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TIME, PERSISTENCE, & CAUSALITY

Towards a Dynamic View of Temporal Reality

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Time, Persistence, and Causality

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ABSTRACT

The thesis revolves around the following questions. What is time? Is time tensed or tenseless? Do things endure or perdure, i.e. do things persist by being wholly present at many times, or do they persist by having temporal parts? Do causes bring their effects into existence, or are they only correlated with each other? Within a realist approach to metaphysics, the author claims that the tensed view of time, the endurance view of persistence, and the production view of causality naturally combine into what is called the dynamic view of temporal reality, and that the tenseless view of time, the perdurance view of persistence, and the correlation view of causality naturally combine into what is called the static view of temporal reality. The author argues in favour of a dynamic view. During the discussion a number of metaphysical problems are addressed. First, it is argued that the charges that the dynamic view is contradictory, made by J.M.E. McTaggart and David Lewis, are viciously circular. Secondly, it is argued that the static view cannot account for change, and deprives metaphysics of essential means to provide natural explanations to empirical phenomena. Thirdly, the author presents a novel account of the nature of necessary causal production. He suggests that the traditional conception of causes as essentially being external to the effects should be abandoned, and that causal production instead should be explicated in terms of reciprocal interactions between coexistent substances.

Key words: Metaphysics, time, persistence, causality, change, interaction, temporal parity, tensed view, tenseless view, endurance, perdurance, McTaggart, Bunge, Lewis, Mellor, Simons.

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PREFACE

This is a Ph.D. thesis in the philosophy of time. Its structure deviates from the usual monograph form of philosophical dissertations in that it consists in three self-contained and previously published articles, whose background and unifying theme is presented in an introduction. The introduction, as well as the appendices, contains complementary material which, for the sake of brevity required by journal articles, did not find its place in the final draft of these articles. Here I can allow myself to include this material, in so far as it facilitates the understanding and appreciation of the articles and the problems they deal with. The three articles are:

I: 'McTaggart and the Unreality of Time', *Axiomathes* **9**(3): 287-306, 1998.

II: 'Temporal Parity and the Problem of Change', *Sats - Nordic Journal of Philosophy* **2**(2): 60-79, 2001.

III: 'Causality as Interaction', *Metaphysica*, **3**(1): 87-119, 2002.

These articles all address, in one way or another, what has been one of the most fundamental issues in the philosophy of time during the last century or so: whether or not there really is an objective difference between the present, the future, and the past, and whether reality really changes with respect to what is future, present and past (Tooley 1997, p. 13; Craig 2000, p. ix). Philosophers are divided into two camps over this issue, those who think that future, present, and past really are objective features of temporal reality, and those that do not. On the latter view, future, present, and past, are merely features of the subjective perspective we have on a reality that objectively speaking does not contain these features; it claims that all moments of time are equally existent and real.

The two views go under a variety of names: the *A* and *B* view, the *tensed* and *tenseless* view, and the *dynamic* and *static* view. The terms *A* and *B* view can be considered to be the original designations of the two views. They were inspired by J.M.E. McTaggart's use of the terms *A* and *B series* in his famous argument for the unreality of time, an argument which must be considered to be the origins of the contemporary debate between the proponents of the two views. Later, D.H. Mellor coined the terms *tensed* and *tenseless* view, which are more

descriptive. Other writers, like Michael Tooley, prefer to talk of the *dynamic* and the *static* view, because these terms put less focus on the linguistic aspects of tense.

In the general introduction I will predominantly use the terms tensed and tenseless views of time, and the terms tensers and detensers for the proponents of the two views, for the sake of convenience, in order not to confuse the reader with too many terms for the same thing. These terms are well known for those who are acquainted with the issue, and descriptive enough to be helpful for those who have no previous knowledge of it. In the articles however, there is a shift from the terms tensed and tenseless to the terms dynamic and static, and this shift occurs when I turn from discussing different views of time, to discussing different unified views of time, persistence and causality. At this early stage, I think it is premature to use the terms dynamic and static, because this dissertation is in itself an account of what I understand to be a dynamic and static view of temporal reality.

Although this dissertation addresses the dispute over the question whether a tensed or tenseless view of time is correct, it should not be taken to be an attempt to *prove* that either of these views is correct. The articles should be seen as complementary parts in an attempt to clarify what I think is really at stake in the choice between the two views, or at least clarify certain central issues relevant to such a choice. This does not mean that I attempt to make an impartial assessment of the issue. I make no secret of the fact that I advocate a tensed view of time, but I do not expect that my reasons for preferring that view will necessarily compel the reader to follow suite. What I hope to achieve is that those who have not made up their mind in favour of either view will appreciate this book as a guide to making an educated choice, and that those who have made up their minds in favour of a tenseless view will find something in my discussion of the issue that will at least persuade them to reconsider their choice. At the very least, I hope detensers will find it worthwhile, and even necessary, to respond to my discussion.

In the general introduction, I will begin with a discussion of the features of the phenomenon that is the subject of the debate, namely time, and some of the problems facing a philosophical inquiry into the nature of time. Then I will try to present the overall picture of the philosophical field that the articles contained in this dissertation address. A more comprised account of this philosophical field can be found in the introduction to article II, i.e. ‘Temporal Parity and the Problem of Change’ (p. 73). It may well be a good idea to begin the reading of this book by skimming through that introduction, before returning here.

