few pages. This is true. Causation and modality are complex topics. Nonetheless, I think that my project is viable. The aim of my thesis is not to defend these particular theories of causation and modality against their rivals, but rather to see which model of time should be adopted if a particular ontology of properties, and their consequent theories of causation and modality, are adopted. Thus, what we are interested in, during this chapter, are the theories of causation and modality that should be adopted if we adopt the particular ontology of properties described in the first two chapters. So, I am not interested (here) in the question of whether, *all things considered*, a reductive theory of causation is preferable to a dispositional theory of

causation. Nor am I interested in whether, *all things considered*, a possible worlds theory of modality should be adopted. Rather, given the claims made in chapters 1 and 2, about what I take to be the best theory of properties, I am interested here in pursuing the causal and modal consequences of that theory of properties, in order to then pursue the consequences of that theory of properties when we think about the philosophy of time.

Another thing worth mentioning is the range of theories of causation and modality. Not only are both topics controversial and complex, they are also broad. Certainly, it is not possible for me to consider *every* strength and every weakness of *every* theory of causation and/or modality, and compare and contrast those theories with the ones that I'll argue pandispositionalism leads to.⁵² It is important to keep in mind my broad project while reading the current chapter, which, for the reasons I have just mentioned, will be mainly exegetical.

Finally, and perhaps most importantly, I am primarily interested in two aspects of the accounts of causation and modality that I will present in the current chapter: these are *production* and *mere natural possibility*. The reason why I am primarily interested in these two aspects of the theories of causation and modality is because these are the starting points of the arguments advanced in the next three chapters (on time and dispositionalism). For this reason, I will mainly focus on these two features rather than spelling out all of the details of the theory in full and gory detail. These two features will be sufficient to understand the thesis that I defend in the second part of

⁵² Although I will briefly mention some of theories of causation to introduce the dispositional one (section 2).

the dissertation. There are a lot of other aspects that I would have liked to discuss, but they are irrelevant for the current context.

Now to the plan for the chapter. As with the previous chapter, this one is divided into two main parts. The first part of the chapter is about causation; the second is about modality. Both the account of causation and the account of modality I am going to present here are advanced and defended by Mumford and Anjum (2010, 2011, 2013)⁵³, who accept a pandispositional view of properties very similar (if not identical) to the one I described in chapters one and two.

As I have already mentioned above, the aspect I will mainly focus upon in the first part of the chapter is the notion of production (or causal production) due to causal powers. I am interested in explaining in the best way possible the idea of production, and for this reason I will begin by briefly introducing two main approaches to causation. I will in fact present a rival (and I think I can say the opposite) view to dispositional causation, one that maintains that an analysis of causation is possible and that does not preserve what we might think of as *real* causal production. Contrasting these two approaches (the reductive and the dispositional), the idea of production becomes clearer (or, at least, it becomes clear what the reductive accounts of causation lack).

In the second part of the chapter, where I talk about dispositional modality, I will principally focus on the idea of *mere natural possibility*. I do this because, again as above, mere natural possibility (along with production) will be at the basis of the

⁵³ Heil (2012, chapter 6) defends a theory of causation very similar to the one advanced by M&A.

construction of the arguments presented in the next three chapters. And again, given my current purposes, both the parts will be primarily exegetical. Let me also remind you that the aim of the project is to reply to a conditional question: if this kind of dispositionalism is true, what happens if we try to combine it with the main theories of time? So, the reader should take this chapter as the starting point for the rest of the discussion.

One last reminder before beginning: although I don't believe macro-properties to be genuine properties, I will use them in my examples for the sake of simplicity. Settling on a definitive list of fundamental properties is a task that must be carried out in step with a future-physics.

I. CAUSATION

There are two main⁵⁴ approaches to causation. One is reductive: we look to analyse claims that appear to be about causal relations in terms of *other*, non-causal relations. The second is non-reductive. Causation is, itself, a genuine part of the world and cannot be reduced to some other kind of relation. Dispositional causation is a theory of the second kind. Dispositional causation brings with it a non-reductive account of causation.

⁵⁴ There are other approaches beyond the two I will describe, but what I need here is to make clear how the dispositional approach is different from those that either reduce (and here I will focus only on reductive analyses) or eliminate causation.

Although this approach may seem odd, I will first briefly introduce the reductive approach to causation (taking as examples the regularity theory of causation due to Hume and the counterfactual theory of causation due to Lewis). I will first talk about the reductive approach to causation to make clear what the non-reductive approach is (focusing mainly on the idea of production, which is lacking in the former and is the most fundamental aspect of the latter). After having introduced the reductive approach, I will go on to explain what this dispositional theory of causation amounts to. And, as I said in the introduction of the chapter, I will mainly focus upon those aspects of the theory most relevant to the thesis I advance when it comes to time.⁵⁵

2. REDUCTIVE ANALYSIS OF CAUSATION

As above, my aim is to describe the dispositional account of causation in order to see how different theories of time behave within an ontology of powers. But although this is the first aim of the first part of the chapter, I will now briefly introduce the reductive approach of causation. This will help to make clear how the dispositional approach is different from the reductive one (which is the mainstream view of causation). The idea of causal production is the most fundamental aspect in which they differ.

The best way to understand causation (very generally) is to look at how things, more specifically, *properties of things*, are *intertwined* and *interact* in the world. The way

⁵⁵ I will individuate a dispositional causal principle and a dispositional modal principle, and show that every theory of time does not accommodate either both or one of them. For this reason, dispositionalism cannot adopt any theory of time.

they do so seems to be anything but arbitrary. It seems that *almost every time* a *fragile* glass hits a *hard* surface, it breaks; that *most of the times* a *spherical* marble is put on an *inclined* plane, it rolls down; and that *usually* when we have a *headache*, we *take a pill* and it disappears. This appears to be no coincidence.

These examples are just three of the countless ways in which things relate to one another: the fragility of glasses leads to their breaking; the sphericity of marbles leads to their rolling down inclined planes; the chemical properties of aspirin lead to pain relief. The natural way to understand these interactions is to think about them in terms of connected events: the *falling* of the glass on the floor causes its *breaking*; *putting* a spherical marble on a inclined plane causes its *rolling down the slope*, *having a headache* causes me to *take a pill*.

So, we have our causes and our effects. But what binds or connects these distinct events? Let me offer up a well-known quote due to Hume (usually Hume's account of causation is the starting point for everyone who wants to talk about it). Regarding the causal connection between events, Hume says:

All events seem entirely loose and separate. One event follows another; but we never can observe any tie between them. They seem conjoined, but never connected. (*An Enquiry Concerning Human Understanding*, section VII, part 2)⁵⁶

⁵⁶ I am aware that Hume's actual view is contested. Here I am just presenting a caricature to describe in the easiest way possible the regularity theory of causation.

On this view, the link between events, rather than being some tight, binding, intimate causal connection, seems to be mere conjunction; one event happens, then another. And when we have the first type of event happen, so we often have the second kind of event happen. But that's it. There is nothing more substantive to causation. There is nothing more that binds together these disparate events. This leads to conceiving causation (or better, causal concepts and causal talk) as something that helps us to describe the world, but not as something active and productive of something new, some real change in the world (what this means will become clear in the next few paragraphs).⁵⁷

This is the approach to causation that aims to provide a reductive analysis of our causal talk. For example, according to this kind of account, when I say "the falling of the glass on the floor caused its breaking" I am not actually referring to a substantial causal relation, but to something else; I am referring to a pair of events that are typically conjoined. The most important thing to say, in this context, is that this account of causation holds there is no real causal *production* in the world. When I talk about causal production, I talk about properties (or events, if you prefer) that *produce* further properties. So, it is not sufficient for causal production to have an event that contingently follows another event; rather for there being causal production we need an event that *really produces* another event⁵⁸. Let's say that where there is causal production there is the first event that is responsible for the existence of the second; or

⁵⁷ Reductive views of causation are defended by Hume (1748); Mackie (1965); Lewis (1973, 2000); Fair (1979), who argued that causation can be reduced to the transfer of energy; Dowe (1992) and Salmon (1994) who claim that causation can be reduced to the transfer of some conserved quantity,

⁵⁸ Here I am not talking about a kind of production like Hall's one (2004). On Hall's view, production can be analysed in terms of counterfactuals (2004, section 7).

even better, that the first event *brings about* the second (this will become clearer when I will talk about the dispositional account of causation).

As I explained at the outset, let me remind you that my aim here is to introduce and explain a dispositional theory of causation. We're now heading off into the task of exploring non-dispositional theories. Again, that may seem odd. Nonetheless, I think that the approach is important. In order to fully appreciate what is distinctly 'causal' and 'productive' about dispositional causation, I need to first explain the alternative theories, that lack the features that Mumford and Anjum (M&A, henceforth) think are distinctive about their non-reductive, dispositional theory of causation. Let us now turn our attention to these reductive attempts.

Let's go back to Hume who thought that one type of events is *usually followed by* another type of events: that means that in the world there are some regularities. On Hume's view, causation consists in a regular succession of types of events, and causal connections are ways we explain the regularities that happen in the world (see M&A 2013: 17). We have an idea of causation, according to Hume, only by observing such regularities in the world. As M&A say: "Repetition is the key." (2013: 17) This is how Hume analyses what appear to us to be causal connections. And the regular connection between these types of events is a contingent matter (on his view, in fact, everything is "loose and separate"). On this view, for example, putting a sugar cube in a glass of water and having a sweet solution after a few seconds are seen as two separate events: one type of event, putting a sugar cube within a glass of water, is usually followed by another type of event, having a sweet solution. That being so, putting the sugar cube in the water is "described as" the cause of there being a sweet

solution (but these two events are not necessarily connected, rather they are constantly conjoined: it is not necessary that the former follows the latter).

This account of causation has three main characteristics, which I will now briefly describe. First, there is no “real” causal connection between these the two events, rather they are just “*constantly conjoined*” types of events: events of type A are usually followed by events of type B. Second, on this view, it is always the case that events of type B follow events of type A, and never the opposite. This is *temporal priority*⁵⁹: causes must always precede their effects. Of course, it is not *always* the case that when there occurs an event of type A, also an event of type B occurs, but it is never the case, on Hume’s view, that the opposite holds. Third characteristic: *contiguity*. Events of type A and events of type B must occur spatio-temporally contiguously; there cannot be causation at a distance. So, on this view, causation is a constant conjunction between causes and effects, and not a “genuine” connection (not real production of an event by another one – it is just a contingent matter the former follows the latter, which in fact does not *produce* it), and is just spatiotemporally ‘next to it’. We can then say that causation is *reductively analysed* in these terms.

Another attempt at analysing causation is due to David Lewis, who, taking his cue from part of Hume’s definition of causation⁶⁰, developed a counterfactual theory of causation.

⁵⁹ A feature that, as we will see, is rejected by the dispositional account advanced by M&A (2011) and Heil (2012).

⁶⁰ Hume says: “(...) we may define a cause to be an object, followed by another, and where all the objects similar to the first are followed by objects similar to the second. Or in other words where, if the first object had not been, the second never had existed.” (*An Enquiry concerning Human*

On Lewis' view, the world is just a collection of individual things that instantiate properties, and causation is analysed in counterfactual terms: causation can be reduced to counterfactual dependences between events.⁶¹ Let's suppose that c is the event cause and e the event effect, and that they both occur. Lewis claims that there is causation in that case if, had c not occurred, then e would have not occurred.⁶² This just means that, if the sugar cube had not been put in the glass of water, then we would not have had a sweet solution. So, the second event counterfactually depends on the first. And this is counterfactual dependence between events. Note, though, that there is a clear sense in which this is not real *causal production*: here causation is *reduced* to something else (counterfactual dependence, in this case).

These two theories are different, but they share a common feature: there are just patterns of events in the world, from these patterns we "construct"⁶³ causation: there

Understanding, section VII) And Lewis develops his theory starting from the second part of this definition of cause.

⁶¹ For further discussion see Lewis 1973 and his refined view 2000.

⁶² I recognize that this reconstruction of Lewis' view is too simplistic. In his original account ('Causation' (1973)), Lewis allowed that c can cause e even if e is not itself counterfactually dependent on c, as long as there is a *chain* of counterfactual dependence linking c with e. But in the current context I am just interested in drawing a clear difference between an approach that analyses causation (Lewis' approach) and one that believes causation to be a primitive feature of reality.

⁶³ With this talk of 'constructing causation' I am not assuming that these theories essentially involve some kind of 'subjectivism' about causation. (i.e., that we 'construct' causation from non-causal facts.) I acknowledge the possibility of these 'realist' versions of the reductive theories.

are these regular connections between events and we then analyse causation in these terms of these regular connections. These connections are, on these views, contingent and not necessary. This means that types of events could have been connected differently from the way they are (see chapter 1, section 5.1, for further discussion of this).

We are now in a position to move to a completely different approach: dispositional causation is not a theory that analyses causation; rather it is a theory that holds that properties and causation are deeply interconnected and *equally real*. On this view, properties are the very properties that they are because of what they do (how they manifest). In the previous two reductive theories I presented, properties could have been differently related (it is a contingent matter the way they are related) and their identity and distinctness is a brute fact (quidditism), while dispositional essentialism, as we have already seen in the chapter 1 (sections 6 and 7) is the view that the identity and nature of properties depend (at least in part) on their relations to other properties. Causation, on the dispositionalist's view, is a *real* feature of the world and it is due to the *activity* and *modal force* of powers – and then to the way they interact between each other. In the next section I will explain this last model of causation, which is the one the rest of the thesis will rely on.

3. DISPOSITIONAL THEORY OF CAUSATION

In the current section I will present the main features that characterize Mumford and Anjum's dispositional theory of causation⁶⁴. These are primitivism (and then unanalyzability) of causation (3.1), mutually manifestation partnership of powers (3.2) and the idea of a threshold account modelled through vectors (3.3), and finally the idea of causal production as unfolding dynamic processes where causes and effects occur simultaneously (3.4). All this should be enough to motivate the claims I will make in the last three chapters on time and dispositionalism.

3.1 PRIMITIVISM

The first feature of causal dispositionalism I will focus on is primitivism and, of course, its unanalyzability. This is the first feature that makes the dispositional theory of causation different from the reductive approach to causation. Dispositionalism (again, the kind of dispositionalism I adopt) holds that causation *is a fundamental* feature of reality. Causation, on this view, is primitive and unanalyzable.

Causation, on this view, is essentially dispositional in nature, since it is produced by the exercise of causal powers (dispositions). And although, at a first look, it may seem that causation may be analysed in terms of causal powers, this is not the case. We can identify at least one⁶⁵ reason why, on this view, causation cannot be reduced to

⁶⁴ I will use "causal dispositionalism" or "the dispositional theory of causation" from now on as a label for Mumford and Anjum's version of the theory. I am aware that one could hold a dispositional theory of causation without being committed to all the features that characterize their theory (see Heil 2012, for example).

⁶⁵ There is a second (and weaker) reason why causal dispositionalism cannot be reductively analysed, and it is that all reductive analyses of causation suffer from different problems.

something more fundamental. The reason is that the notion of causal powers and the notion of causation are so strictly interconnected that it is not possible to have one without the other. In fact, M&A claim

Powers, we maintain, are productive of their manifestations, and production is clearly itself a causal notion. We cannot, therefore, analyse causation in terms of an already causal notion of production. (2011: 8)

M&A also say that

(...) those causal powers are not in a position to reduce causation away, for the notions of cause and power are too close. Power is already a causally laden term so not in a position to provide a non-circular analysis of causation. (2013: 96)

And more:

Powers produce their manifestations. Production is already a causal term. So we cannot invoke the notion of a disposition to reduce away causation. The exercise of a disposition seems already to include it. (2013: 108)

Let me unpack this. A causal power clearly brings with it a commitment to causal productivity (or production): fragility manifests into breakage, and in order to break, a fragile object has to undergo some causal process. And we have already seen how trying to analyse or reduce causal powers to a more basic kinds of entity is an attempt

that raises problems (chapter 1, sections 4, 5.1, and 5.3). If dispositional causation is analyzed into something more fundamental, then causal powers would lose their potency, their force: we would have causally inert properties that populate the world. And this is exactly what dispositionalists want to deny. Causal powers already have the notion of causal production within them, so it would then not be possible to involve them in an analysis of causal production (or causation), and furnish a non-circular analysis. In short: powers are powers *for*, or *to cause*, something. We cannot, then, use the powers themselves to analyse causation.

And, following this, it should now be reasonably clear why a counterfactual theory (as well as a regularity one) will not serve M&A's purpose. As we have already seen above, Lewis, developing Hume's definition of causation, believes that causation can be analysed in terms of counterfactual dependence between events (if event a had not occurred, then event b wouldn't have occurred), and these counterfactuals are made true by possible worlds (for further discussion see Lewis, 1973, 2000).

But, again, it should be clear enough that, first of all, since powers are primitive and unanalyzable (those are the basic bricks of reality), the truth of counterfactuals is just "secondary and parasitic" (M&A, 2011: 151). Causation, in a view such as Lewis' is analyzable and analyzed. In a dispositional framework it is not.⁶⁶

⁶⁶ Even though M&A claim that their goal is not to offer a critical and detailed criticism to the counterfactual theory of causation, but rather a positive account of causation, the discussion on counterfactuals and causal dispositionalism is not exhaustive. For further discussion on the relation between counterfactuals and causal dispositionalism, see M&A, 2011: 148-155.

M&A suggest that they offer a *realistic theory of causation* rather than an analysis of it.⁶⁷ To put it simply, according to causal dispositionalism, properties *are* causal powers, and these causal powers are able to *produce* further powers and, when they do so, are then responsible for the production that has occurred. And this—this production—is *causal* production. Dispositions, that are causal powers, *produce* their manifestations. This is causation: a real feature of the world and not a way in which we think about it, and not something to be understood in terms of mere constant conjunction, or mere counterfactual dependence.

If we believe that the world is inhabited by irreducibly dispositional properties, this dispositional theory seems to be the right account of causation to adopt. The world, on this view, is not a mosaic of qualities contingently linked, rather, reality is produced by powers in a dispositional way (this will become clear in the second part of the chapter). The powers themselves aren't merely loose and separate from one another (as we said in chapter 1, sections 6 and 7).

This production is distinctively causal. A manifestation is caused by a disposition *manifesting*. This is what causation *is*. Reality is the product of the action of causal powers, rather than a ready-made sum of events to be then analyzed.⁶⁸

⁶⁷ Cf. M&A, 2011: 8.

⁶⁸ M&A stress the fact that every object possesses its own properties, so, its own causal powers, which are able to produce further powers (effects). This just means that every object has powers that can potentially manifest: a ball is spherical and it has the potential to roll down a inclined plane, a particular sugar cube is soluble and had the potential to dissolve when immersed in a cup of tea, the glass that is now on my desk is fragile and has the potential to become broken if it falls on the floor. These are “hidden”, but real powers that objects have. These causal powers (those of each particular

3.2 MUTUAL MANIFESTATION PARTNERSHIP

Now to the second aspect of the dispositional theory of causation. In section 3.1, we have seen that causation is given by the interaction of causal powers: causal production consists in the production of new causal powers by “old” ones. In this section, I will take a step further and say something about *how* powers interact. More specifically, this section is about the mutual manifestation of powers. Mutual manifestation of powers is *how* causation occurs (M&A, 2010, 2011).

When we think about dispositions, we may be tempted to think that, in order to manifest, they have to be somehow stimulated. Indeed, when introducing dispositional views, I used such terminology. For instance: in order to burn, a match had to be lit, and being lit is what is usually conceived as a stimulus for the flammable-disposition of the match. These stimuli conditions plus the powers that the object instantiate are usually thought to be what is responsible for a given effect (the burning of the match, in this case). If this conception of dispositions is accepted, then these powers are conceived as passive properties that “wait for” the right stimulus condition to get activated and then manifest themselves. On the dispositionalist’s view⁶⁹, though, this is the wrong conception of causal powers and causation. Causal

object), then, are responsible for the behaviour that their bearers manifest. And, as already mentioned in the previous two chapters, even if these dispositions have never and will never manifest, they are real, they exist within the object that instantiates them. And again, let me remind you that these properties are not only real, but also irreducible. This is to say that M&A’s account is a singularist account of causation, even though it works for general causal claims as well. For further discussion, see M&A 2011, pp. 13-15.

⁶⁹ Not only Mumford and Anjum 2011, but also Martin 2008, Heil 2012, Molnar 2003.

dispositionalists usually think that dispositions form *mutual manifestation partnerships*.⁷⁰ This means, for instance, that the flammability of the match mentioned above does not have to be thought of as something that needs to get stimulated in order to manifest. Rather, the flammability of the match has to be thought of as something such that, when it comes into contact with an abrasive surface, *teams up* with it, and this interaction produces a certain outcome: burning, in this case. The flammability of a match and the abrasiveness of a surface are mutual manifestation partners for the production of a burning match. Both of them are powers, equally active and neither of the two is a stimulus condition for the other.

According to causal dispositionalism, all powers are active entities. All dispositions, in causal production, play some role (in different grades of course, but all of them are active), and by teaming up and producing new causal powers, all of them undergo some change. To illustrate again, think about water and salt: both water and salt have some causal powers. Water, for example, has the power to dissolve some substances, and salt has the disposition to dissolve in some liquids. When a pinch of salt is put in a glass of water, it dissolves and we then have a saline solution. Here we have reciprocal change: in this interaction, both the powers of the water and the powers of the salt play a causal role and bring about a saline solution by changing themselves and producing some new powers (saline solution has the power to cure some infections, for instance). And this is what a causal process is.

Before talking about causal process, though, let me say something more about the way in which these mutual manifestation partners can interact and produce further

⁷⁰ There are dispositions that manifest spontaneously, though (radioactive decay).

powers. The idea of the production of powers due to the interaction of other powers is the most natural way of thinking about causation given the account of properties I presented in the first two chapters. Dispositions are causally powerful properties, they are modally forceful, they are responsible for the production of further dispositions. If this was not the case, then we would have had causally inert properties spread across space-time and these causally inert properties would have been contingently related. This would have led to conceiving causation as reductivists do; as involving ‘loose and separate’ entities, with some relation or other connecting them, playing the part of the relation ‘causation’.

With that said, we now need to explore in a little more detail the idea of the ways in which causation can occur. There are, according to the dispositionalist, different *ways* in which powers can combine: powers are “multi-tracking” (see Molnar 2003, Bird 2007, Heil 2012): a single power can have different reciprocal partners. This means that one and the same power can manifest in different ways, and that the way it manifests depends on which other powers it interacts with. For example, the sugar cube that is soluble dissolves if in contact with water (and so the manifestation of the solubility of the sugar is a sweet solution), while the sugar cube melts if in contact with a hot pan (and so the manifestation is caramel). Let me also mention an example due to Heil on multi-tracking powers:

Consider an electron’s power to repel fellow electrons. Suppose this power resides in the electron’s charge. The very same power would lead the electron to attract positrons, to trigger a Geiger counter, and to behave as it does in the company of neutrons and protons. One unhappy consequence of denying that

powers could manifest themselves in different ways with different reciprocal partners is that this would render most powers undetectable. If an electron's charge is *solely* a power to repel other electrons and nothing more, we could have no evidence that it possessed this power, at least not if our having evidence requires our being causally connected in the right way with whatever our evidence is evidence for. (...) If you start with the thought that the diversity we find in the universe stems from varying combinations of a small number of different kinds of fundamental entity, then you will want powers to be capable of diverse manifestations with diverse reciprocal partners. (2012: 121)

So: the same power can have different manifestations depending on the powers it combines with.

Having said this, I can now explain how powers interact in a causal process by using two technical terms that are often mentioned in this version of dispositionalism. Powers interact polygenically⁷¹: lots of powers contribute to the production of a particular effect.⁷² So, for instance, as we have seen above, for the production of a saline solution lots of powers are in play and all of them contribute to the “final effect” (this is just another way of saying that powers act by mutually manifesting).

⁷¹ Polygeny is a term that Molnar (2003) first, and then M&A (2011), borrow from biology.

⁷² Mumford and Anjum define polygeny as follows: “The same power can produce different overall effects depending on which other powers combine with it. Powers can thus have different partners for the production of different mutual manifestations.” (2011: 35)

But also, powers are pleiotropic: one and the same power can make different kinds of contribution to the effect of which they are cause.⁷³ In M&A's words:

[P]leiotropy of powers: one power can be involved in the production of many different effects. (2011: 128)

These two terms do not add much to the current section, but since are technical terms often used within the dispositional literature, I think it may be useful to introduce them.

3.3 A THRESHOLD ACCOUNT AS A VECTOR MODEL

Although this section won't be crucial for the rest of the discussion, I would like to say something about the way in which we could think about causal production; I think the heuristic is useful, if non-essential.

What I have said in the previous section (3.2) may help to understand why Mumford and Anjum define their account of causation as a "threshold account" (2010, 2011, 2013). M&A believe that different powers, with different intensities (the fragility of a glass is "stronger" than the fragility of a mug) come together and "sum up their intensities" till they reach a certain "threshold", and then a certain outcome manifests. Thresholds are not real entities, they are just points that interest us because a change happens – they are "significant instants". "Powers' intensities" sum up and bring about a given manifestation. So, for example, consider a balloon. A balloon has the disposition to explode when there is too much air in it. Suppose that we start blowing

⁷³ For further discussion, see M&A (2011: 128, 223-5) and Molnar (2003: 194-8).

up the balloon and keep blowing it up: at some point it will explode – it has reached its threshold; the explosion occurs.

M&A dedicate an entire chapter (chapter 3, 2011) to explaining how this threshold account can be represented and explained via vectors. In fact, they “construct” a vector model to represent powers in action. Both powers and vectors have a direction and an intensity, and powers sum up in the same way vectors do (when summed up, both their intensities and their directions are considered). Just a quick comparison between the threshold account and the vector model should be enough to make this discussion about causation clearer. Let me quote them at length:

We offer what can be called a *threshold account* in which an effect occurs when its causes have accumulated to reach the requisite threshold. Our preference is to outline this account in terms of powers, which we believe to be the most plausible truth-makers of causal claims, but we note that other views of the truth-makers may be able to make use of the same idea. (...) The threshold account of causal production states that an effect is produced when some local aggregation of operative powers reaches the requisite threshold for that effect. In other words, an effect is caused when powers have accumulated to reach the point at which that effect is triggered. However, in reaching that point, we cannot consider simply the addition of operative powers. Other powers might be subtracting from the accumulation and tending away from the requisite threshold. Powers compose additively and subtractively in the sort of way we would have to consider when calculating vectors. To calculate a final effect, we have to consider the strength and direction of each individual

vector. The resultant vector R will be constituted by all the component vectors along the lines of vector addition. (M&A, 2010: 144 – 145)

To put it simply, powers produce further powers by interacting and summing their intensities and directions, and bringing about some manifestation. For instance, a sweet tea is the manifestation of the teaming up of different powers: those of the water, those of a sugar cube, those of the tea, those of the mug: all of these powers, in the right quantity, bring about the sweet tea. And, of course, in order to do this, these powers have to be mutual manifestation partners.

3.4 THE PROCESS THEORY OF CAUSATION AND SIMULTANEITY

All I have said about powers and the way they interact and combine leads to a conception of causation made by processes where causes and effects are simultaneous.

Let's consider again the way in which reductionist accounts of causation conceive of it. Causation is understood as a relation between distinct events: an event A, the cause, brings about another event B, its effect. The relation between A and B is usually conceived of as an asymmetric relation, because mostly we think that if c causes e then it's not the case that e causes c (that's what asymmetry requires). Thus, or so we suppose, causes always precede their effect. Causation is also irreflexive, because no event is the cause of itself, and transitive, because if an event A causes an event B, and the event B causes an event C, then A is (usually thought as) a cause of C as well.

As we have seen above (section 2), these relations are considered contingent by the Humean.

Contrary to reductivists, who usually conceive causation as an asymmetric relation between a cause and then an effect, the dispositionalists conceive of causation as “instances of causation: *causings*” (Heil, 2012: 118), also called “causal processes” by Mumford and Anjum (2011), or “power nets” by Martin (1993, 2008). All these labels just stand for “mutual manifestation of reciprocal powers” and this is something different from the conception of causation due to mainstream views (regularity theories, counterfactual ones, etc.). Dispositionalists believe that what actually happens during a causal process is a teaming up of different powers in a continuous process, which is then not composed by distinct events “somehow” related. A causal process, on this view, is not seen as a relation, rather it is seen as a “happening”; a continuous interaction of powers that brings about some change, or better, some further power in the world. And so, again, the conception of properties as passive elements and some other properties as the active ones is wrong and misleading: the interaction between properties, on this conception of causation, is symmetrical (as we have seen in section 3.2 of the current chapter).

A final remark has to be made. Causal processes do not need to produce a *change* in order to be causal process. For instance, equilibrium states, on this view, are conceived as causal processes. To illustrate: just think about two playing cards that are leaning against each other on a table (or we could also think about a more common situation: a book on a desk): these objects mutually support each other. The objects, the surfaces on which they lie and the gravitational attractions involved

(among other powers), produce the equilibrium state: an outcome, an “on going effect”. This is a causing; an ongoing causal process. The first card causes the second to remain standing; the second card causes the first to remain standing. Together, they cause there to be an equilibrium state: a pair of cards, leaning against one another. The working together of their powers is not sequential (as causal chains, are typically conceived). The equilibrium state is “a continuous mutual manifestation of reciprocal powers” (Heil, 2012: 119). These apparently static states are, in a sense, not really static: there are a lot of powers *working* together to keep the status quo. What we describe as a passive scenario, is actually better described as a process where lots of powers are working together to produce a state of (what we could describe as) ‘active equilibrium’. To use Heil’s words (2012: 119):

Stability requires massive cooperation, the mutual manifestation of countless reciprocal powers to hold things together, to preserve the status quo. Their holding together is an outcome, but one that temporally coincides with their manifesting themselves as they do. The causing here is a reciprocal, symmetrical, continuous affair.

This is true for equilibrium states (at least, so I have suggested) but it is also true for what we normally consider to be diachronic causal relations, as we shall now see.

Suppose I throw a stone at the window and the glass breaks. One way of describing this situation is that the event A, the stone thrown at the window at t_1 , is the cause of the event B, the shattering of the glass at t_2 . But this description is misleading (or at least, it is if we consider M&A’s version of the story). We can think about this event-

based story as a way of describing the situation, as an abstraction. What actually happens (or, a better description of what happens) is that the stone and the glass both undergo some kind of change. They “put their powers together”, and it is a continuous, reciprocal and symmetrical process. There is no gap, either temporal or causal, between the two events. Causation is not a third element that connects two distinct events.⁷⁴ The powers of the stone and those of the glass simultaneously cooperate with each other throughout the process.

If we consider a process as a sum of distinct and separate events, as the Humean would have us think of it as, then what we have is just a sequence of contiguous changeless events. The dispositionalists want powers to be active and bring about *real change* (or real new powers) in the world. Having those static events would bring back the conception of causation as a relation between two distinct events that are bound together by some ‘causal link’. Considering the cause and the effect as simultaneous gives rise a dynamic process that unfolds through time and whose existence is generated by powers interacting and producing new powers.

This may be easier to understand if we think about an equilibrium state: although it does not produce a visible change in the world, is nonetheless causal, since different powers are at work. Think about a case of book resting on a table: we see no change, but there is a causal process that is on-going; a causal process where causes and effects are simultaneous. The book has some powers: it is hard, smooth, has a parallelepiped form, has a certain mass. Also, the table has powers. The powers of the book and the powers of the table interact and give rise to an equilibrium state: there

⁷⁴ See M&A, 2011: 113.

are causal powers at work, there is definitely some causation going on, but not a relation between distinct events. The table supporting the book (the cause) is simultaneous with the book being supported (the effect).⁷⁵

So, according to dispositional causation, cause and effect are *simultaneous* and this should be now quite clear. Having lots of powers that cooperate, we have dynamic processes that unfold through time, which cannot be broken down into static events somehow related.⁷⁶ Accepting causation as a relation between events leads to a static view of reality (this will become clear in chapter 4, sections 3 and 4), and this would lead to the rejection of powerful properties that actively operate in the world and bring about change. This conception of processes as dynamic entities rather than sequences of changeless and static events is crucial for the arguments of chapter 4, 5 and 6, given that the dispositional conception of causal production makes very hard (if not impossible) to combine this type of dispositionalism with different temporal

⁷⁵ For further discussion and example on simultaneous causation see M&A 2011 chapter 5.

⁷⁶ The reader may be worried on the juxtaposition of two claims:

- 1 Causation is simultaneous.
2. Production occurs ‘over time’.

One relation seems to be instantaneous; the other seems to take time. How do we get from the one in 1, to the one in 2? I will use M&A words to clarify this. “For an effect to happen instantaneously, there must be no temporal gap between it and the cause. For causes and effects to be simultaneous, on the other hand, they must entirely coincide temporally. Effects being instantaneous does not require that they are simultaneous with their causes. (...) For causes and effects to be simultaneous, however, requires that they be instantaneous in the sense that the effect would commence as soon as the cause commences, or is in place.” (2011: 111-112)

ontologies.⁷⁷ Let's now turn our attention to another aspect of pandispositionalism: dispositional modality.

II. MODALITY

In this second part of chapter 3 I will mainly focus on the aspects of modality relevant for the purposes of the next three chapters. Along with causal production, dispositionality (a modal notion) is at the heart of the arguments that I will develop in chapters 4, 5 and 6, where I will defend a thesis according to which the notion of dispositional modality, conceived as natural possibility, is at odds with a range of conceptions of time.

4. DISPOSITIONAL MODALITY

Let's now focus on the kind of modality that arises from the conception of properties presented in the previous two chapters. As noted, this is another crucial feature of dispositionalism (along with causal production) that will help us to understand which model of time, if any, best fits with this ontology of properties.⁷⁸

⁷⁷ Here I focused only on the aspect of this account of causation that are relevant for the rest of the discussion.

⁷⁸ I will individuate a modal dispositional principle and see which theories of time can satisfy the principle.

Dispositions are causal powers, which, we have seen, are able to produce change in the world by interacting with each other. This suggests an idea of active and dynamic properties: active and dynamic properties that have the power to bring about change in the world themselves. These dispositions, we have seen, are naturally and essentially powerful. This, on Mumford and Anjum's view, leads to the idea of a new kind of modality: dispositionality: a worldly, *de re* modality due to the *force* of causal powers. M&A believe that their account of modality is originally due to Aquinas, who used to believe that causes do not necessitate their effects, but only tend towards them. They, in fact, describe their account as "neo-Aquinian" (M&A, 2010: 143). Let's see what this new theory of modality consists in.

First of all, on M&A's view, causes, or better, powers, do not necessitate effects. M&A are after a more naturalistic theory of causation, one that does not require necessitation. A cause is something that *disposes* or *tends* towards an effect. This tending *is* the modal force of properties. Think about Paul and Jane who are playing with their ball in the garden, when Paul violently kicks the ball towards a window. Jane runs toward the ball and kicks it, again deviating its trajectory and saving the window. The ball does not break the glass. At the beginning we have all the right "conditions" for the glass to break: the mass of the ball, its velocity, the fragility of the glass (and many more background conditions). All the right powers are in place for the glass to break, but suddenly a new power interferes that prevents the breaking of the glass and makes something different happen (the ball breaks a vase, instead, let us suppose). This means, on M&A's view, that although all the right powers for a manifestation to occur are in place, these powers do not *necessitate* the manifestation (the breaking of the glass, in this case). Rather, these powers just *tend or dispose*

towards that outcome. This is dispositional modality (or dispositionality), which they argue to be a primitive and *sui generis* type of modality, and, or so they claim (and we shall see), is definitely not reducible to neither necessity nor pure contingency (see M&A, 2011: 175).

Let see what this means in more detail. First of all, the most basic claim: for a power to be disposed towards a certain manifestation is not to necessitate that manifestation. Why? Because that manifestation could be prevented by the intervention of some other power (as we have seen in the example I made in the previous paragraph: the interferer, in that case, was Jane's kicking the ball). To say this with M&A's words (2010: 143)

When it comes to causation we should think less of necessity and more of dispositionality. Others have already suggested that it should be possible to get a theory of causation from an ontology of real dispositions or powers (Harré and Madden 1975, Cartwright 1989, Ellis 2001, Molnar 2003: ch. 12, Martin 2008: ch. 5). (...) One of the key attractions of a dispositional theory of causation should be the claim that causes dispose towards their effects. This offers us something stronger than Humeanism, in which everything is loose and separate. Unlike many opponents of the old Hume, however, we do not want dispositionality to be reduced to necessity either for that too would be to overlook what is most important about dispositionalism. Causes do not necessitate their effects: they produce them but in an irreducibly dispositional way.

For example, the glass that is now on my desk is fragile, even though it is not breaking. Even if I throw the glass on the floor, so even if there is the right power for it to break, it is not necessary that it breaks, because a further power could intervene and prevent the breaking (my boyfriend could run towards it and catch it before it touches the floor). Powers, then, do not necessitate their manifestations.⁷⁹ We have seen in the previous two chapters (chapter 1, sections 7, and chapter 2, section 4) that dispositions are real even if they never manifest.

Perhaps less surprisingly, dispositionality is not to be identified with pure possibility/contingency. Many things are possible without being disposed to happen, but what is disposed to happen is possible. The second claim is easier to understand: if something is disposed to happen, then it is possible for it to happen. If the glass is fragile, then it is possible for it to break. As M&A say

Dispositions thus open a horizon of possibility. (2011: 180)

Now to the first, and slightly more complex, claim: many things are possible without them to be disposed to happen. We can say that it is possible for a cherry to become an alien, but that cherry is not disposed to become an alien: there are no dispositions of the cherry that tend towards becoming an alien.⁸⁰ Let's see what this means.

⁷⁹ See, also, the cases of finks and masking in chapter 1, section 4. And for further discussion on the necessity and dispositionality see M&A 2011 pp. 177-9.

⁸⁰ For further discussion of dispositional modality and pure possibility see M&A 2011 pp. 179-181. I believe the discussion on metaphysical possibility to be not exhaustive: M&A's framework lacks of a satisfactory account for it.

5. DISPOSITIONALITY AS NATURAL POSSIBILITY

The idea is to distinguish pure possibility (the one that admits that it is possible for a cherry to turn into an alien) from natural possibility (it is naturally possible for the cherry to overripe).

(...) what is naturally possible is what is disposed to happen. In the sense of natural possibility, therefore, it would actually be the case that if F is possible then there is a disposition towards F. (M&A, 2011:182)

It can be said that dispositionality is half way between necessity and mere possibility. Dispositions, on this view, open a horizon of natural possibilities. This means that what is naturally possible is disposed to happen. For instance, a sugar cube is soluble; it tends to dissolve if certain conditions are met. This means that there is a natural possibility that that sugar cube would dissolve, but it is not necessary for it to dissolve, and it is not *naturally* possible for it to turn into a chair. We can think of dispositional modality as a natural function that selects only a number of outcomes among those that are just merely possible. M&A argue that we can think dispositionality as grounding natural possibility (see 2011: 182). The idea is that the more the possibility is natural, the more it is grounded by dispositionality; the more the possibility is non-natural (cherries turning into aliens, glasses falling on the floor and turning into chickens) the more we move towards pure possibility. Pure contingency is the “limiting case” in this bar, while necessity is on the other end of it (see M&A, 2011: 182).

The manifestations/outcomes that the disposition selects are the ones that the disposition is for; those are the possible manifestations of that disposition. For example, depending on the partners it interacts with, the disposition of being unripe instantiated by an apple, may manifest by its ripening, or over-ripening, etc. The solubility of a sugar cube selects the possibility of its dissolving, but it may or fail to manifest (the dissolution maybe be stopped by some interfering factor: someone takes out the sugar cube by the glass of water in which it was placed, for example).

And here I shall refer back to the discussion about the conditional analysis (chapter 1, section 4). In chapter 1, I claimed that the reason why dispositions cannot be analysed in terms of conditionals would become clearer in this chapter. Here is the explanation of why it is a mistake to think that it is possible to analyse dispositions and then dispositionality in terms of conditionals. We can understand conditionals in terms of selection functions where “the antecedent selects the consequent but irreducibly only tends towards it” (M&A, 2011: 190). If dispositions and dispositionality are irreducible, then no analysis of them can succeed. We have seen how such analyses fail in chapter 1 (section 4), and M&A further dedicate a section to a discussion of this issue (2011, chapter 8, section 10). Their final claim is that

The main point is that dispositionality as an important, real, and irreducible modal force of its own. Any attempt to replace it with something non-dispositional will miss the most important thing about dispositionality and, as we argue here, causation. (M&A, 2010: 156)

(...) any putative conditional analysis would either be false, and susceptible to counterexamples, because it attempted to reduce this *sui generis* modality to something that it is not. (2011: 190)

The idea of dispositionality as natural possibility plus the idea of causal production, where causal powers are responsible for the coming into existence of new causal powers, leads to thinking that reality does contain only presently existing powers that tend towards merely possible outcomes. I am aware that the idea of this new kind of modality is difficult to buy, so for this reason let me quickly mention what M&A offer to show that this is the kind of modality that governs the world.

6. MAY THE MODAL FORCE BE WITH YOU

Dispositionality is a primitive modality that, according to M&A, we can daily perceive. M&A appeal to causation to explain why. Contrary to Humeans about causation, dispositionalists believe that causation can easily be perceived. This perception of causation gives us knowledge of dispositionality as well (causation is dispositional, in fact!) This also, on M&A's view, allows us to further show that dispositionality is a primitive modality. M&A say:

Even in a standard empiricist epistemology, such as Locke's, not all concepts can be analysed. It is allowed that some are primitive. What gives the primitive ones legitimacy is that they are known directly from experience (Locke 1690: II.i.2). The dispositional modality could be acceptable by

empiricist standards, therefore, if it can be known through experience. We will argue that this is the case. (2011: 195)

The fact that causation is perceivable is also argued by other philosophers (such as Ducasse (1965: 177) and Cartwright (1993: 426)), but M&A have something different in mind. Usually, when we see things interacting (a child drinking a glass of milk, a stone breaking a window, etc.), we see instances of causation, which is not something over and above things interfering. This can still be reduced to a Humean model, though. A Humean may say that the fact that we believe we see causation does not prove much (Beebe 2003). But if we perceive causation within our bodies as causal agents and patients, it is easier to hold that causation can be directly perceived (and M&A hold this). In this case, we are not passive observers, rather active ones, since causal processes unfold within our bodies. Causes can be perceived and perceiving them we can grasp their dispositional character. Perceiving causation allows us to know what dispositional modality is. Proprioception and balance are examples of such direct access to dispositionality (see M&A, 2011, chapter 9).

7. CONCLUSIONS

In this final section I shall reiterate the main features of M&A's version of dispositional causation and dispositional modality. I am aware that such an account lacks of details, but it is also true that it is a novel project that leaves space for further development.⁸¹

⁸¹ I reiterate the features mentioned in this chapter, but there are other features, or better discussions of further aspects, that I have not mentioned and that can be found in M&A's 2010, 2011 and 2013.

Causation, on this version of dispositionalism, is a primitive and so a non-analyzable feature of reality. On M&A's view, causation is, in fact, non reducible to something more fundamental, and it consists in the exercise of causal powers (section 3.1). The way causal powers exercise their power is by mutually manifesting with other powers, their mutual manifestation partners (section 3.2). Let me reiterate the example I made above: the powers to dissolve of the water and the solubility of the sugar are mutual manifestation partners for the production of a sweet solution. This is a simplistic example, but one that clearly explain this notion of partnership. This account of causation can be represented via vectors: each power of the water and the sugar and other powers that interact with them (oxygen that is in the glass, for example) can be represented by vectors that have an intensity and a direction, the resultant of the sum of these vectors represent the final effect (the sweet solution) (section 3.3). This account of causation has lead M&A to think about causation not as a relation between a "static" cause related to a "static" effect, but rather as a dynamical feature of reality, where cause and effect are simultaneous (as soon as we put the sugar within the water, it starts dissolving and the water starts becoming sweet). Causation is better conceived this way: causal powers interact and give rise to causal processes, where powers team up, transform themselves and produce some change in the world (section 3.4).

Along with this account of causation, M&A also advance a new theory of modality. Dispositionality is a *sui generis* and primitive type of modality (section 4). It is

Briefly, just to mention a few of them these are: causation by absence (2011: 143), explanation (2011: 130), the logic of causation (2011: 156-174).

presented by M&A as a selection function: it selects the possible manifestation of a given disposition, and the possible manifestations that it selects are just the natural ones (section 5). The reason M&A develop such account of modality is because they believe that causation is free of necessity and that the modal force of causal powers consists of these causal powers as *tending* (and not necessitating) towards their manifestations.

**DISPOSITIONALISM AND ETERNALISM:
POWERLESS POWERS IN A FIXED FUTURE**

Chapter Overview

In this chapter I:

- *Describe the main features of eternalism (section 2).*
- *Consider one of the main objection against eternalism: the no-change objection (section 3).*
- *Explore the combination of eternalism with dispositionalism and raise two problems (sections 4, 5 and 6): eternalism cannot account for the kind of production that the dispositionalist defends; it cannot account for the openness of the future that the dispositionalist requires.*
- *Explore the combination of the moving spotlight view of time with dispositionalism, and conclude that it has the same problems as the combination with eternalism (section 7).*

1. INTRODUCTION TO THE CHAPTER

In this chapter I will discuss the combination of dispositionalism and eternalism. My thesis is that these two theories are at odds. My argument is made of two distinct parts. The first part shows that dispositionalism and eternalism have incompatible conceptions of change. The second part shows that they have incompatible accounts

of what it means to be possible. The upshot is that the combination of dispositionalism and eternalism fails. Before starting, let me say something about the terminology I will use from now on. With “dispositionalism” I refer to the theory of properties I argued for in chapter 1 and 2, and the theories of causation and modality it brings with it (chapter 3).

This chapter is structured in 8 sections. After this brief introduction (section 1), I introduce the standard eternalist view, describing the main aspects and consequences of the eternalist position (section 2). In section 3 I describe a common objection raised against eternalism: the no-change objection that is originally due to McTaggart (1923), and that has since been developed by others (Geach 1972, Lombard 1986, Mellor 1981, Simons 1987). Though the standard iteration of the objection is now seen as largely ineffectual against the eternalist (because eternalists claim that their account of change can account for real change, even though this is change in the block and not of the block), in section 4 I show how the objection is fatal for the dispositional eternalist. In section 5 I introduce a second objection to eternalism, which flows from the fixity of the future, drawing on a presentation due to Diekemper (2007). Again, although this objection to eternalism is typically seen as posing no threat to eternalism itself, in section 6 I show that the objection does rule out dispositional eternalism. In section 7 I will briefly talk about a different view of time: the moving spotlight. I will argue that, because it is a form of eternalism, it too is prone to these objections if combined with dispositionalism. In section 8 I will draw my conclusions. In short, though, I will argue that no eternalist conception of time can sensibly be conjoined to a theory of powers: the temporal extension that the eternalist

posits is at odds with the change and openness required by the dispositionalist metaphysic.

2. STANDARD ETERNALISM

To set the stage, let us begin by introducing “standard eternalism”⁸². What I call standard eternalism is the conjunction of three theses: an ontic thesis, a metaphysical thesis (the B-theory), and a tenseless semantics. Let’s start with the ontic thesis. This is the thesis that past, present and future entities all exist. It can also be described as the thesis that all entities, past, present and future are ontologically alike. These are different claims. One, the first, is an existence claim. If all entities, past, present and future exist, then Lincoln, Trump and the sixtieth president of the United States all exist. In contrast, the second claim is a parity claim. None of the three is less real or less existent than the others just because located at one time rather than another. The three of them are ontologically on a par.

Though I will set them aside for the time being, and discuss them in later chapters, it’s worth just quickly noting here three of the chief rivals that the eternalist faces: the moving spotlight view, the growing block view and presentism. First, presentism is the theory of time according to which only present entities exist (Markosian 2016, section 6). In the presentist framework, Trump exists, but neither Lincoln nor the sixtieth president of the United States exists. Second, according to the growing block theorist, only past and present entities exist. So, Lincoln and Trump exist, while the sixtieth president of the United States does not. Finally, the moving spotlight theorist holds that past, present and future entities exist, but the present is somehow

⁸² I borrow this expression from Miller (2013: 347).

privileged. In fact, present entities are ‘lit up’ by a spotlight—a privileged present—that constantly moves. So, Lincoln, Trump and the sixtieth president of the United States all exist, but Trump is the only one who is illuminated. With a sense of those rivals in hand, let us return our attention to the eternalist picture.

Describing eternalism, Sider (2001: 11) writes as follows and brings out a particularly interesting (for us) feature of the view:

According to *eternalism*, past and future objects and times are just real as currently existing ones. Just as distant places are no less real for being spatially distant, distant times are no less real for being temporally distant; the ontological significance of distance is thus a respect in which time is spacelike.

As Sider makes clear, in the eternalist framework, space and time are very similar. The fact that I am currently in Nottingham does not make Achille, who is currently in New York, any less real or less existent than me just because he is very far from here. I am in Nottingham, Achille is in New York; we both exist, and are equally real. In the same way, the fact that Lincoln and the sixtieth president of the U.S. are located at different times, both far from the time where Trump is located, does not entail anything about their existence. The three of them are equally real; they just occupy different temporal locations. The eternalist would say that the three of them exist *simpliciter*.

Moreover, and this is a point that I will have cause to return to later on in the chapter, just as space is extended, so too is time. There is a dimension of time and objects are spread out across it.⁸³

And so we see that the eternalist's conception of reality consists in a four-dimensional manifold where all the objects, past, present and future exist. To make use of a much deployed metaphor, we can treat reality as akin to a block; a block with one temporal and three spatial dimensions. In this block, where time and space are alike, "now" and "here" are indexicals that pick out their own location. Within the block no object occupies a metaphysically privileged position. Rather, all the objects existing in the block are ordered⁸⁴ and stand in two-place relations: *earlier than*, *later than*, *simultaneous with*. Such relations are called B-relations, and are fixed relations between the objects that inhabit the manifold (or between points in the manifold).⁸⁵ To illustrate: WWI is earlier than WWII. There is a B-relation between WWI and

⁸³ It's equally common to see the eternalist say that there are four dimensions and then to run with this quote from Minkowski: 'Henceforth, space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality.' (1952: 75)

⁸⁴ The series of ordered objects is called the B-series. For further discussion, see McTaggart 1908.

⁸⁵ And this is what the B-theory of time holds (with eternalism being a version of this theory). The B-theory of time is opposed to the A-theory of time, which holds that "there are genuine properties such as *being two days past*, *being present*, etc.; that facts about these A properties are not in any way reducible to facts about B relations; and that times and events are constantly changing with respect to their A properties (first becoming less and less future, then becoming present, and subsequently becoming more and more past). According to The A Theory, the passage of time is a very real and inexorable feature of the world, and not merely some mind-dependent phenomenon." (Markosian, 2016, section 5).

WWII. The relation is fixed in the sense that it was, is and always will be the case that WWI is earlier than WWII. This is an unchanging fact within the block.

Such a conception of reality rules out the idea that time *really* flows. At least, so say some. Let me quote Markosian (2016, section 5):

On this view, there is no sense in which it is true to say that time really passes, and any appearance to the contrary is merely a result of the way we humans happen to perceive the world.

I don't want to engage here with the vexed question of whether time really passes or 'flows' on this model. The debate is long and complex and orthogonal to current purposes.⁸⁶ So, to sum this up in a thesis:

Metaphysical thesis: Objects are ordered by fixed relations (B-relations) within a fourdimensional manifold, and there is (plausibly) no passage;

Finally, I should describe what I take to be the last relevant feature of standard eternalism. This last point concerns semantics. The conception of reality just described usually makes eternalists reductionist about tense. Simply put, eternalists believe that tensed locutions have tenseless truth-conditions (Sider, 2001: 14). An example will help. Let's consider the following statement: "Napoleon fought in Waterloo on the 18th June 1815". The eternalist believes that this statement is true

⁸⁶ For more discussion on time's passage, see Oaklander and White (2007), Olson (2009), Savitt (2002, Tallant (2007, 2010).

because it was, is and will always be the case that Napoleon [tenselessly] fights on the 18th June 1815 and because the current moment, at which we utter this sentence, is later than the 18th of June 1815. This means that propositions about objects do not change their truth values; they are either true or false *simpliciter*.

To illustrate the claim that the existence of tensed sentences can be reconciled with the view that reality itself is tenseless, let me quote Sider at length (2001: 13)

(...) the temporal reductionist claims that temporal locutions are (...) indexicals. ‘Present’ applies to an event iff it occurs at the time of the utterance, ‘past’ to an event iff it occurs before the utterance, and ‘future’ to events occurring after the utterance. (...) Nothing corresponding to tense need be admitted as a fundamental feature of the world.

To be clearer, let me quote Dyke at length:

“The (new) B-theory of time accepts that tense cannot be eliminated from natural language, but denies that this entails that time is itself tensed. Tensed expressions, those that reflect the distinction between past, present and future, and the associated flow of time with respect to this distinction, merely pick out features of our representations of temporal reality itself. (...) tense is a feature of language that picks out no feature of reality. (...) tense is both irreducible, (it cannot be eliminated from language without some loss of meaning) and non-referring (there is nothing in reality to which it refers). (2003: 66)

This semantic aspect of eternalism clearly reflects the ontological and the metaphysical aspects. Objects in the block exist *simpliciter*, that is to say *tenselessly*. This tenseless language reflects the way reality is fundamentally. Our tensed language does not.⁸⁷

Before moving on to a discussion of change, let me briefly recapitulate the main theses (ontic, metaphysical and semantical, respectively) of standard eternalism:

- All objects and times, past, present and future exist (ontic thesis), and are ontologically on a par (parity thesis);
- Objects are ordered by fixed relations (B-relations) within a fourdimensional manifold, and there is (plausibly) no passage;
- Tensed language does not reflect the way in which reality is; rather tensed language has to be reduced to tenseless language by giving it tenseless truth conditions.

Now that the stage is set, and keeping these features in mind, in the next section I will discuss the first objection to eternalism: the no-change objection.

3. THE NO-CHANGE OBJECTION

3.1 CHANGE WITHIN THE MANIFOLD

⁸⁷ This is in contrast with theories of time that take tense seriously: “The verbal tenses of ordinary language (expressions like ‘it is the case that’, ‘it was the case that’, and ‘it will be the case that’) must be taken as primitive and unanalyzable.” (Markosian, 2016, section 5)

There is a famous objection to eternalism (so described): that it cannot account for change. To get a feel for the objection, let us begin by considering the way in which eternalists typically try to account for change. In the next section (3.2) I'll explain why opponents of the view have found this account lacking before showing how this generates a problem for a dispositionalist.

When we talk about change, we talk about objects that lose and acquire properties over time. A case of change is the ripening of an apple: the apple is green at one time and yellow at a later time. The object, an apple in this case, changes its intrinsic properties (assuming that colours are intrinsic properties) over time.

To understand how the eternalist accounts for change, the analogy between space and time described above will help us again for, on the eternalist's view, change of properties over time is like variation of properties across space. An apple, for example, instantiates different properties in its different spatial parts: its skin is red, its flesh is white and its seeds are brown. Different spatial parts of the apple instantiate different properties. In the same way, according to the eternalist, a temporal part of the apple is green at t_1 , another temporal part is yellow at t_2 and another one red at t_3 : different temporal parts of the apple instantiate different properties at different times. Thus suffices for it to be the case that the apple has changed its colour over time. More specifically, this change in the apple consists in the apple having a green part on

January 1st 2016 (and this is a temporal part of the apple⁸⁸) and a part red on January 5th 2016 (and this is a different temporal part of the apple).⁸⁹

I believe that the following two claims are enough to summarise what I have said so far regarding the eternalist's conception of change. These two claims are due, respectively, to Sider (2001: 214) and Tallant (2011: 147).

1. Change *just is* the variation in the (intrinsic) properties of a thing between one time and another.
2. Change over time *is* just like spatial variation.

This leads to the conclusion that, according to eternalists, the qualitative variation of properties across the manifold is enough to account for change. We can sum up this account of change in a principle:

P1: Change of properties over times is like qualitative variation of properties across space.

Let us now move on and consider the objection usually raised against such a conception of change; the accusation that this is not considered to be genuine change.

⁸⁸ For further discussion, see Sider 2001, chapter 5. But also Hawley (2001).

⁸⁹ I am aware here I am using perdurantist language and that the stage theory is an option on the table. In this case, "temporal part" would be replaced by "stage". Although there are differences between these two theories of persistence, I do not believe these to be relevant to the current discussion.

3.2 THE NO-CHANGE OBJECTION

The no-change objection was first raised by McTaggart in his *The nature of Existence*⁹⁰ (1927), and was focused on the refutation of Russell's account of change. Here, I will consider just McTaggart's objection, though many others have developed similar objections taking a cue from McTaggart's.⁹¹ The core of this objection is that eternalism is inconsistent with genuine change. Let us have a look at it in more depth.

Here's McTaggart arguing against Russell's account of change (1927, chapter XXXIII, sections 315-16)

If my poker, for example, is hot on a particular Monday, and never before or since, the event of the poker being hot does not change. But the poker changes, because there is a time when this event is happening to it, and a time when it is not happening to it.

But this makes no change in the qualities of the poker. It is always a quality of that poker that it is one which is hot on that particular Monday. And it is always a quality of that poker that it is one which is not hot at any other time. Both these qualities are true of it at any time—the time when it is hot and the time when it is cold. And therefore it seems to be erroneous to say that there is any change in the poker. The fact that it is hot at one point in a series and cold at other points cannot give change, if neither of these facts change...

⁹⁰ McTaggart's first aim was to show the unreality of time, the no-change objection was just a part of that broader project.

⁹¹ Just to mention again a few of them: Geach (1972), Lombard (1986), Mellor (1981), Simons (1987).

Let us consider the case of another sort of series. The meridian of Greenwich passes through a series of degrees of latitude. And we can find two points in this series, S and S', such that the proposition “At S the meridian of Greenwich is within the United Kingdom” is true, while the proposition “At S' the meridian of Greenwich is within the United Kingdom” is false. But no one would say that this gave us change. Why should we say so in the case of the other series?

Following Sider (2001: 213-214), I will talk about the two different arguments that look to generate this conclusion. The first argument is the *argument from unchanging facts*, the second is the *argument from spatial analogy*.

Here’s the reconstruction of the first argument:

The Argument from unchanging facts:

1. Objects cannot change unless the facts change.⁹²
2. Facts do not change.
3. Therefore, objects do not change.

To illustrate the argument from unchanging facts, let’s consider the example of the apple that I used in the previous section. The first premise of the argument from

⁹² If the object instantiates a property at a particular time, then it is always true that that object instantiates that property at that time.

unchanging facts tells us that the apple cannot change unless the facts about the apple change. So, we should then note that if the apple is green on January 1st 2016, then the fact that “the apple is green on January 1st 2016” is always a fact. This means that this fact (in this case, the fact that the apple is green on January 1st 2016) never changes (this is premise 2). Given that objects cannot change unless facts change (premise 1), and that the facts about the apple do not change, so it follows the apple itself does not change. If the argument works in this case, then it should work in all cases. Thus, the conclusion should be true for all the objects that inhabit the fourdimensional manifold. The consequence of this conception of change would result in a “static universe”.

And so we should turn our attention to the premises. Why believe premise 1? Well, at least intuitively, the apple cannot undergo a change unless the facts about the apple change. If the fact that the apple is green changes, then the object changes. And the apple is placed in a fixed fourdimensional manifold, where facts and objects exist simpliciter. This means that if facts exist simpliciter, these facts do not change, and so neither do the objects, if conjoined to eternalism.

Now to the second argument—the argument from spatial analogy. Here the problem lies in the analogy between the variation of properties across space, and the variation of properties through time. McTaggart holds that when there is spatial variation of properties there is no *genuine* change. To use an example: the poker that McTaggart mentions instantiates the property of being cold at one end and the property of being hot at the other. It would seem intuitively odd to say that the poker has *changed* along its length. Rather, all that we appear to have is some spatial variation in the

temperature property of the poker across its length. Similarly, if that's right, then given the analogy between space and time, we should not say that the temporal variation of properties that an object has over time is genuine change. But, given the eternalist's account of change, it seems that there is no difference between the two. There just is no interesting or salient difference between spatial variation (which is not genuine change) and the kind of variation in properties over time that the eternalist gives us. Given what we have said about the case of the poker, we should therefore conclude that there is no change at all in the eternalist universe.

With this all this in mind, we must now see what happens when a powers ontologist adopts an eternalist view of time.

4. POWERS, CHANGE AND ETERNALISM: THE TENSION

4.1 A QUICK RECAPITULATION

Let us start with a quick recap of the dispositionalist's conception of change that we noted in chapter 3, section 3. Change is thought of as change of properties over time. This *seems* very similar to the account for change proposed by the eternalist. However I believe the theoretical background of these two theories to be very different, and I think that what is in that theoretical background will make it very difficult (if not impossible) to unite an eternalist metaphysics with a powers ontology. What similarities there are, are merely superficial.

Dispositionalists believe that properties are dispositions and, as I mentioned during the first three chapters, that dispositions are causal powers (chapters 1, 2, 3). Powers manifest themselves when they interact with their mutual manifestation partners

(chapter 3, section 3.2). When powers interact and manifest themselves, new powers are thereby generated (chapter 3, section 3). This is what dispositionalists believe to be a causal interaction that produces some change. This is what we took from chapter 3.

So, suppose that I have a cup of tea and a sugar cube. Both the hot tea and the sugar have some unmanifested dispositions: for example, the hot tea has the power to dissolve some substances, and the sugar cube is a soluble substance. As soon as I put the sugar cube in the hot tea, the sugar cube starts dissolving. A causal process starts and both the causal powers possessed by the hot tea and the causal powers possessed by the sugar cube, by causally interacting, give rise to some change. After a few minutes, in fact, we have a tea with a new property: sweetness. We do not have a tea with its initial features, nor the sugar cube with its properties. The interaction between the two has produced a new cluster of causal powers. Old causal powers cease to exist and turn themselves into further new powers. This is *causal production*, and this is a *change*. Old powers go out of existence by transforming themselves into new ones.⁹³

So, let's keep in mind the following principle before moving on:

P2: Change consists in the production of new causal powers, via the transformation of old causal powers.

⁹³ There are equilibrium states that, at least apparently, are no changes. As we have seen in the previous chapter (chapter 3, section 3.4), although equilibrium states (such as a book resting on a table) can be a causal one. There are powers at work that reach an equilibrium. But it can also be said that if the real properties are the fundamental properties of physics, at the subatomic level there is change although it cannot be directly perceived. In both cases, there is causal production.

P2 will be crucial in what follows.

4.2 POWERLESS POWERS

In this section, I will show that the eternalist's conception of change and the dispositionalist's conception of change are at odds. Before we move to the argument, let me remind you of the two different conceptions of change they have:

P1: Change of properties over times is like qualitative variation of properties across space.

P2: Change consists in the production of new causal powers, via the transformation of old causal powers.

The tension between these two principles seems to be quite clear. P1 holds that change through time is analogous to different properties being spread out across space. Properties spread across space as well as properties spread across time are all existent; all are actual. These properties simply occupy different spatial and temporal locations. The fact that different properties occupy different temporal locations is enough to account for change on the eternalist's view.

P2, in contrast, holds that, although change *is* still taken to consist in variation of properties over time, this change *is the result* of causal production. This 'production' results from the transformation of old powers into new ones. Production is a real feature of reality. And the "new causal powers" mentioned in the principle are

manifestations of the old ones. The new powers come into existence when the old ones cease to exist. As we shall now see, this makes some very particular requirements of us.

Change, on the dispositionalist's view, requires that dispositions stop existing in a given form and transform themselves into new powers. If causal production is a fundamental feature of reality, then this is something that has to happen: there has to be *real production* of new powers. There cannot be a manifestation of powers, without this genuine causal production.

Let me introduce the concern with an example. The solubility of a sugar cube at t_1 and its having dissolved at t_n is a putative example of causal production. In order for production to be real and for powers really transform themselves into new ones, it must be the case that the old powers not exist. But, if the solubility still exists (tenselessly, in the block), then it is not the case that this power (this solubility) has been transformed into a new power. If the old power has not been transformed into the new, then (per P2) we do not have change. That being so, since the eternalist framework includes the existence of both the alleged power and its manifestation, there cannot be change—not, at least, if we adopt a powers approach to properties.

The eternalist may reply that qualitative variation of properties across space is enough to account for change, and then it is enough for production. But I believe that it is here that the problem lies. Production, on the dispositionalist's view, is a genuine metaphysical feature of reality. For change to occur, it must be the case that we have the *transformation* of one power into a new power. Change *is* the production of new

powers via the transformation of the old ones. Absent that—and absent that being a *genuine* (and given that we have said that powers are primitive, unanalysable and irreducible, I take ‘genuine’ to include all three of those features) transformation from one power to another, we cannot have change in the block. More, following the earlier chapters (chapter 3, sections 2 and 3.4), powers cannot be reduced to static events/objects.

That being so, any eternalist attempt to reduce production to static events that occupy different locations in the fourdimensional manifold will fail. The dispositionalist idea, here, is that in the dispositionalist framework production is real and fundamental and cannot then be reduced to anything more fundamental. In contrast, in the eternalists’ framework, production *is* analysed in terms of qualitative variation of static objects across the manifold. So if, for instance, the eternalist tries to understand ‘transformation of power’ as a matter of a particular, O being F at t and G at t*, that will fail, for the process of manifesting cannot be reduced to a series of static stages. To repeat myself, production, manifestation, and so on, are taken to be primitive and unanalysable elements of the dispositionalist picture. If the eternalist must analyse them, then the union of dispositionality and eternalism must fail.

Very generally, I think that we can present the rough structure as follows:

1. Assume the eternalist picture of change: that change reduces to an object being F at t and G at t*.
2. For the dispositionalist, manifestations cannot be analysed.
3. Dispositional manifestation is a form of change.

4. For any change, C, if C is an instance of dispositional manifestation, it cannot be analysed.
5. Given 1 and 3, if C is an instance of dispositional manifestation, it can be analysed.

I take it that the conclusion of any such argument is a reductio of *either* the eternalist or dispositionalist accounts of change. At any rate, it serves to show that the two positions cannot readily be combined. There is a clear tension between 4 and 5.

5. FIXITY OF THE FUTURE: A SECOND OBJECTION

5.1 DIEKEMPER'S OBJECTION TO ETERNALISM

In this section, I introduce a distinction drawn by Diekemper (2007) between the fixity of the future, determinism and fatalism. Following Diekemper, I show why, although eternalism does not imply either determinism or fatalism, it does imply the fixity of the future. As we shall see, the fact that eternalism implies the fixity of the future leaves it in tension with dispositionalism. As with my arguments in section 4, I'm happy enough that the eternalist *in general* faces no particular problem here. My goal is narrower: showing that a version of the objection is fatal to the union of dispositionalism and eternalism.

To draw out the pertinent features of eternalism, and set the stage for this section, I will use an analogy that Diekemper develops. This is called the "Road Analogy", and it will be useful for the rest of the discussion. To be clear, in Diekemper's paper he is not arguing against eternalism. Rather, he is diagnosing and discussing an impasse

between eternalist and non-eternalist positions with regards the matter of fixity and fatalism. Let us now turn to a particular helpful passage from Diekemper:

Suppose I am moving along the road from Village A to Village C, which runs via Village B, and my current location is Village B. This description of my spatial location does not imply that Village C, or indeed Village A, are any less real than Village B. On the total spatial picture, my location along the road has no bearing on the ontology of the places that lie along it. The fact that I am ‘here’ in Village B does not say anything about Village B. ‘Here’ is just an indexical that derives its meaning from the context of utterance. So, too, according to the B-Theorist, there is nothing objectively special about one’s subjective temporal location. ‘Now’ is just an indexical, and does not pick out any special property instantiated by the time at which I utter it. World War Three (if actual *simpliciter*) is just as real as my writing of this paper, as is World War Two. For the B-Theorist, a maximal description of existence includes all times along the one dimensional timeline, just as anyone would agree that it includes all places in three dimensional space. (2007: 442)

The fact that the future exists (tenselessly) on the B-theory, seems to suggest that “an existent future implies a fixed one”⁹⁴ (2007: 429), at least for those who aim to defend

⁹⁴There are a numbers of replies to this kind of worry (see, for example, Mellor, 1998), so against the idea that an existent future is a fixed one, but, along with Diekemper, I found them not convincing and not relevant in this context.

the objectivity of time passage⁹⁵. This fixity of the future, according to Diekemper, is the most counterintuitive feature of eternalism.

Notably, the fact that the future could have been different is not enough to make this problem go away, or render the future ‘open’. As Diekemper puts matters “the metaphysical contingency of the fixity does not make it any less counterintuitive” (2007: 443). Our temporal experience seems to suggest that the past is fixed (since nothing can be done to change it), while the future is open (since it is not here yet). Modally speaking, we might be inclined to say that the past is necessary, while the future is “merely potential” (Diekemper, 2007: 430). In order to make clear what fixity is, following Diekemper I will compare it with two other doctrines: determinism and fatalism.

First and most importantly, “a fixed event is neither equivalent to a causally determined event nor to a fated one” (2007: 432). Roughly, on Diekemper’s view, ‘being fixed’ means ‘being actual’; therefore, fixed events are actual events (and vice versa). If all the events exist *simpliciter* in the manifold, then they must be actual. Since the ontological status of future events is the same as the one of past and present events, this means that the future is fixed in the same way the past and the present are. So far, so good.

How does Diekemper think that fixity then differs from determinism?

Determinism is the doctrine that a complete description of the state of the world at any time, could, in principle, be derived from a complete description

⁹⁵ These are the A-theorists of time and I am going to focus on their theories in the next two chapters.

of the state of the world at any other time and a specification of the laws of nature. (Diekemper, 2007: 431).

In other words, the fact that an event is fixed does not imply that it is causally determined. Fixity is a doctrine concerning only the *nature* of events in time, while determinism, as is clear from the quotation, is the doctrine according to which it is possible to have a complete description of the world at any time t if we have a complete description of the world at any earlier time. This does not imply that the complete description is a description of *actual* events (a view of time according to which the future does not exist could nonetheless be one according to which the future is nonetheless determined).

This should be enough to show that although the two doctrines can be connected, one does not imply the other, since a causally determined event does not have to be an actually existing event. For example, if causal determinism is true and I had a complete description of the world as it is now, I would be able to have a complete description of the world as it will be in 2050. But the fact that I can have the complete description of the world in 2050 does not imply that the state of the world in 2050 is actual and so does not imply that it is fixed.

So to our next question: how is fixity different from fatalism? Following Diekemper, I shall take fatalism to be a position that denies that there is free will, thus making fatalism “by definition, an agent centred doctrine” (2007: 432). There are three broad categories of fatalism, thus understood: the logical, the ontological and the theological. Logical fatalism is about the logic of future directed propositions, which already have determinate truth-value, and we do not have the power to change – this

means that we don't have power over the future. Ontological fatalism holds that the ontology of future events nullifies human freedom (perhaps because these events are causally determined, assuming incompatibilism, or perhaps because they exist eternally) Finally, theological fatalism holds that God's knowledge of the future, again, nullifies human freedom. The fact that an event is fixed does not mean that it is (logically, ontologically or theologically) fated. If the future is fixed, it could be fixed also if there were no human beings (remember that fatalism is an agent-centred doctrine). Fixity does then not imply fatalism. Again, fixity is a doctrine about events.⁹⁶ It is fixity with which we are concerned here.

Let's now consider again Diekemper's Road Analogy (outlined above) and its relation to the fixity of the future. Let me quote Diekemper at length:

Given B-Theoretic ontology, the parameters of the road analogy are such that, i) it is impossible to get off the road, ii) it is impossible to stop moving long it, iii) the road is not under construction, but it is complete and cannot be destroyed, rerouted, etc. and iv) it passes through Village C at mile marker 30. (2007:443)

The possibility of an alternate history containing an alternate future is not a possibility for me (...) the possibility for me avoiding Village C at a mile

⁹⁶ Even though, as Diekemper claims, "generally, in some cases it is plausible that there is an intimate relationship between a fixed future and fatalism; (...) this intimacy obtains in the case of eternalistic ontological fatalism." (2007: 437) Although these doctrines can be related, in this context we are not interested in their relationships, but rather on the concept of fixity of the future, so it is important to keep in mind that and how they differ between each other.

maker 30 may exist in a world in which the road takes a different course, but there is nothing I can choose to do that would make such a world accessible (...) The future as unfolding in a way that she is *powerless to avoid*. (2007: 445) (emphasis mine)

The road passes through Village-A, Village-B and Village-C. This road is the only accessible road, and although there could have been a different road, this is not the case. There is one single actual road we can walk on.

Usually, according to eternalists, the fact that the road could have been different is enough to account for the openness of the future. Eternalists believe that although actual, the future is not necessary. Mellor (1998:20), for example, claims that for each actual moment in the manifold there are many possibilities, but just one series of actual facts. This amounts to saying that the future is fixed (in Diekemper's sense), but merely contingently. By way of an example: at a particular moment, say 10AM on August 19, 2015, there are many possible futures and only one past relative to it. But although there are many possible futures relative to that moment, according to Mellor, only one of them is actual.⁹⁷

Thus, from eternalism we can extract P3:

P3: All the events/objects, past, present, and future that exist in the manifold, are actual (fixed) events.

P3 will be central in what follows.

⁹⁷ For further discussion, see Mellor 1998.

6. ETERNALISM, DISPOSITIONALISM AND POSSIBILITY

6.1 DISPOSITIONAL MODALITY: A QUICK RECAPITULATION

My main objection here will be that the fixity of the future is not compatible with the kind of openness that the dispositionalist requires. Before moving to my objection, let me recap the aspect of dispositionalism most relevant to the objection itself: dispositional modality. The dispositional view of properties that I described in the previous chapters (chapter 2 and chapter 3) conceives of properties as *tendencies*. This conception of properties gives rise to dispositionality: a *sui generis* type of modality that Mumford and Anjum (2011) describe and defend, and that I described in chapter 3.

M&A claim that dispositional modality (or dispositionality), is the modality that “governs” reality. Using M&A’s words (2011: 104):

Causation typically involves change, and this means a change of properties. For dispositionalists, that is also a change of powers. (...) New powers come from old ones, therefore, and this is how we have a changing, dynamic world. The regular nature of such changes is often called nomological, though we think the powers alone can do all the work. Certainly calling such regularity in behaviour lawlike adds nothing of explanatory value that powers do not have already.

In order to drill down into the details of my argument, let's have a look at the main characteristics of this dispositionality. First of all, M&A claim that dispositional modality is

sui generis and irreducible (2011: 189)

and we can

truly speak of dispositionality only by using "dispositional terms".

Also, M&A stress the fact that their theory concerns just

natural de re modality, which is free of necessity (2011: 183).

Again, as I already said in the previous chapter (chapter 3, sections 4 and 5), for M&A, dispositionality can be placed half way between necessity and possibility (2011: 193): although dispositionality is free of necessity, it is different from mere metaphysical possibility. In fact, they say that we can think of dispositional modality as natural possibility⁹⁸. For example, if something is soluble then it is (naturally) possible that it dissolves. In contrast, it is not true that pigs are disposed to fly, even

⁹⁸ Natural possibility is different from logical possibility.

though it is possible that pigs could fly (“ (...) in the sense of pure, logical possibility” M&A, 2011: 181).⁹⁹

With all of that made plain, we now need to make sense of this ‘tending’ and the nature of dispositional modality itself. In the words of M&A, dispositionality,

is a function that selects, from all the many possible things that could occur – in the broadest sense of could – the subclass of possibilities that is disposed to happen. (...) this does not entail that those possibilities must happen; it is *only* that they are disposed to happen. (2011: 191)

In fact, they say that

Dispositions thus open a horizon of possibility (...) In the sense of natural possibility, therefore, it would actually be the case that if F is possible then there is a disposition towards F (...) what is naturally possible is what is disposed to happen. (...) The reality of dispositions seems to provide (...) a grounding of natural possibility. (...) Not everything is naturally possible; only certain possibilities are disposed towards by the things that exist in nature. (2011: 180-184)

A little later on they say:

⁹⁹ For further discussion, see Mumford and Anjum 2011 pp.179-183.

Dispositionality, it will be suggested, can be understood as a sort of selection function - a *natural* one in this case - that picks out a limited number of outcomes from all those that are *merely* possible. (2011: 189) (emphasis mine)

To reiterate (see chapter 3, sections 4 and 5), these *mere* possibilities, if not yet manifested, are just that; they are *mere* possibilities; they are non-actual.

Finally, powers collectively do all the causal work that is to be done and are responsible for causal production, and are “modally forceful” (chapter 3). Pulling all of those remarks together allows us to formulate the following principle.

P4: Present properties tend toward merely and naturally possible (future) states.

As before, this principle will be crucial.

6.2 ETERNALISM AND DISPOSITIONALISM ON POSSIBILITY: THE TENSION

To reiterate, the two principles of actuality and possibility due to eternalists and dispositionalists are the following, respectively:

P3: All the events, past, present, and future that exist in the manifold, are actual (fixed) events.

P4: Present properties tend towards merely and naturally possible (future) states.

P3 holds that everything is tenselessly in the manifold. This principle discloses a universe of actuality; the universe is fixed because it is actual. In contrast, P4 holds that the outcome of powers interacting together is not fixed; it is not actual. As M&A say, this dispositional picture opens a horizon of natural and *mere* possibility. This is a clear tension.

To work through some of the details of the tension, and make clear just how serious it is, let's consider an example. The event of Caesar dying after having been stabbed by Brutus, from my perspective, exists in the past. I would not say now, in 2016, that Caesar *tends to die* (because stabbed by Brutus) in 44 BC. Rather, I would say that Caesar *tended to die (and then died)* in 44BC. This is not a *tending*, properly understood, because the two events (the stabbing and the death of Caesar) exist; they are both actual. The death of Caesar is a *fixed* event, because it is in the past. It could have gone differently, to be sure. Brutus could have decided not to kill Caesar. But it went as it went and nothing can change this fact. The death of Caesar is a realized possibility, an actual and fixed event and not a merely possible one. There is no natural possibility of this event not taking place.

To show the difference between a fixed event and a tending, let's now consider an example of a present event that genuinely tends towards a (merely and naturally possible) future event. From my perspective, I would say that the yellow leaf that is *now* hanging on the tree in my garden *is tending* towards falling. In this case, it seems right to talk about a tending, as it seems right to say that that leaf has the power to fall

from the branch and that this power is real, because, as we shall see later in the year, that leaf will (probably) fall at some point. To say this with M&A's words, this is a natural possibility and is a consequence of the leaf having the powers that it does. Now think about the fourdimensional framework, where all events exist tenselessly. If we adopt such a framework, then this means that the leaf's falling exists tenselessly as well as Caesar's death. Both Caesar's death, which from my point of view is a fixed event in the past, and the leaf's fall, which in my perspective, will (probably) fall in the future are ontologically on a par; they are equally real events. In this framework, then, things do not *tend* to be, they just are: tenselessly.¹⁰⁰

Finally, let's recall the road analogy drawn by Diekemper: the road that goes through village A, village B and village C. Keep in mind what Diekemper says about it: the three villages are equally real. The fact that I am located at village B does not make village A and village C less real. So, let's consider now a slightly different version of

¹⁰⁰ Here there is a deep connection with language. If it is true that, as M&A (2011) say, we can "truly speak of dispositionality only by using "dispositional terms" ", then it seems that dispositionalism must hold that tensed language is the language that reflects the way reality is. Dispositional language makes sense only from a "present perspective towards the future". The sentence "the leaf is tending to fall" reflects the way reality behaves, on the dispositionalist's view. Tensed language seems to be metaphysically significant, in the dispositionalist's framework. On the contrary, in the eternalist framework, if I utter the sentence "the leaf is tending to fall" this does not have any metaphysical significance, since it just depends on the location I occupy in the block. The fact that I say at t1 that the leaf is tending to fall in the future does not reflect the way in which reality behaves in the eternalist framework, since the fall of the leaf is "tenselessly actual". Keep in mind that in the fourdimensional manifold facts are fixed, and therefore propositions have their truth values tenselessly.

the Road Analogy. Suppose that village A is the death of Caesar, village B is the village I am now in (looking at the tree in my garden) and that the falling of the leaf is village C. The fact that I am in village B, looking at the leaf hanging on the tree in my garden, on the eternalist's view, does not make less real either village A, the death of Caesar, or village C, the leaf's falling. This is just a "temporal reading" of the Road Analogy: all the events are fixed, both village A (the death of Caesar) and village C (the falling of the leaf) exist *simpliciter*, and the fact that I am village B makes me describe the two events in different ways, but they are both there, equally real, fixed. Again, the road could have been different, those villages could have been different, but still the actual road is the only available path – so the route, although not necessary, is fixed.

Events in the block are, thus, actual; in Diekemper's terms, fixed. And if events are fixed, tenselessly fixed, then they cannot be a "tending towards" some state, for in order for x tend towards y, y cannot exist. An existing event is a fixed event and if y is fixed then we cannot merely tend towards it—not, at least, as M&A think of tendings. "Tends" seems to presuppose a temporal perspective of privilege. Eternalism, as we have seen, does not give us that.

7. MOVING SPOTLIGHT AND POWERS

In this last section, I quickly consider a different view of time: the moving spotlight. This is a view of time that sometimes is seen to be neither purely eternalistic nor presentist. Since the aim of this thesis is to test this version of dispositionalism with all (standard) views of time, I need to discuss this position as well. The reason why I am talking about such a view in this chapter will become clear in a moment. Before

moving on, though, let me clarify something: there are different versions of the moving spotlight view, but I will describe what I believe to be¹⁰¹ the standard version of it.

The (standard) moving spotlight theory holds that the past, the present and the future are ontologically on a par, but believe that the present has some metaphysical privilege. This view is sometimes seen to be a halfway-house between eternalism and presentism, since it claims that the past, the present and the future are all equally real, but that the present is an irreducible feature of reality.¹⁰² On this view, the present moves along the fourdimensional manifold that I have described above. Imagine the eternalist block full of ordered events/objects and a light that progressively illuminates those events/objects. The illuminated events/objects are the present ones and “presentness” is believed to be an objective property that those illuminated events/objects instantiate. To be clearer, let me quote Broad, the first defender of such a view:

We are naturally tempted to regard the history of the world as existing eternally in a certain order of events. Along this, and in a fixed direction, we imagine the characteristic of presentness as moving, somewhat like the spot of light from a policeman's bull's-eye traversing the fronts of the houses in a street. What is illuminated is the present, what has been illuminated is the past, and what has not yet been illuminated is the future. (1923:84)

¹⁰¹ Following Miller 2013.

¹⁰² Roughly speaking, the presentist is one who believe that only present objects exist, and so that the present is the only time existing. I will focus on this theory of time in chapter 6.

The reason why I mention this view of time in the current chapter is because I believe it to be just a variant of eternalism, even though it is sometimes described as a version of the A-theory of time (chapter 4, section 2).¹⁰³ This naturally suggests a question: if this is a version of eternalism and it is combined with powers ontology, then is it affected by the same kind of tensions that I described above? I'll argue that it is. Let's see why.

The first tension I described was about the different conceptions of change. In the fourdimensional block all events/objects exist *simpliciter* and change is qualitative variation of properties across time. The moving spotlight view must share with eternalism this conception of change. In the powers ontology framework, change is causal production: powers interact and by interacting cease to be the powers they are and turn themselves into new ones. Powers progressively make/produce the world. The fact that events are lit up by a moving spotlight is not enough to account for the kind of production the dispositionalist wants to defend. Again, in the moving spotlight framework, we can see an actual block full of existing events/objects some of which are illuminated, some of which were illuminated and some of which will be illuminated. The light does not produce anything, it merely lights up events.

¹⁰³ See, for example, Skow (2009): “Roughly speaking, A-theorists say that there is some absolute (that is, non-relative) distinction between the past, present, and future. B-theorists deny this. The moving spotlight theory is one version of the A-theory of time. But it is not the most popular. Instead, most A-theorists prefer presentism—the view that everything that exists is present. (In fact, while many people defend presentism, I do not know of any contemporary defenders of the moving spotlight theory.)” (Skow, 2009: 666-667) Though there is now Cameron (2015).

The second tension I described was about the fact that within the block, dispositional modality loses its force: it would not be able to “drive” reality as the dispositionalist wants. The same tension would affect the combination of powers ontology with the moving spotlight view of time. The light that moves along the block illuminates objects/events, but does not confer any modal force upon reality. The union between dispositionalism and the moving spotlight view of time is just as problematic as the union of dispositionalism and eternalism.

8. CONCLUSIONS

In this chapter, I’ve argued that eternalists and dispositionalists have two very different conceptions of change. The eternalist believes that change can be analysed, while the dispositionalist holds that it is a fundamental feature of reality and is a consequence of causal production. Also, I have shown that a dispositionalist cannot accept the fixity of the eternalist manifold, since this is at odds with dispositional modality.

I believe that in both cases (change and possibility) the trouble is caused by the temporal extension defended by eternalists. First, the extension of time does not allow powers to genuinely transform themselves and produce new powers; if all powers exist in the block simpliciter, then there cannot be production (and, of course, genuine transformation of powers). Second, this temporal extension gives us fixity which, as already said above, is not compatible with a dispositional modality; which is a modal force that every single power possesses and through which it acts in the world.. That

being the case, no eternalist conception of reality—one that treats past and future objects as equally existent—can be adopted by the dispositionalist.

**DISPOSITIONALISM AND THE GROWING BLOCK VIEW:
PRODUCTION WITHOUT TRANSFORMATION**

Chapter Overview:

In this chapter I:

- *Briefly mention the main differences between a static and a dynamic conceptions of time (section 2); and individuate the ontic and the metaphysical theses of the Growing Block View of time (not the semantical one, since there is no accordance among different versions of the Growing Block theory) (section 3);*
- *Argue that in the Growing Block theory of time there is production without transformation of properties, and that for this reason the Growing Block account cannot satisfy P2 (section 4);*
- *Argue that the Growing Block view is compatible with dispositional modality (section 5);*
- *Explore the combination of the dispositional Growing Block view and time travel and argue that it leads to undesirable results (section 6);*
- *Consider a common objection to the Growing Block view (the epistemic objection) (section 7) and a reply to it (the Dead Past Hypothesis – Forrest, 2004), and show that in a dispositional framework, this reply generates further problem to the union of the Growing Block account and dispositionalism (section 8).*

- *Conclude that there is no way to reconcile the Growing Block view and dispositionalism (section 9).*

1. INTRODUCTION TO THE CHAPTER

In the previous chapter, I explored the intersection between eternalist B-theory and dispositionalism, and showed that a dispositionalist should not endorse an eternalist view of time. Eternalism cannot account for the dynamism of reality and the openness of the future that a powers ontologist defends. The same goes for the moving spotlight theory of time, a theory which holds the same ontic thesis as B-theoretic eternalism, but which adds a moving present. It is, as we saw, this ontic thesis that creates the tension between powers ontology and eternalism.

In this chapter, I will to explore another possibility: I will focus on the combination of powers ontology, as described in the previous chapters, with a different theory of time: the Growing Block view. Contrary to eternalism, GB is considered to be a dynamic view of time and adopts a different ontic thesis.

Just as I did in my discussion of eternalism, I will argue that it is the GB's ontic thesis that is problematic when combining GB with dispositionalism. Although there are various versions of the growing block view of time, I will individuate a common ontic thesis that all agree with, and I will show that the combination an ontology of powers and GB is to be rejected because of this ontic thesis. Even though GB *can* account for the openness of the future that the dispositionalist aims to defend, it cannot account for the kind of causal production advanced by dispositionalists.

I will divide the chapter in nine main sections. In the previous chapter (chapter 4) I focused on eternalism, a static view of time; in this chapter I will focus on a dynamic view of time, the Growing Block view. For this reason, in section 2 of this chapter I describe the main differences between a static and a dynamic conception of time for the GB view is a dynamic theory of time (this will be useful for the rest of this chapter). I will individuate an ontic thesis and a metaphysical thesis common to all GB versions (I do not individuate a semantical thesis common to GB theories, since I do not think that there is widespread agreement) (section 3). I will then show that GB can partially satisfy the dispositional principles I individuated in the previous chapter. Although GB is at odds with the dispositional principle about production (P2), and another fundamental dispositional principle (the Eleatic test of reality) (section 4), it can satisfy the principle about the openness of the future (P4) (section 5). At this point, I will make a quick digression on time travel, GB and powers. I show that time travel is not possible within a dispositional growing block framework (section 6). Finally, I will briefly consider the most common objection to GB (the epistemic objection) and a possible reply to it (the Dead Past hypothesis due to Forrest 2004), and show that instead of overcoming the difficulties, it creates more problem for a dispositional Growing Blocker (section 7 and section 8). I will then conclude that GB and dispositionalism cannot be reconciled (section 9).

2. STATICITY AND DYNAMISM

The main difference between GB and eternalism is that while eternalism is a *static* view of time, GB is a *dynamic* one. In the current section, I will briefly explain the difference between staticity and dynamism within the philosophy of time.

Those who advocate a static view of time (and reality) claim that past, present and future do not differ with regard to their existence: there is no ontological difference between them – all times all simply exist. To put it simply, according to them, time does not flow, and the world is a ‘block’ where all the events exist tenselessly. This means that there is not an intrinsic direction to time itself and that, therefore, time itself is not intrinsically asymmetric. The asymmetry and the direction of time (if indeed time *is* asymmetric and has a direction) are given by patterns of events, and/or by the temporal relations between them. Points in time are like points in space. On the contrary, those who advocate a dynamic theory of time argue that past, present and future are ontologically different and that there is a constant change as to which moment in time is absolutely and mind-independently present. According to this view, time really does flow: it is intrinsically asymmetric and has a direction. Time’s passage is a real feature of the world, and not just a matter of relations between events.

These two different conceptions of time correspond to two different conceptions of how the world changes. The static theorists believe that for an object to change is simply for it to have different properties at different times and similarly for the world as a whole; the totality of the facts exist *simpliciter*. According to dynamic theorists, however, at each moment what the whole of what exists changes. This means that for the dynamic view, the totality of facts is different at different times: what facts there are depends on what time it is, and the facts that are actual as of a time are different from facts that are actual as of another time. Whereas for the static view, change cannot be a matter of a change of what states of affairs exist, but simply consists in

the possession by objects of different intrinsic properties at different times, for the dynamic theory change is a matter of genuine production; new events come into being.

Though it is clearly a dynamic theory of time, GB retains certain features that we found in eternalism. Let's see what GB consists in

3. GROWING BLOCK VIEW OF TIME: ONTIC AND METAPHYSICAL THESES

One of the intuitions on which the Growing Block theory of time relies on for motivation is that there is an ontological asymmetry between past and future: while the past is fixed and determinate, the future is not, it is open; and this is because while past and present entities exist, future entities do not. (Tooley 1997, Button 2006, Briggs and Forbes 2012). For example, according to a GB theorist, on the list of what exists there are both dinosaurs and Prince George, but the 70th president of the U.S. is not on the list.

I want to focus on the ontic thesis defended by GB in order to bring out the fact that it is a dynamic theory. To use Briggs and Forbes (B&F henceforth) words, as they in fact defend a GB theory of time, GB is a view that

(...) is committed to the (tenseless) existence of past objects and events, but not to the (tenseless) existence of future objects and events. (...) present things are the last things the Growing-Block theory takes seriously. (2012: 258)

Given such a view, it is clear that this view is dynamic. The totality of what exists at this time will not be the same as the totality of what exists at some later time. The ‘last things’ that B&F mention are not fixed and static. What is ‘last’ changes as we add facts to the growing block of reality.

Thus, philosophers who defend this view of time, have developed an intuitive account of ontology: reality is a fourdimensional block that grows as time passes. The present adds new entities to the block, that grows bigger and bigger as our ontological commitments grow (new things come into existence as time passes). Call our ontic thesis the thesis that past and present objects exist. This ontic thesis is one that all GB theories share.

Ontic thesis: only present and past moments (and then present and past objects) exist, future moments (and then objects) do not.

The second thesis that GB theories share is metaphysical: it is the thesis that time passes. The (above) described addition of facts to the block *is* the passage of time: it is a real feature of reality. And these two features (the ontic thesis that past and present objects exist and the metaphysical thesis that time passes via the addition of facts to the block) are based on two related intuitions: the intuition that the future is open and the past is closed, determinate; and that time really seems to pass.

On the growing block theorist’s view, then “(...) the world includes a dynamic reality with an evanescent present.” (B&F, 2016: 3) Braddon-Mitchell (2004: 199) describes this view as follows:

The future is unreal: it does not exist. The past however does exist – it is a space-time volume of the kind that orthodox four dimensionalists think that the universe is as a Parmenidean whole. The present is a kind of hyperplane that borders reality; it is the edge of Being. As time goes on, the volume of the universe increases. Think of it as a kind of (four-dimensional) growing salami. The universe starts out with a single slice, and as time moves on slices are progressively added to it.

And so we have our metaphysical thesis.

Metaphysical thesis: at each moment what exists change: the block grows bigger and bigger with the addition at each moment of a new present, which is at the edge of the block – the boundary between the past and the future (the present is a special moment).

Individuating a common a semantical thesis is harder than for eternalism, since theories mainly differ regarding this thesis.¹⁰⁴

¹⁰⁴Let me say why I do not individuate a common semantical thesis. In what follows, I will offer only a cursory examination of some of the differences. Among GB theories the semantical aspects are quite different, although they all agree on the ontic and metaphysical theses. We would expect that in such a dynamic view we would have tensed propositions that supervene on the tenseless ones, if semantics has to reflect the way reality works. But among GB theorist we find Tooley, for example, who clearly holds a GB ontology and metaphysics, but who believes that tensed propositions supervene on tenseless ones, and this is a view usually defended by tenseless accounts (standard eternalism, for example, as we have seen in the previous chapter, section 2). On Tooley's view, the dynamic

4. PRODUCTION WITHOUT TRANSFORMATION

In this section I will present a first argument to test the intersection of dispositionalism and GB. As I have done for eternalism, I will start from the dispositional principle about causal production and show that this cannot be satisfied by GB.

Prima facie, there is in fact no problem. The future is not existent and this means that new powers can be produced by present powers as time passes. We can give colour to this claim very easily. If we think about Tooley's GB theory, for example, causation occupies a very important role. On his view, in fact, "causation lies at the very heart of time" (1997: 31), inasmuch as the direction of time is to be defined in terms of the direction of causation. He claims:

conception of reality is compatible with a tenseless semantics (he in fact accepts an hybrid view where there is both an actuality simpliciter and an actuality as of a time, there are no tensed properties that make true tensed propositions, rather "it may simply be a world where what tenseless states of affairs are actual is different at different times" (1997: 20) He claims that the present is the point where possibilities become actualities, and what becomes actual remains actual onwards. Button (2006) believes that tense is necessary and it is fundamental (contrary to Tooley), tensed facts are fundamental. There are also people like B&F who are linguistic ersatzists (like Bourne), who believe that there are no future objects but that there can be truths and falsehoods about the future, by using times in the same way Lewis uses possible worlds (for further discussion see B&F 2012). Fortunately, so far as I can tell, nothing will turn on our choice of semantics: my arguments against the union of GB and dispositionalism will go through regardless. Let's now see what happens when we try combining GB with dispositionalism. The interested reader might survey the differing semantics taken by Briggs and Forbes (2012), Button (2006) and Tooley (1997).

Given a satisfactory account of causation, it turns out to be a necessary truth that causes bring their effect into existence. So events can be causally related only in a dynamic world. Causation is basic both to temporal order and to the passage of time. (1997: 31)

It thus seems as if it will be straightforward to combine GB with dispositionalism. After all, both these theories hold that causation is central and both uphold the thesis that reality is dynamic. Things are not so straightforward, though. Let me remind you of the causal dispositional principle that I focused on in the previous chapter:

P2: Change consists in the production of new causal powers, via the transformation of old causal powers.

Now to the argument:

1. If only present and past entities exist, then what is present changes; new entities come into existence becoming present and old entities become past.
2. New entities come into existence becoming present and old powers keep existing and become past.
3. Genuine production is possible only if old powers stop existing by transforming themselves into new ones. (P2)
4. This (new entities coming into existence by becoming present and old powers keeping existing and becoming past) does not happen via transformation of old powers into new ones but only by adding new things to the block.

Thus,

5. There is no transformation of old causal powers.

There is thus no genuine (dispositional) causation in a growing block.

We should now work through the argument. On the dispositionalist's view, as described in chapter 3, there is causation when (a set of) powers turn themselves into new powers. For example, a sugar cube is soluble, water has the power to dissolve. When we put the sugar cube into a glass of water, the sugar cube and the water interact, being mutual manifestation partners, and acting together, their powers give rise to a causal process. The causal process consists in a change of powers: the solubility of the sugar cube and the power to dissolve of the water cease to exist as such powers, and *change turning themselves into new powers*. The result is a sweet solution that has *new causal powers*. For example, when combined with blood, it makes the glycemic values to rise. For there to be genuine causal production, as the dispositionalist wants, those powers really have to manifest and cease to exist as dispositions. The growing block view, though, is a hybrid theory that keeps the past fixed and existent and the future open and non-existent.

It is clear where lies the problem: the growing block theorists claim that new instants make the block bigger and bigger, but that past powers do not genuinely turn into new ones. Rather, these new putative powers come out and are additions to the block (and these static parts added at the edge of the block.)

So, roughly, the dispositionalist holds this:

Powers at T1 → Powers* at T2 → Powers ** at T3

Powers that exist at t1 interact and transform themselves turning into powers that exist at t2 and powers that exist at t2 turn themselves into powers that exist at t3, etc.

In contrast, the GB theorist holds that:

Powers at T1

Powers at T1 + Powers* at T2

Powers at T1 + Powers* at T2 + Powers** at T3

Although there is production in both the pictures, it is not of the same type. While in the dispositionalist framework causation is the transformation of some powers that produce new ones by literally turning themselves into new powers, in the GB framework, new powers come into existence (from where?) and old powers keep existing. Simply, then, the two models are very different.

But this is not the only problem that affects the combination of dispositionalism and GB. As we have seen, according to GB, the past contains existing entities that do not change. Those entities, in fact, are causally inert, since these powers lose their power to act (a past power does not (now) cause anything to happen, after all). This will create problems. The dispositionalist believes that in order to exist something has to

be causally powerful, so it has to have the potency to make some change in the world. However, the past is a realm where nothing can change. And although fixed, on a GB theorist's view, the past is existent. If the past cannot change, though, it means that the "powers" that inhabit the past are causally inert. And this is something that a dispositionalist cannot accept; powers are essentially powerful. A causally inert power is not a power.

In fact, we can make the argument even stronger. The Eleatic test of reality, one of the dispositionalists' principles, states that the only things that are real are those that are causally powerful (so those that have the power to make some change in the world)¹⁰⁵. If we combine GB and dispositionalism we would then have the following contradiction:

1. In order to exist, entities have to be causally powerful (Eleatic test)
2. Past entities exist but are causally inert (GB ontic thesis)
3. In dispositional GB past entities both exist and do not exist

Premise 1 is held by the dispositionalists that I am focused upon: it is the Eleatic test of reality (chapter 1, section 7) and it is one of the most fundamental principles defended by dispositionalists.

Premise 2 can be easily defended, I think: on a GB theorist's view, dinosaurs exist, they are in the past. Can they produce some change in the world now? No. Can

¹⁰⁵ See chapter 1, section 7, for further discussion.

dinosaurs causally interact with anything? No. That being so, a dispositionalist could not accept their existence.¹⁰⁶

5. AN OPEN FUTURE

The second fundamental dispositional principle, as noted in chapter 4 (section 6.2) is the one about the openness of the future. Let me reiterate:

P4: Present properties tend toward merely and naturally possible (future) states.

The GB theory preserves the common intuition about the openness of the future. As we have seen, in fact, the GB ontic thesis states that while the past and the present are existent and therefore fixed, the future it is not. The “GB future” does not exist and for this reason is non-fixed. This idea can definitely accommodate P4.

Schematically:

1. If the future is open (not fixed), then it is a realm of mere possibilities;

¹⁰⁶ And although I do not explicitly state it in the previous chapter, this problem also looks as if it affects the combination of dispositionalism and eternalism. In an eternalist framework, all entities exist *simpliciter*: all entities occupy a “static” location in the block and nothing new is generated. All of the powers instantiated by those entities are then causally inert, since in the block there is no change as conceived by dispositionalist. If something does not have the power to produce some real change in the world, it cannot be said to exist “properly”.

2. In order for dispositional modality to “guide” reality, the future has to be open;
3. In the GB’s picture the future is open.
4. Dispositional modality can ‘guide’ the GB open future.

So, although GB ontic thesis and P2 are at odds, GB and P4 are not. GB can then partially satisfy dispositionalism, but it is not sufficient to be a suitable theory of time for a powers ontologist. That said, another problem with openness lurks for the GB theorist. In the next section I discuss a time-travel case that seems to bring the problem to the fore.

6. NO POWERS IN TIME TRAVEL

In his 1976 article on the Paradoxes of Time Travel, Lewis argues that time travels is possible. In this section, my aim is to show that in a dispositional GB framework time travel would not be possible. I will first show, following Lewis, why time travel should be possible (8.1), and then show how combining this possibility with the GB picture and causal powers generates a problem (8.2).

6.1 IS TIME TRAVEL POSSIBLE?

Lewis defends the possibility of time travel and he does it by showing why the argument that proves that time travel is not possible is flawed. His starting point is, in fact, the following argument:

P1 Time travel generates some paradoxes

P2 If time travel were possible, then those paradoxes would be possible.

P3 Paradoxes are not possible

C1 Therefore time travel is not possible.

Lewis's first aim is to reject P1. He considers three paradoxes and shows why those paradoxes are not in fact paradoxes. I will quickly explain each paradox and Lewis's responses, and take that to show that time travel is possible.

First alleged paradox. Suppose that Tim is a guy that lives in 1985 and that he travels forward in time arriving in 2025. If he is a genuine time traveler, then the journey to arrive in 2025 took less than 40 years (otherwise, if it took 40 years, we are all time travelers in this sense). But if Tim is a 'real' time traveler and his journey took less than 40 years, then this seems to give rise to a first paradox. If Tim's journey took less than 4 years, say 1 minute, if time travel is possible, then the time that separates Tim's departure and Tim's arrival is 1 minute. But if time travel is possible it is also true that Tim's departure and Tim's arrival are 40 years apart. But the time that separates Tim's departure and Tim's arrival cannot be both less than 40 years and equal to 40 years. For this reason, it seems that time travel is not possible. Lewis's response to this first paradox is that there are two kinds of times: external time and personal time. Personal time is the time measured by Tim's watch, while external time is *real time*. And these are not two time dimensions, Lewis says:

Clearly we are not dealing here with two independent dimensions. Just as distance along the railway is not a fourth spatial dimension, so a time traveler's personal time is not a second dimension of time. (1973: 146-147)

First paradox solved. Now to the second paradox: the paradox of causal loops. The main idea here is that things come out from nothing (Lewis talks about 'uncaused information'). It's now 2017. Suppose that I go back in time and talk to my younger self and tell the younger me how to build a time machine. The younger me learned this information from the older me. This is the only way in which my younger self can get this information. And I can now build a time machine only because the younger me was told how to do it and I preserved such a memory. But where did this information come from? Here is the second paradox: if time travel is possible, then causal loops are possible. But there cannot be causal loops. And so time travel is not possible. In order to solve the paradox, Lewis denies the second premise: causal loops are instead possible, so he argues that there can be causal loops. There are, on his view, uncaused (and therefore unexplainable) things. Causal loops are oddities, but not impossibilities. So, the impossibility of time travel cannot rely on this second paradox either.

Last paradox, the most popular: the grandfather paradox. Tim, the time travel guy we considered in the first paradox, travels backward in time and arrives in 1921. His task is to kill his grandfather: he has a gun, he is able to shoot, and all the conditions to commit murder are perfect. It then seems that he could kill his grandfather. However, he *could not* kill his grandfather; had he done it, Tim would not have been born. If Tim had not been born, he could not have traveled back in time to kill his grandfather.

Roughly, then: if time travel is possible, Tim could kill his grandfather; at the same time, if time travel is possible, it's not the case that Tim could kill his grandfather. This gives rise to a contradiction and so time travel is not possible (1973: 148-149).

Lewis' response to this is that the meaning of 'could' is equivocated upon in the previous argument. The idea is that when we say that we '*could do something*', we mean that we have the capacity to do something (holding certain things fixed). For example, unlike dogs, I can play the piano. I have the capacity to learn. But I cannot give a concert. In fact, I have never learned how to do it. Keeping my potentialities fixed, I can say that I could play the piano, even though I cannot do it. The same holds for Tim: he has the capacity to kill his grandfather, but he cannot do it in 1921 (1973: 149). Problem solved.

Having solved the three paradoxes, that are not real paradoxes, rather, as Lewis' says, oddities, he finally claims that time travel is possible. Having explained this, we will now have a look at what happens if we put together the possibility of time travel, a growing block manifold and causal powers.

6.2 TIME TRAVEL, GROWING BLOCK AND POWERS

The growing block view of time cannot accommodate the possibility of time travel within a dispositional framework. Let me quickly reiterate how the argument goes:

1. Time travel is possible.
2. Time travel requires the *tending* of powers "towards" the past.

3. The past is fixed.¹⁰⁷
4. The *tending* of powers towards x is possible if and only if x is not fixed.
5. From 2-4, the growing block view of time is false.

I defended premise one in the previous section. Some explanation for premise two is needed: traveling back in time from time t, requires some power to act towards the past. As well as premise 2, premise 3 is defended in chapter 4 section 5.1: here, following Diekemper, I showed that an actual (and existent) future (or past) is fixed. Briefly, though, we can conceive a tending only towards something that is not fixed and then open. Powers cannot tend towards something fixed, so GB is false. The GB theorist may say that, contrary to what Lewis claims, time travel is not possible. This can be easily discarded: the possibility of time travel is widely recognized both in philosophy and physics.¹⁰⁸

7. THE EPISTEMIC OBJECTION

Although I believe that the previous sections are sufficient to show why GB should be discarded in a dispositional framework, in this section, I want to quickly mention a further objection to GB. I am talking about the epistemic objection and this is a problem that a GB theorist has regardless an ontology of powers. This has been raised and differently articulated by various philosopher; and it can be summed up by using Braddon-Mitchell's words:

¹⁰⁷ See chapter 4 section 5.1, for a definition of fixity.

¹⁰⁸For further discussion on time travel, see Arntzenius and Maudlin (2002), Smith (2016).

I argue that on the growing salami view¹⁰⁹, it is almost certainly not now. It is not now now. It is not now now; or less tendentiously, the current time is probably not the present. (2004: 199)

GB holds that the present is ontologically privileged, but there also exist other moments: past moments. This means that, since the present is not the only existing moment, we cannot know for sure that *this is* the present moment. The problem is that people who are in the trunk of the block, so in the past and believe they are present, have a false belief. How can we then know that *this moment*, the current one, is the objective present moment?

For example, 524 years ago, in 1492, Christopher Columbus was completing his voyage across the Atlantic Ocean, and was disembarking on San Salvador believing he is doing this in the present. He was right 524 years ago, but since that time is passed, he is wrong; he falsely believes he is doing this in the present. But what reasons do we have to believe that we are present ... right now? The problem, then, is how we can distinguish between past and present events. We may be in the past and falsely believe that we are present. Braddon-Mitchell claims:

Of course, if our current location *is* the objective present, then there is no future volume, but to *know* that our current location is the objective present we would need to know that there is no future-directed volume, and we have no independent access to this. So by a principle of indifference we should regard all alternatives as equally likely. (...) So we should conclude, therefore, that

¹⁰⁹ This is how Braddon-Mitchell calls this view.

the current moment is almost certainly in the past. This is absurd, and so by *reductio* we should reject the growing salami view. (...) we want a guarantee that *this location in space-time* (if our theory countenances space-time) *is the present*. And this is precisely what such theories cannot offer. (2004: 200-1)

As Tallant (2011a: 38) formalises:

- (i) Many past times exist, yet only one present time exists.
- (ii) We all, whether past or present, believe that we are present.
- (iii) Given the number of us who believe ourselves to be right at different times, the probabilities militate against our being right at *this* time.

Thus,

- (iv) Given our conviction that we are right about our being present, we ought to believe that the growing block view is false.

It seems, then, that we should avoid the Growing Block theory of time.

8. A POSSIBLE REPLY: ZOMBIES?

Let me consider a possible attempt to solve the problem and see if also a dispositionalist may adopt the reply that I am about to briefly focus on to overcome the difficulties above mentioned.

Forrest (2004) replies to the epistemic objection by saying that past entities exist (inhabit the trunk of the block), but lack of consciousness. The occupant of the past are just Zombies; the past is real but dead (Forrest 2004).¹¹⁰ Forrest's "Past is Dead" hypothesis relies on the idea that

Life and sentience are, I submit, activities not states. Activities only occur on the boundary of reality, while states can be in the past. Activities only occur on the boundary of reality, while states can be in the past. (2004: 359)

This change from activity to states is given, on Forrest's view, by the following conception of causal activities:

If x causes y then in the normal case y is after x. If there is a precise moment at which x ends then y begins only after that moment, not at it. At the precise moment of the end of the cause there is as yet no effect. Hence there is neither the state of affairs of x causing y nor the state of x having failed to cause y. In that situation, x has, however, a causal property, the tendency to generate an event of type Y where Y is the type to which y will belong. By causal activity I mean the occurrence of such tendencies at a time too early for it to be the case that there has been a causal relation or to be the case that there has not been one. (2004: 359)

This reply generates further problems for a dispositional GB account: at least two. The first problem is given by Forrest's conception of causation. On his view, there is

¹¹⁰For further discussion, see Braddon-Mitchell (2004) Correia and Rosenkranz (2013).

a passage from cause to effect where the effect commences as soon as the cause finishes. This is a static conception of causation (as we have seen in chapter 3, sections 3.4 and chapter 4, section 4). The dispositionalist wants causes and effect to be simultaneous: let me remind you an example I already made. A sweet tea is the result of the interaction of a sugar cube's causal powers and the tea's causal powers: as soon as the sugar cube is placed in the hot tea, a causal process starts and the powers involved in this causal process work simultaneously (nonetheless through time). For this reason, the dispositionalist cannot accept an account of causation that involves temporal priority (of the cause over the effect).

The second problem is generated by the “dead entities” that inhabit the trunk of the block. Although we have already seen that it is problematic to accept the existence of past entities (see section 4), I want to add a further problem. The fact that the past is populated by people who lack consciousness seems to imply the existence of some bizarre kind of power: being unconscious. When not present human beings do not have mental states. The mental states that were present, disappear in the past. “Being unconscious” does not seem to be a power at all. But suppose it were a power, then it would be a very bizarre one. And it would only be a state of these people who do not have the power to produce any activity. A dispositionalist cannot accept such a scenario.

9. CONCLUSIONS

In this chapter, I've argued that GB and dispositionalism are at odds. Although GB can satisfy the dispositional principle about the openness of the future (section 5), it

cannot satisfy other fundamental principles that are at the heart of dispositionalism. First, GB does not allow production to occur via transformation of causal powers (violating P2). Second, it is not clear how past entities can keep existing within the GB block without being causally powerful. Dispositionalists believe that the Eleatic test is the mark of the real, and past entities seem to fail to pass such test (section 4).

I believe that also in this second attempt (the first being the combination of dispositionalism with eternalism) the trouble is caused by the temporal extension defended by GB theorists. Also in this case, as for the combination of dispositionalism and eternalism, the extension of time (although given only by the existence of the past) does not allow powers to genuinely transform themselves and produce new powers; if past powers keep existing in the block (*simpliciter*), then there cannot be production via transformation (although there is a different kind of production, since the block grows bigger and bigger with the addition of new entities at the edge of the block, but, again, this does not happen because powers transform themselves).

I also explored what happens in the case of time travel in a dispositional GB scenario (section 6). The conclusion was unacceptable (at least for a dispositionalist): if it is possible to travel in the past, then there has to be a tending of powers towards the past, so towards something fixed (determined, actual). This is at odds with the dispositional principle about the openness of the future (P4).

Finally, I considered a common objection to GB: the epistemic objection (section 7). I argued that even the GB attempt (Forrest 2004) to solve the problem generates at least

two difficulties for a dispositionalist: a “static” conception of causation and bizarre powers populating the past (section 8). I then conclude that also the alliance of dispositionalism and GB is an unholy one (section 9).

DISPOSITIONALISM AND PRESENTISM:

TEMPORAL DYNAMISM VS DISPOSITIONAL DYNAMISM

Chapter Overview

In this chapter I:

- *Individuate ontic, metaphysical and semantical presentist theses (section 2);*
- *Argue that presentism can satisfy both P2 and P4: it can then account for dispositional production and the openness of the future (sections 3 and 4, respectively);*
- *Engage in a quick digression on time travel and show that in dispositional presentism it would not create difficulties (section 5);*
- *Argue that although presentism can satisfy both principles, there is a further problem: presentism and dispositionalism defend two different conception of dynamism. Temporal dynamism and dispositional dynamism differ (section 6);*
- *Consider three different ways to reconcile presentism and dispositionalism (Thick Presentism, Lucretianism, and Temporal Distributional Properties) (section 7), and argue that there is no way to reconcile the two views (section 8).*

1. INTRODUCTION TO THE CHAPTER

In the last two chapters I focused on the difficulties of combining a powers ontology with both eternalism and the growing block theory of time. We saw that a powers ontology is incompatible with both eternalism and the growing block view. There is still an option on the table, though: presentism (roughly, the view according to which only present objects exist). The aim of this chapter is to explore the prospects of the union of a powers ontology and what I will call standard presentism. I will argue that there is no way to reconcile the two views. In fact, I will show that, although standard presentism can accommodate the dispositional requirements regarding production on the one hand, and the openness of the future on the other, it cannot accommodate a further requirement of dispositionalism. Standard presentism cannot account for the fundamental dynamism of reality typically defended by powers ontologists.

This chapter is structured in 8 sections. After having introduced the chapter, in section 2, I will describe standard presentism. I take standard presentism to be the conjunction of four theses: an ontic thesis, two metaphysical theses and a semantic thesis. In sections 3 and 4 I will show that standard presentism can accommodate, respectively, the dispositional principle about production and the dispositional principle about the openness of the future. (The latter section will be quite quick, since we will find that the same argument given to demonstrate that the growing block view of time can satisfy the dispositional principle about the openness of the future works for presentism as well.) In section 5, I will make a quick digression on the possibility of time travel in a dispositional presentist framework.

In section 6 I will focus on a different issue. Here I will show that although standard presentists consider dynamism to be a real and irreducible feature of the world, this is not the same kind of dynamism required in a dispositional framework. Temporal dynamism, in fact, appears to be different from and incompatible with dispositional dynamism. In section 7, I will consider three possible replies to this second worry, by considering a non-standard presentist view (Thick Presentism) due to Hestevold (2008) (section 7.1), Lucretianism about properties (section 7.2) and Temporal Distributional Properties (TDP) defended by Cameron (2011) (section 7.3). I will show that also this non-standard view and different conceptions of properties are at odds with dispositionalism. In section 8 I will draw my conclusions.

2. STANDARD PRESENTISM

Presentism is, roughly, the view that only present objects exist. The past does not exist (any more) and the present does not exist (yet). To use Le Poidevin's words, presentists "restrict reality to the present moment" (2003: 136). Let me borrow a quote from Leininger (2015: 725) that nicely summarizes and outlines the presentist's view:

According to presentism, reality is limited to the present. That is, only temporally present objects exist. (...) In confining existence to one privileged moment, the NOW, presentism accounts for some of our seemingly deeply held intuitions about time: that the future is yet to be and thus is open, that the present is vivid and somehow uniquely privileged, and that the past is settled and gone.

As noted above, I take standard presentism to be the conjunction of an ontic thesis, two metaphysical theses and semantical thesis. Before exploring the details, let me say that presentism is considered to be the common-sense conception of time (see, for example, Bigelow 1996: 35, McKinnon 2003; Leininger 2015; 724, Deasy 2017: 380). Intuitively, there seems to be a deep difference between the present and the past and the future—something that the presentist preserves by ‘restricting reality to the present moment’. Let us now turn our attention to the four theses that make up standard presentism.

2.1 THE ONTIC THESIS

The ontic thesis held by presentists is that only present objects exist, or, to put the point another way, nothing exists that is non-present. On this view, then, Trump is on the list of what exists, but neither Lincoln nor the sixtieth president of the United States are on the list; they do not exist. Let me quote respectively Miller (2013: 346) and Merricks (2007: 119) on this thesis:

(...) only the present moment, and hence present objects and events, exist.

Presentists deny that dinosaurs exist. (...) Of course, presentists believe that some things exist – namely, those things that exist at the present time. In fact, the standard definitions of ‘presentism’ are all some variant or other of the claim that *everything* exists at the present time (see, e.g., Bergmann 1999; Crisp 2004; Keller 2004; Lewis 2004; Markosian 2004; Rea 2003; Sider 2011: 11)

As is clear, this thesis is in stark contrast with the ontic theses held by eternalism and the growing block theory (that I described in chapters 4 and 5, respectively). Where the eternalist will claim that all objects (past, present and future) exist, and the growing block theorist will allow that objects past and present exist, the presentist will admit the existence of only the present objects.

2.2 THE METAPHYSICAL THESIS

Now to the metaphysical theses. First, presentism shares with the moving spotlight and the growing block views the idea that there is an objective difference between the present, the past and the future.¹¹¹ Because of this, along with the growing block and moving spotlight views, presentism is often described as an A-theory of time.¹¹² This is the first metaphysical thesis endorsed by presentism.

The second metaphysical thesis (that is also held by A-theorists): the passage of time is taken to be a fundamental characteristic of reality such that what is present constantly changes. Trump's Presidency is present, but it will cease to exist. Other, more short lived, states will disappear from the inventory of existence more quickly.

So, the first metaphysical thesis is a claim about the difference between the past the present and the future and the latter is a claim about passage. This is all very orthodox. These two theses correspond to the A-theory of time about which, in general, Markosian and Zimmerman, respectively, say:

¹¹¹ But, of course, these three theories hold three very different ontic theses.

¹¹² See Zimmerman 2008, Miller 2013, Deasy 2017, Markosian 2016 (among others).

According to the A Theory, the passage of time is a very real and inexorable feature of the world, and not merely some mind-dependent phenomenon. (2016, section 5)

To be an A-theorist is to believe in some sort of objective distinction between what is present and what is past and what is future. (...) [A-theorists believe that] the present is distinguished from past and future in a way that is not relative to any other temporal thing, such as a conversation, a time, or a frame of reference. To be a B-theorist on the other hand, is to deny the objectivity of our talk about past, present, and future. (2007: 212)

As I have said, presentists share this thesis with both moving spotlight theorists and growing block theorists. These views are ‘of a kind’ when it comes to their metaphysical theses. Keep in mind, though, that the ontological theses involved are very different. As we shall see, this difference brings us to very different conceptions of the world.

It is, I think, no great challenge to explain (at least *prima facie*) how to connect the presentist’s ontological thesis to the two metaphysical theses. If we consider both the presentist’s ontological thesis that only present objects exist, and the two metaphysical theses, that there are differences between the past, the present and the future, and that there is an objective passage of time, we can see that the “presentist world” is a world that changes over time. Entities come into existence and go out of existence, by being constantly replaced by new entities. This ensures that there is an

objective difference between past, present and future and that the passage of time is itself constituted by this coming into and going out of existence of entities. At least superficially, the picture has much to recommend it.¹¹³

2.3 SEMANTICAL THESIS

Even though I won't engage with it directly, let me also say something about the semantic thesis which presentists are usually committed to. Presentism is typically associated with anti-reductionism about tense. Let me quote Lowe and Sider, respectively:

(...) the only statements ascribing qualities to objects that can strictly be true are those that ascribe those qualities now to objects that exist now. On this view, then, the only strictly true statements of the form '*a* is *F* at *t*' are ones of the form '*a* is *F* now'. That being so. The word 'now' in such a statement is really redundant and can be dropped without loss of informative content. (2002: 43)

[According to anti-reductionists] tensed facts, for example the fact that dinosaurs existed in the *past* or that it is *now* raining, are ultimate features of reality. (2001: 13-14)

¹¹³ Although in this context I am not interested in them, I am aware that there have been objections to the combination of the presentist ontic thesis and the presentist metaphysical theses. Leininger (2015), for example, believes that in order to satisfy the presentist principle according to which there is temporal change (that is, what establishes the passage of time), there must be more than one single moment in time. But this second claim is in conflict with the presentist ontic thesis according to which only present object exists.

Of course, given that the present constantly changes, as new objects come to be, propositions have different truth-values at different times. Here is an example: the proposition ‘I am *now* writing the last chapter of my dissertation’ is now true but this proposition was false a month ago (and will be by the time you read this). This can be contrasted with the semantic approach that we saw endorsed by the eternalist (in chapter 4), which treated tense as reducible, in the sense that we can (and should) provide tensed sentences with tenseless truth conditions. The presentist believes that the truth conditions are tensed.

Now that the stage is set, and keeping these theses in mind, let’s move on to explore whether the alliance of presentism and powers ontology is viable.

3. PRESENTISM AND DISPOSITIONAL PRODUCTION

In this section and the next I will explore whether we can combine standard presentism and dispositionalism. I will argue that we cannot. I will start by discussing whether presentism satisfies the dispositional requirement about production, and then I will move to the question of whether presentism also satisfies the dispositional conception of the openness of the future (next section). I will argue that both principles are satisfied by presentism. I will very briefly reiterate the conception of production held by powers ontologists, and show why and how presentism can accommodate it.

As a reminder, by ‘production’ dispositionalists typically mean ‘transformation of clusters of causal powers into new clusters of causal powers’. Causal powers, when

interacting with other causal powers, cease to exist in a certain form and turn themselves into new powers.¹¹⁴ The production of new causal powers via the transformation of the old is the most crucial feature for our concerns, here.

P2: Change consists in the production of new causal powers, via the transformation of old causal powers.

I think that the upshot, here, is straightforward. Presentism is *definitely* compatible with P2. If the present constantly changes, and the list of what exists does not include either past or future entities, then powers *can* genuinely produce new powers by transforming themselves. Schematically (and more clearly):

1. If only present entities exist, and what is present changes, then new entities come into existence (become present) and old entities cease to exist (become past).
2. Genuine production is possible only if old powers stop existing by transforming themselves into new ones. (P2)
3. New powers come into existence (become present) and old powers cease to exist (become past).
4. Production is given by transformation of old powers into new ones.

As is clear, presentism can satisfy P2: premises 1 and 2 just summarize the ontic and the metaphysical theses of presentism and the dispositional principle about production, respectively. From 1 and 2 follows 3: the coming into and going out of

¹¹⁴ For further discussion, see chapter 3, section 3; chapter 4, section 4; chapter 5, section 4.

existence of entities can happen via the transformation of causal powers. Presentism is therefore compatible with this crucial dispositional requirement. And I believe this is very straightforward. In a presentist framework we can have production via genuine transformation of powers, that is what the dispositionalist believe causation to consist in. Transformation, in fact, does not require the extension of time: present powers, in this presentist framework, can transform themselves, by ceasing to exist in a certain way and producing new powers (as a result of their “present teaming up”), which in turn can transform themselves and produce a new cluster of powers, and so on and so forth. We can have production via real transformation of powers (contrary to what we have in the growing block view case, where there is production, but there is not transformation, since past powers keep existing *simpliciter* (chapter 5, section 4).

We can easily see what I have just said by comparing presentism with eternalism and the growing block view when it comes to production. We have seen that the ontic thesis of eternalism and the ontic thesis of the growing block view of time were the ones that made those theories incompatible with a powers ontology. In the former case, the fact that all past, present and future entities exist and are ontologically on a par is what prevents the *genuine* production or transformation of powers (chapter 3, section 3, and chapter 4, section 4). There is no real *transformation* of powers in an eternalist framework because old powers keep existing within the block (and they are then causally inert). And there is no real, genuine production (at least the kind of production the dispositionalist wants), because there is no transformation of powers. In the growing block picture, only past and present entities exist, while future entities do not. The growing block view of time can thus account for some kind of production, since future entities constantly come into existence making the block bigger and

bigger. Still this is not the kind of production the dispositionalist aims for. Although future entities do not exist and new entities constantly come into existence, this coming into existence is not given by the transformation of old entities, which in fact still exist in the block. The fact that in a presentist framework neither past nor future entities exist can allow powers to genuinely transform themselves and produce new powers.

To illustrate, if such an illustration is required, let me return to an example. Let us suppose that we have our sugar cube that is soluble, and our hot tea that has the power to dissolve some substances. As soon as I put the sugar cube in the hot tea, it starts dissolving. At the end of the process we have a sweet solution. In the presentist framework, during the dissolution phase, we just have the powers operating in that phase; we have neither the solubility of the sugar cube nor the sweet tea existing. The dissolution of the sugar cube will produce the sweet tea via genuine transformation of powers. At first we have the sugar cube with some powers, and the tea with other powers, as soon as the two interact a causal process starts and powers transform themselves till the tea has become sweet. The powers that were in place at the beginning of the causal process at the end of it changed and give rise to a different cluster of powers.¹¹⁵ So, presentism is the only theory of time that can allow genuine dispositional production. So far, so good.

¹¹⁵ Here, talking of the start of a causal process and the end of it may be misleading, but I believe that the example gives an idea of how the presentist framework allows for genuine (dispositional) causal production.

4. PRESENTISM AND THE OPENNESS OF THE FUTURE

In this section I will consider whether presentism can satisfy the second crucial requirement of dispositionalism: the openness of the future (guided by dispositional modality – see chapter 3 sections 4 and 5; chapter 4 section 6; chapter 5 section 5). As I have already said in the previous two chapters, a fixed future cannot accommodate an open future conceived of as a horizon of mere possibilities (as the dispositionalist conceives it).¹¹⁶ Given that both the growing block theorists and presentists conceive the future as an open horizon of mere possibilities, the current section is going to be a short one. In what follows, in fact, I will just reiterate the argument given to show that the growing block view of time does satisfy the dispositional principle about the openness of the future.

Here, the crucial idea is that a non-existent future leads to an open, and therefore non-fixed one. Let me briefly remind you what the dispositionalist holds. She conceives powers as *tendencies*: dispositions tend towards *merely possible* manifestations. Given this, I identified

P4: Present events tend towards merely possible (future) events.

Contrary to eternalism (chapter 4, section 6), and as well as the growing block view (chapter 5, section 5), presentism can satisfy this dispositional principle.

1. If the future is open (not fixed), then it is a realm of mere possibilities;

¹¹⁶ For further discussion, see chapter 4, section 6; and chapter 5, section 5.

2. In order for dispositional modality to “guide” reality, the future has to be open;
3. In the presentist’s picture the future is open.
4. Dispositional modality can guide the presentist open future.

As a reminder, the openness of the future defended by dispositionalists is conceived of as a horizon of mere possibilities (possibilities that are only disposed to exist). This means that the future is not actual, rather it is merely possible. Presentists believe that the future does not exist, and this appears consistent with the idea of a merely possible future. Again, a non-existent future implies an open one. It is then clear that the presentist’s conception of the future is compatible with dispositional modality and then with the openness of the future the dispositionalist aims at. (This is obviously similar to the growing block view of time and contrary to eternalism and the moving spotlight view according to which the future exists simpliciter and is then fixed.)

Given that presentism satisfies both the fundamental requirements of dispositionalism (contrary to eternalism that does not satisfy either of them, and the growing block view that can satisfy just one of them, P4¹¹⁷), it *seems* that we have found the theory of time that can be adopted by a powers ontologist. Presentism allows both genuine (causal) production and an openness of the future guided by dispositional modality. Not only does presentism satisfy two crucial principles of dispositionalism (that other theories of time do not satisfy), but also the combination of presentism and dispositionalism passes the time travel test. Let me quickly say something about this, as I did for the union of powers ontology and the growing block view of time.

¹¹⁷ See chapter 4, section 6.2; and chapter 5, section 5.

5. A QUICK DIGRESSION ON TIME TRAVEL

In the previous chapter, we saw that the growing block view of time cannot accommodate the possibility of time travel within a dispositional framework. Let me briefly reiterate how the argument goes¹¹⁸:

1. Time travel is possible.
2. Time travel requires the *tending* of powers “towards” the past.
3. The past is fixed.¹¹⁹
4. The *tending* of powers towards x is possible if and only if x is not fixed.
5. From 1-4, the growing block view of time is false.

Now, to time travel, powers and presentism. I believe that the upshot is straightforward: a presentist powers ontologist can account for the possibility of time travel, because, in her framework, the past does not exist. The argument would then be the following:

1. Time travel is possible.
2. Time travel requires the *tending* of powers towards the past.
3. The past is open (because it does not exist)
4. The tending of powers towards x is possible if and only if x is not fixed (i.e. open).

From 2-4, presentist powers ontology is compatible with the possibility of time travel.

¹¹⁸ For further discussion, see chapter 5, section 6.1.

¹¹⁹ See chapter 4, section 5.1, for a definition of fixity.

This would be a small victory for presentism and powers.

While 1 and 2 have been explained and defended in the previous chapter (see chapter 5, sections 6.1 and 6.2), 3 needs some explanation and defence, for it looks (at least *prima facie*) odd. Presentists, in fact, usually hold a view according to which the past and the future are both unreal, and so ontologically on a par. But while they defend this ontological symmetry, they typically also defend an asymmetry of fixity. This means that, although the past and the future have the same ontological status (again, they are both not real), the past is fixed and the future is not. But is this legitimate?

Here I will show that defending an ontological symmetry and a fixity asymmetry is problematic. I'll borrow Diekemper's argument to show that if the presentist wants to defend a symmetry of the ontological status of the past and the future, then they are also committed to a symmetry of openness (if the future does not exist and then it is open, then the past is open too, given that it does not exist either). Diekemper (2005) believes that presentists have never argued for the asymmetry of fixity. The only one who tries to construct a semantics that makes sense of the asymmetry of fixity is Craig (1991)¹²⁰, but Diekemper believes that the upshot of Craig's semantics is not a good one. He also considers possible replies that the presentist could give to this problem (trying to explore the possibility that other kind of asymmetries "fundamentally constitute" (2005: 223) the temporal one), but he shows that none of these works. But this is not his only attempt: he also tries to check if the presentist can "avail herself of some of the standard B-Theoretic accounts of the asymmetry of fixity" (2005: 224), but he concludes that she cannot do it. For these reasons, there is

¹²⁰ For further discussion, see Craig 1991.

no way, according to Diekemper, to reconcile an ontological symmetry of the past and the future with their fixity asymmetry.¹²¹

Here, I am not interested in reporting all Diekemper's attempts, I will report just one presentist's possible reply and show how Diekemper dismisses it. To repeat myself, Diekemper argues that if the presentist wants to deny the fixity of the future, then she must also deny the fixity of the past. This means that if the presentist wants to defend an ontological symmetry of the past and the future, they cannot maintain the asymmetry of fixity between the two (holding that the past is actual, while the future is just potential – to use Diekemper's terms). A possible way for the presentist to reply to Diekemper's objection that if the future is open, then the past must be too, is to appeal to the principle of bivalence (cf. Diekemper, 2005: 236). The presentist may say that while proposition about the past have a truth-value, proposition about the future do not. On Diekemper's view, this answer can be interpreted in three distinct ways (2005: 236):

- i) the asymmetry of bivalence fundamentally grounds temporal asymmetry independently of temporal becoming;
- ii) the asymmetry of bivalence is more fundamental than the asymmetry of fixity, but is itself ultimately grounded in temporal becoming;

¹²¹ Diekemper uses this strategy and considers different replies/further possible solutions to this problem (he tries to see if other kinds of asymmetries could ground the temporal asymmetry required by presentists), but he does not find a solution to it. He concludes that presentism cannot be reconciled with temporal asymmetry. For further discussion, see Diekemper 2005.

- iii) the asymmetry of bivalence *just is* temporal becoming, that is, temporal becoming consists in non-bivalent propositions becoming (and remaining) bivalent.

Here's how Diekemper replies:

- i) this first way is incompatible with the A-theory of time (the A-theorist believes in a real passage of time, and it is this temporal becoming that gives the idea of temporal asymmetry (cf. Diekemper 2005: 234);
- ii) temporal becoming consists in a continuous going out of existence and coming into existence of events. And if the presentist wants to apply the principle of bivalence, she must admit that "(...) only propositions *about the present* could be bivalent." (2005: 238) By admitting this, the presentist would lose the asymmetry.
- iii) in this third case, "the inconsistency becomes an incoherence; since we are now asked to *identify* a temporally asymmetric notion (propositions becoming, and remaining, bivalent), with a temporally symmetric one (events becoming, but *not* remaining, real)" (2005: 239).

The asymmetry of bivalence, as well as other attempts, fails to account for temporal asymmetry. So, and this is the conclusion that I am interested in endorsing in the

current contexts, if the presentist wants to defend the openness of the future, then she has to accept the openness of the past too.¹²²

To conclude, not only can presentism accommodate two crucial dispositional principles, but the union of presentism and powers ontology can also account for the possibility of time travel.¹²³ So, a small victory for presentism (from a dispositional point of view). There is further a problem though, and it concerns dynamism. It seems that presentism and a powers ontology have two different conceptions of dynamism, and these two do not seem to be reconcilable.

6. TEMPORAL DYNAMISM AND DISPOSITIONAL DYNAMISM

As I said when I described standard presentism (section 2), presentism is a version of the A-Theory of time. And one of the two theses of the A-theory of time is that the reality of time's passage is a fundamental feature of the world (cf. Markosian, 2016, section 5). Given this, and given presentism's ontic thesis (according to which only present objects exist), presentism is typically described as a dynamic view of time. Different philosophers, in fact, describe presentism as the theory of time that results from the conjunction of a thesis about the existence of present objects and a dynamic thesis according to which what is present constantly changes. Let me quote respectively Miller (2013: 346) and Leininger (2015: 726):

¹²² Notice that also Markosian believes that if we want to defend the openness/indeterminacy of the future and be presentists, then we must embrace the openness of the past as well. Contrary to Diekemper, he defends such a view. For further discussion, see Markosian 2012.

¹²³ For a defence of the compossibility of presentism and time travel see Keller and Nelson 2001, Daniels 2012, Hall 2014.

Dynamical Thesis (DT): The present moves: which moment is the present moment changes.

The Change Thesis. What is present changes: there is a difference in what exists from moment to moment.

Miller also writes (2013: 346):

Thus a presentist world is one that *dynamically* changes over time: the totality of the events that exist changes as time passes, so that *a different set of events comes into existence* as each new present moment comes into existence, and *those events then pass out of existence* as that moment ceases to be the present moment. (Bigelow 1996; Bourne 2006; Crisp 2005; Markosian 2004; Oaklander 2002; and Zimmerman 2008). (emphasis mine)

Thus, presentists believe that (objective) dynamism is given by the (objective) passage of time. This dynamism is conceived as a constant coming into existence and going out of existence of sets of entities.

Now to dynamism and dispositionalism. Dispositionalism is also described as a dynamic theory (chapter 3). Let me reiterate a couple of quotes from Mumford and Anjum:

A world of powers suggests a world of active, dynamic particulars (see Harrè and Madden 1973) and there are some problems in squaring that with time-slice views of persistence and change. (2011: 26)

Processes are seen as dynamic in the sense that change is undergone throughout the process, which means it is to be found in any part of it, and it thus *cannot be broken down into a string of changeless parts*. (2011: 116) (emphasis mine)

From these quotes, we can see that, on a dispositionalists' view, dynamism is thought of as a fundamental and irreducible feature of reality that then cannot be reduced to anything static.¹²⁴ This is a conception of processes that Williams (2017) calls 'adamantine', as opposed to the domino model of processes. The adamantine model of processes conceives processes as units that are not composed of parts, while the domino model conceives processes as a sequence of parts, one part after another. A dispositionalist of the kind described in the first three chapters conceives processes as adamantine, rather than as domino processes. the reason for this will become clearer in the next section.

So, we have the presentist's dynamism that is given by the inexorable passage of time and that I have called temporal dynamism, and we have the powers ontologist's dynamism that is given by the constant work of powers and that I have called dispositional (/adamantine) dynamism. My contention is that these two forms of dynamism are incompatible and that this leads to problems.

¹²⁴ For further discussion, see chapter 3.

6.1 TEMPORAL DYNAMISM VS DISPOSITIONAL DYNAMISM

First, let's have a look at temporal dynamism. If only the present exists, and there are no past moments and future moments, then that implies that the present lasts one instant.¹²⁵ Presentists, in fact,

(...) hold that there is a succession of present moments. (Leininger, 2015: 726)

Consider, also, McKinnon (2003: 307) on St. Augustine's argument against an extended present:

If the present is extended then it has wholly distinct parts and those parts must be simultaneous. This rests on the assumption that if x and y are both metaphysically present then they are simultaneous. On the other hand, if the present is extended then it also seems that its disjoint parts cannot be simultaneous: if x and y are not overlapping then they are temporally separated and hence, not simultaneous. Thus, we have a *reductio* of the view that the metaphysical present is extended.¹²⁶

If this is true, then the presentist defends a succession of static/frozen present moments. When I talk about static/frozen moments, I mean that these moments do not allow any form of change to happen *at* that moment (in chapter 3, section 3.4 we saw

¹²⁵ Leininger 2015.

¹²⁶ McKinnon uses "metaphysical present" as opposed to "context-dependent present" peculiar to tenseless theories of time.

that causal processes unfold through time. It takes time for powers to manifest themselves). A static/frozen moment is present, stops existing, and a new static/frozen present moment comes into existence, presumably with new objects existing at it. This is how we have temporal dynamism in a presentist framework.

The present is then temporally unextended. Just a few presentists have suggested that the present is durational¹²⁷ (see, for example, Hestevold 2008), but we will have a look at this in section 6.

The dispositionalist, though, wants dynamism to be *in* the existing entities. Those entities are dynamic *because* they undergo constant change; they instantiate properties that are *essentially dynamic*. That constant change is to be understood as fundamentally dynamic, for it cannot be reduced to a sequence of static instants. (see Mumford 2009, M&A 2011). On Mumford's view, in fact, properties are 'dynamic' iff they

(...) are essentially changes and thus cannot be instantiated at an instant.
(2009: 230).¹²⁸

A few examples can be borrowed from Mumford himself: a rotting, a heating, a growing. We can also introduce a "more scientific" property as an example: the radioactive decay of a particle. *Decaying* seems to be a property that a particle

¹²⁷ Here I take "durational" to mean "extended".

¹²⁸ 'Dynamic' is opposed to 'static'. According to a powers ontologist, properties are static iff they are 'capable of being fully instantiated at an instant and thus involving no change.' (2009: 230)

instantiates and it seems to be a property that takes time to manifest; it is an essentially temporal property. These are definitely causally powerful properties (see chapter 1, section 7; chapter, 2, section 7.2; and chapter 3, section 3), and these properties are not the kind of thing that can occur at just one time; they must be extended over time.

Why are these believed to be properties? And why are these properties essentially temporal? Well, a rotting is quite plausibly causally powerful: it tends to produce a smell. And a rotting is not the kind of thing that can occur at just one time; it must be extended over time. So, it must be a dynamic property in the sense that it cannot be instantiated at *an* instant; it must be instantiated at many.

More generally, on the dispositionalist's view, all causal processes come in "temporally extended wholes rather than as constructions from changeless discreta." (M&A, 2011: 121) And these causal processes are essentially dynamic.¹²⁹ But, as we have already seen in section 2, and at the beginning of the current section, present moments are instantaneous (or else are very short lived). It then follows that the properties instantiated by entities existing at the present moment, must themselves, be only instantaneous (or else very short lived—simply, of no duration greater than their bearer). From this we may infer that any dynamical property must outlast any given present moment; since the present entities are the bearers of the properties, the dynamical properties cannot outlast the entities intended to instantiate them. Thus we have a contradiction. Present entities must, but cannot, instantiate dynamic dispositional properties.

¹²⁹ For further discussion, see chapter 3.

As it goes, Mumford uses the very same argument against perdurantism. Perdurantists claim that properties are instantiated by temporal parts of objects, and these temporal parts are instantaneous (or very short lived). Mumford believes that

The perdurantist cannot permit such essentially dynamic properties as real and irreducible. Instead, they have to be reduced to sequences of static properties. (2009: 231)

He then suggests a fallback option: one that he thinks fails. We might try to give a reductive account of these dynamic properties. This proposed reduction would proceed by treating dynamic properties as ‘made up’ from what Mumford calls ‘static’ parts and the properties of those parts.¹³⁰ The idea is that we could understand a dynamic property to be a sequence of properties, instantiated by a range of temporal parts, over a particular period: a specific dynamical property (a growing, for instance) will be reductively analyzable in terms of the static properties, instantiated by each temporal part within the lifetime of the growing.

But, Mumford (2009: 230) complains, this will not do. We are, he thinks, to view dynamic properties as fundamental and so not as reducible to a sequence of static properties. Suppose that a dynamic property were reducible to a sequence of static properties. If that reduction were complete, then there would be no additional causal

¹³⁰ I take Mumford to mean that a temporal part is static because it is capable of existing at an instant and thus involving no change. Mumford does not formally describe why temporal parts are understood as ‘static’.

work for the dynamic property to do, over and above the causal work done by the static properties. A growing, for instance, would not make a causal contribution over and above that made by the non-dynamic properties to which it is reducible. These merely derivative dynamic properties would be (to borrow a hackneyed phrase), ‘nothing over and above’ the fundamental ‘static’ parts. Something that is not ‘over and above’ the static parts cannot, we should assume, do causal work that is not already done by the base to which it is reduced (for it is, literally, nothing over and above that which it depends upon). Mumford sees no obvious means by which we might recapture the notion that the derivative properties really are dynamic, provided the fundamental base is static. Thus, granting Mumford’s assumption that there are dynamic properties, and on the further assumption that the Eleatic test¹³¹ is appropriate, we have a reason to think that these dynamic properties are not reducible to static parts. The following quote due to M&A (2011: 26) summarize their notion of change:

A world of powers suggests a world of active, dynamic particulars (see Harré and Madden 1973) and there are some problems in squaring that with time-slice views of persistence and change (see Mumford 2009). Some powers may involve such dynamism as cannot be captured at an instant. They might be always in a state of flux (as urged by Whitehead 1929: 309)

Constant change and frozen moments are, thus, two incompatible notions, since on the dispositionalist’s view, change requires temporal extension, it takes time to

¹³¹ As we have seen in chapters 1 (section 7), the Eleatic test of reality is the mark of the real. In order to be real, something has to be causally powerful.

happen. The kinds of dynamism defended by presentists and dispositionalists are clearly different and incompatible. With temporal dynamism we have a change *of* what is present, while with dispositional dynamism we have a change *in* what is present. The key idea, in any case, is that a dispositionalist argues that a process is an *essentially dynamic* entity, and since it is essentially dynamic, it cannot be reduced to a sequence of static/frozen instants. Temporal dynamism and dispositional dynamism are thus incompatible notions. Presentism does not accommodate this further dispositional requirement, and for this reason cannot be adopted within a dispositional framework.

7. THREE POSSIBLE REPLIES

7.1 THICK PRESENTISM

In this section I want to consider an alternative, non-standard presentist view that apparently escapes the problem I raised in the previous section. Hestevold (2008) develops a view of presentism that, according to him, can account for genuine dynamism. Although this is a positive aspect of the view for a dispositional ontology, I will show that this non-standard presentism faces another problem which we encountered when I discussed the combination of eternalism, the moving spotlight and the growing block view: fixity.

Let me start by saying why Hestevold develops this non-standard view. Hestevold believes that standard presentism faces a couple of problems that make it an unacceptable theory of time. I won't engage with the first problem he raises, as for our concerns it's the second problem that counts. Hestevold claims that presentism cannot account for temporal becoming. In a presentist picture, as we have already

seen, the past and the future do not exist; for this reason, temporal becoming cannot be given by temporal changes of a series of times.¹³² Rather, as I already said in the previous section, temporal becoming is given by the coming into existence and going out of existence of times. On Hestevold's view this is problematic because these times seem to come into existence *ex nihilo* and cease to be *in nihilum*. On his view, this suggestion is "unilluminating" (2008: 329) and "metaphysically dubious" (329).¹³³ He argues that if it is true that temporal becoming "takes time to happen", then durationless instants must be rejected. And here comes dispositionalism.

As we have already seen many times, dispositionalists reject staticity. The durationless instants that, according to Hestevold, need to be rejected in a presentist framework, are static instants (no duration, no change, no dynamism). An alternative view, one that rejects the static instants and accepts some temporal extension, seems then to be compatible with this dynamism.

But, be that as it may, Hestevold's view will bring back a now familiar problem. Hestevold's position is a view that he calls Limited Time-Free Thick Presentism (LTFTP). On this view, the present is not durationless but neither is it unlimitedly thick. The present, in fact, has a limited duration. Hestevold argues that there are temporal atoms and that the present is one temporal atom long (2008: 334). He says:

¹³² A similar worry is raised by Leininger (2015).

¹³³ For further discussion, see Hestevold 2008, pp. 326-9.

Presumably, an actual maximal temporal atom would be the sort of state of affairs that, should it occur, would be conceived as an ‘extraordinarily brief’ event; e.g. *a butterfly’s flapping its wings exactly twice*. (2008: 334)

Temporal becoming is given by a succession of temporal atoms that overlap each other. So, a temporal atom that is ceasing to exist overlaps with the temporal atom that is about to come into existence: the last part of the present temporal atom overlaps the first part of the temporal atom that is coming into existence. Hestevold believes that his view is supported also by the way in which we perceive change. He suggests we imagine a light that repeatedly changes colour, turning from blue to red and then back to blue. He says:

(...) one would presently perceive the light’s undergoing a red/blue present change and *then* a blue/red present change – a seamless awareness of repeating present changes of color. (2008: 335)

Although Hestevold considers and replies to a few objections¹³⁴, he does not consider the one that would worry a dispositional ontologist. I will not discuss this worry at length, since this is the same problem that affects eternalism. Temporal extension leads to the fixity of the future. Similarly, a very short temporal atom leads to fixity - albeit only fixity over a very short period. Hestevold, as said above, claims that these temporal atoms are long as two butterfly’s wings flaps. In an example like this, we can see that dispositions and their manifestations exist, better coexist, and this is

¹³⁴ See 2008: 336-343.

something that a dispositionalist cannot accept, once it has manifested, the disposition loses its power (section 4).

Just to add some colour, let me quote McKinnon who, regarding “durational presentism”, says:

(...) once we admit that the metaphysical present could be long enough for both *a* and *b* to coexist, it becomes hard to see what sort of reasons we might have for supposing that in the actual world the metaphysical present is not arbitrarily long. This sort of presentism has no apparent advantages over the tenseless view of time. (McKinnon, 2003: 319)

Durational presentism does not help to square presentism with a powers ontology.

7.2 LUCRETIANISM

Presentism does not work within a powers ontology, because it cannot account for dispositional dynamism. If the present is durationless, we cannot account for dispositional dynamism. If the present is extended, we run into the problem of the openness of the future. This looks like a tension at the heart of any potential union.

How can a presentist reply to this? I don't think that they can. In what follows I'll consider 2 further possible replies and show that they are not convincing.

A first way to reply to this objection is by using similar strategies that the presentist uses to solve the truthmaker problem. The truthmaker problem is generated by the

fact that presentists do not have truthmakers for propositions about the past (and the future), given that past (and future) entities do not exist in their ontological framework. The dispositional presentist has to face the problem of a durationless present (the lack of past and future entities makes a dynamic change not possible – as we saw in section 6). The two problems I have just mentioned originate from the same presentist principle: that the past and the future do not exist. So, the presentist dispositionalist may try to adopt a similar strategy as the presentist.

Let me explain what the truthmaking objection consists in. Roughly: the truthmaker theory is a theory that holds that truth depends on/is grounded in reality (Cameron, 2011: 55). So, if a proposition/utterance is true there has to be something in the world that makes that proposition/utterance true. And how can a presentist say that some propositions about the past (future) are true if the past (future) does not exist? Well, one strategy would be to claim that there is something that makes either true or false propositions about the past (and the future), but that is not itself identical to the past (and future). Might such a strategy help us here?

A first option is Lucretianism (Bigelow 1996). Lucretians say that a present entity instantiates certain properties and the properties that it now instantiates settle how this entity was and will be intrinsically at every past (and future) time. For example, the proposition “There were Socrates and Xantippe” is made true by a present property *being such as to have contained Socrates and Xantippe*, and the world presently instantiating this property. Might not ordinary Lucretian properties do the job for the dispositional presentist? Might x instantiating *having been growing* and *being going to growing* not be enough to account for a dynamic change of x? No. Here’s why.

Lucretian properties seem to be mysterious entities. About them, Cameron says:

The property *being such as to have been a child* is suspicious because it points beyond its instances in the sense that a thing's presently having that property tells us nothing about the *present intrinsic nature* of the thing. (2011: 58)

Cameron notes the following distinction: the intrinsic nature of an object at a time, and the intrinsic nature of an object across time. He says that at the present time the intrinsic nature of the object is just the intrinsic nature of the object at that time. When that intrinsic nature is not present, then it is the intrinsic nature that that object *had* or *will have* when it *was/will be present*. But when not present these properties do not contribute to the present intrinsic nature of the object, for his reasons there are seen with suspicion (Cameron, 2011: 58). Also, for a presentist, Lucretianism should look odd, because, at least on Cameron's view, the only way one is, is the way one presently is. On a presentist's framework, "my present intrinsic nature [should be] my intrinsic nature *simpliciter*" (2011: 58), given that only the present is real. Cameron (2011: 60) also argues that "instantiating a property should make a difference to the intrinsic nature *simpliciter* of the bearer at the time of instantiation", and Lucretian properties do not make any difference. So he proposes that

We constrain the properties we admit into our ontology by only admitting those properties – call them *difference making properties* – the instantiation of which at a time makes a difference to the intrinsic nature of the bearer at that time. (2011: 61)

A power ontologist should definitely agree with Cameron. If dispositional properties are modally forceful and *tend towards the future*, of course, it is what is presently instantiated that makes a difference in the object that instantiates it. *Being red* makes a difference to the intrinsic nature of an apple and it is these intrinsic powers that makes future states of the apple possible (e.g., becoming red). A powers ontologist argues that properties that do not “make a difference” at all in the intrinsic nature of their bearers would not be causally powerful. And remember that something needs to be causally powerful in order to exist (for the Eleatic test of reality). So, in order to be real, a property has to be able to make a difference in the world, it has to be able to produce some change in the world - and a Lucretian property does not seem to have such a power. So, Cameron, and a powers ontologist would agree with him, believes that the presentist

Needs properties which both make a difference to the present intrinsic nature of their bearers – properties which are *difference making* – and which fix the truths concerning how the bearer was in the past (call these properties *past settling properties*). (2011:62)

Lucretianism is then ruled out from a presentist dispositional framework. Let’s make a second attempt and explore the possibility of a dispositionalist to adopt what Cameron calls Temporal Distributional Properties.

7.3 TEMPORAL DISTRIBUTIONAL PROPERTIES

Let's make a last attempt and see what happens if we adopt Cameron's Temporal Distributional Properties. But before exploring the combination of Temporal Distributional Properties (TDP) and dispositionalism, let me briefly explain what these TDP are.

Cameron borrows the idea of a distributional property generally from Parsons (2000, 2004). Here is what distributional properties are: consider an object, O, which is white with black polka-dots, and its corresponding property being-polka-dotted. This property tells us how O is across a region of space. Thus, call this a spatial-distributional-property (SDP hereafter). O itself can be seen as both wholly white at places, and wholly black at others. While nothing can be both wholly white and wholly black, instantiating the SDP, being-polka-dotted, is enough to explain exactly how O is across the region of space it occupies.¹³⁵ Properly speaking, being-polka-dotted does not have proper parts. It is a single property without an internal mereological structure, though it is distributed across a region of space.¹³⁶ Thus, in response to the objector who claims that the property being-polka-dotted has as parts, for instance, being-white-at-s and being-black-at-s*: no. The property being-polka-dotted just is the property of being-white-at-s-and-being-white-at-s*-and-being-black-at-s**...and so on. The distributional property should not be identified with a mere conjunctive property.

¹³⁵ Being-polka-dotted is just one example of an SDP, a colour-distributional property. Other dialectically respectable SDPs include being-hot-at-one-end-and-cold-at-the-other (a heat-distributional property), having-a-uniform-density-of-1kg/m³-throughout (a density-distributional property), and so forth.

¹³⁶ Cf. Cameron (2011: section 4).

It may help the reader to get a grip on the properties that I have in mind by contrasting them with another kind of property—a structural universal. Lewis (1986a: 26-27) introduces the notion of a structural universal, a notion familiar from Armstrong.

[A]nything that instantiates it must have proper parts; and there is a necessary connection between the instantiating of the structural universal by the whole and the instantiating of other universals by the parts.

On two counts, distributional properties are unlike structural universals (so described). First, the distributional property being-white-at-s-and-being-white-at-s*-and-being-black-at-s**, etc. does not have, for instance, ‘being-white-at-s’ as a proper part. Second, on the distributional account, the property being-white-at-s-and-being-white-at-s*-and-being-black-at-s** does not ‘involve’—in any sense at all—other universals, such as being-white-at-s, or being-black-at-s*. Rather, the property being-white-at-s-and-being-white-at-s*-and-being-black-at-s**—the property of being polka-dotted—is a single, simple, universal. This, at least, is the picture that Parsons presents us with and is put to work by others in a variety of other contexts (e.g. Hawthorne 2006: 153; Schaffer 2010: 58-60).

Just as a distributional property may be spatial, spanning a particular spatial region, I see no reason to think that such distributional properties may not also be temporal and span “regions of time”. Cameron claims:

the temporal distributional property is fundamental, whereas the conjunctive property is not... Distributional properties cannot be broken up into simpler components: there is just one property here, and it is fundamental (2011: 70)

Can this help the dispositional presentist? By adopting this kind of properties, the dispositional presentist would not have the problem of a frozen present with static properties (see chapter 6, section 6) anymore. TDPs are not made of static frozen parts, rather these are “continuous properties” that may account for the dynamism beloved of the dispositionalist. After all, Cameron claims that TDP cannot be broken up into simpler parts, but rather there is just a (fundamental) single property, that is the same property that grounds the truths about how the bearer of such property was in the past (and how it will be in the future). This approach seems then to solve also the dispositionalist’s worry about dynamism.

But things are not so straightforward, and also Cameron’s view has (at least) two problems. The first is a problem about production, the second is a problem about the openness of the future. Roughly, here are the two problems.

First problem: If TDPs are single properties, then this means that they do not change. Remaining the same over time, these properties do not allow genuine production to occur. For example, the TDP that I instantiated yesterday is the same TDP that I instantiate today, and always has been and always will be the same TDP that I instantiate. It then seems that there is no transformation of powers. Genuine

transformation of powers is what dispositionalists require for something to change (P2). And this is a first reason why dispositionalism and Cameron's TDPs are at odds.

Second problem: seemingly, TDPs do not satisfy P4 either, that means that TDPs cannot account for the openness of the future defended by dispositionalists. On Cameron's account, as we have just seen, TDPs are actual properties, this means that also "the parts" of the property that I will instantiate in the future are "already" actual. It then seems that these properties are fixed (at least in Diekemper's conception of fixity (see chapter 4, section 5.1). And, as we have already seen, the fixity of the future is something that a dispositionalist cannot accept. So, also TDPs and dispositionalism are at odds, in the same way eternalism and dispositionalism are.

8. CONCLUSIONS

In this chapter I argued that the last option on the table, presentism (the view that only present objects exist), does not fit well within a powers ontology. In fact, I argued that, although standard presentism can accommodate the dispositional requirements regarding production, and so satisfy P2, and the openness of the future requirement, and so satisfy P4; presentism cannot accommodate a further requirement of dispositionalism. The problem lies in a different and seemingly similar aspect of these two theories: the intrinsic dynamism of reality.

In this chapter (section 6), I individuated two different kinds of dynamism: temporal dynamism on the one hand, and dispositional dynamism on the other. I argued that these two kinds of dynamism are different. Presentism defend a temporal dynamism,

which consists in a continuous succession of (durationless) present moments; while dispositionalist defend a dynamism that consist in the continuous change of the entities that populate reality. Constant change and frozen moments are two incompatible notions.

I concluded this chapter by considering three possible strategies that the presentist could adopt to overcome the problem just mentioned. In section 6, I considered a possible reply to this worry: a non-standard presentist view due to Hestevold (2008). I argued that also this non-standard view is at odds with dispositionalism, because it violates P4. I then considered two different type of properties (Lucretian properties and TDPs) usually adopted by presentists to overcome the truth-making objection and claimed that also these two types of properties do not solve the problem, but rather create similar worries as eternalism.

I then conclude that there is no way to reconcile presentism and dispositionalism.

THERE IS NO TIME FOR POWERS (YET?)

In this brief chapter I will summarize the main claims that I have argued for in each chapter and conclude by leaving the reader with two open issues: the lack of a viable metaphysics of dispositional properties and the incompatibility of dispositionalism with all of the mainstream theories of time.

In chapter one I wanted to persuade the reader to be a realist about dispositional properties and to be a pandispositionalist. Analyses of dispositional properties (both simple and more sophisticated ones) suffer from different problems. I argued that a realist account of dispositions should be preferred. I also argued that accepting only categorical generates a problem (the contingency problem), and that dualist views (where there are both categorical and dispositional properties) lead to a problem too (the overdetermination problem). Having done this, I believe I made a *prima facie* case for pandispositionalism. Seemingly, pandispositionalism is the best theory among those dispositional theories discussed.

In the second chapter, I raised a first issue for the dispositionalist. Seemingly, there is no viable metaphysics of properties for dispositions. Aristotelianism, Platonism and tropism fail to satisfy fundamental principles defended by dispositionalists. This is a problem that needs a solution. Following Tugby (2013), I argued that both Aristotelianism and tropism fail to satisfy two principles at the heart of dispositionalism (CP and IP, respectively). Tugby, for this reason, develops and defend a Platonic account for dispositions. I argued that Platonism too is not

consistent with two other fundamental principles of dispositionalism (PP and TAP). Here I concluded the first part of the thesis, leaving the dispositionalist with a question to be answered.

The second part of the thesis is about the combination of a particular account of dispositionalism and time. I chose to adopt a particular version of pandispositionalism, one that brings with it a theory of causation and a theory of modality. This version has been developed and defended by Mumford and Anjum (2011) (although this view is similar to others, see for example Heil (2012) on causation). From this chapter I individuated three principles at the heart of dispositionalism (one about production, P2; one about dispositional modality, P4; and one about the fundamental dynamism that dispositionalists defend). Here are the principles reiterated:

P2: Change consists in the production of new causal powers, via the transformation of old causal powers.

P4: Present properties tend toward merely and naturally possible (future) states.

Dispositional Dynamism: change is essentially dynamic and cannot be reduced to a succession of frozen instants.

The result I reached in the second part of the thesis is that none of the standard views of time (eternalism, GB and presentism) can be adopted in a dispositional framework,

since they fail to satisfy (in different ways) the principles just mentioned. It should be now clear that the problems that arise from the combination of the various theories of time is given by these three dispositional requirements.

Dispositional and eternalism are in tension, because eternalism cannot account for the type of productivity and the openness of the future that dispositionalism requires. The extension of time defended by eternalists does not allow for production and the openness of the future (and, of course, it does not account for the fundamental dynamism either, given that it is a static theory of time).

Dispositionalism and GB cannot be combined, because although GB can satisfy P4, it does not satisfy P2. In the GB picture, in fact, there is some production (the block grows bigger and bigger, since new entities come into existence), but this production is not given by the transformation of causal powers. The extension of time does not allow transformation of powers to occur, because old powers keep existing in the past.

Dispositionalism and presentism cannot be reconciled either. Although presentism can satisfy both P2 and P4, it defends a type of dynamism that is fundamentally different from the type of dynamism defended by dispositionalism. In this case, it is the non-extension of time that creates the tension. If time is not extended, change cannot happen. Temporal dynamism is conceived as a succession of durationless instant, but, as we have seen, dispositional change cannot occur at an instant, but rather it needs the extension of time to occur.

Dispositionalism seems then to require both time to be extended and time to be non-extended, and it seems that what causes the conflict is its commitment to the ‘intrinsic dynamism’ of reality. We are then seemingly left with three options:

1. All theories of time are wrong and we need a new theory of time.
2. This version of dispositionalism should be completely rejected.
3. Dispositionalism needs to be revised.

It is hard to see how 1 could help: if my arguments work, then this means that the required model of time should have to be both extended and non-extended. Rejecting dispositionalism, and so choosing 2, would mean to reject also all the positive upshots that dispositionalism brings with it. So, I believe that this not to be a viable option. Then we are left with 3. A revision of dispositionalism: a modified version of dispositionalism might be defensible, and might still be recognizable as a dispositionalist view. And this is what I would like to explore next.

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