The general introduction does not contain a summary of the discussion in the articles. This is because the articles are highly comprised, to the point that any informative summary would probably be just as long as the articles themselves, and make this book tediously repetitive. So, the introduction will only serve as a presentation of certain connections between different views on the nature of time, persistence and causality, and of the problems related to those views and their connections, which will then be discussed in the articles. The appendices contain commentaries to the discussion in articles II and III, and, to a lesser degree, some further elaboration of some of the arguments therein.

Please note, finally, that there is a list of references at the end of each part of this book, but no complete bibliography for the whole book. This is due to the independent fashion in which each part is written. I have tried to make the references in the different articles as homogenous as possible, but in this respect 'McTaggart and the Unreality of Time' deviates from the norm, only in the way that all references are given in the footnotes, none in the text.

GENERAL INTRODUCTION

1. The appearance of time

Time, or temporality, is a basic feature of our experience of the world, perhaps the most basic feature. Time permeates our experience of the occurrence of every phenomenon, whether material, social, or mental, e.g. of a cup standing on a table, of a radiant smile, and of our reflections on our experiences of these phenomena. All phenomena, including our reflections on various phenomena, appear to have a certain *duration*, they appear to occur *earlier* than some occurrences, be *simultaneous* with others, and *later* than the rest.

The world also appears to be *tensed*, firstly, in the sense that in our immediate experiences of the world events are constantly beginning and ceasing to occur. This gives us the impression not only that events are beginning and ceasing to occur, but also that new events will continue to occur. It creates in us an expectancy of the occurrence of events that do not yet exist, and we talk and think of those events as occurring in the *future*. Those events whose occurrence we are immediately experiencing we talk and think of as being *present*, and the events that have ceased to occur, but which we remember having occurred, or which we otherwise know to have occurred, are said to have occurred in the *past*. It is not just the existence and occurrence of events that appears to be tensed. So does the existence of things and persons. I exist presently, there will exist (I hope) persons in the future that will be my grandchildren, but Plato existed in the past.

Change is also an essential feature of the appearance of time. Reality as a whole appears to change with regards to what is future, present, and past. Things appear to have certain properties at one time, but other contrary properties at other times. And, events appear to be changes in things or constellations of things. The existence in time of things and of events appears to be different in this respect. Things often continue to exist after having changed; they *persist* through the changes they suffer. Events do not continue to exist through changes, rather they are the changes. And, changes also appear to be tensed. A leaf which has turned yellow, has been green in the past, and it will turn to mould in the future.

It may be noted that there are, allegedly, a certain kind of objects that do not appear to be temporal, namely abstract objects, and some philosophers think of

them as objects existing outside time and space (Lowe 1998, Ch. 10). But, to say that they do not appear to be temporal, is not to say that as a matter of experiential fact they appear to be located outside time and space. We have no *experiences* of abstract objects located outside of time and space. Abstract objects do not have an appearance in that sense We only have experiences of the universal features of objects existing in time and space, and each particular instance of such features appears to be in time. Of course, one might argue that we have experiences of abstract objects as objects of thought.

To be sure, the number 2, when I think of it, is not an object I think of as being located at any particular time or at any particular place (admitting for the sake of argument that it can be thought of as an object), or as being an object subject to change. But, I do not think of it as an object existing outside time and space either; I think of it as an object located in my thoughts, and those thoughts have a certain duration, they occur earlier than some thoughts, and later than others. I am thinking of it now, I expect to think of it again in the future, and I remember having thought of it in the past. So, the thoughts exist in temporal reality, the question is whether the objects of those thoughts do.

There is a significant difference between the manner in which abstract objects appear to us in thought, and the way concretely existing objects appear to us in sensory perception. We can think of an object at will, while concretely existing objects only appear to us when they causally influence our senses. The question is then, whether the objects of our thoughts have a mind-independent existence outside space and time, or whether their non spatio-temporal appearance just reflects the fact that they are objects that only exist when we think of them. If there exist abstract objects outside time and space, and not just in our minds, then our knowledge about their existence, or our assumption of their existence, is at least derived by some other way than from our mere experience of the world.

The question whether there are objects existing outside time and space is an interesting one, since it implies that the whole of reality is perhaps not entirely temporal, i.e. that there is a non-temporal reality ‘outside’ temporal reality, but this is a question that is not discussed in this dissertation. The focus here is on the *temporal* nature of reality, and then it is of course primarily temporal reality that is of interest. I am however sceptical as to the reality of objects existing outside time and space, and of the division of reality into the temporal and non-temporal. Partly, because it seems to me that by ‘abstract objects’ one means ‘universals’, and I fail to see the need to assume that universals exist outside of time. That is, I have sympathy for the view that one should accept the existence

of abstract objects if it is found to be unavoidable in order to explain some feature of the world, but I am not yet convinced that it is unavoidable. According to immanent realism, abstract objects are simply universal features of objects existing in time and space, and exist nowhere else than in those temporal objects. On that account, our knowledge of abstract objects is derived by abstraction from our experiences of concrete reality, experiences that are the product of the causal influence of that concretely existing world.

Admittedly, mathematical objects are not easily thought of as being universal features of existent reality, at least not as easily as one can think of colours and shapes as universal features of existent reality. Perhaps mathematical considerations would compel me to accept the reality of non-temporal abstract objects, but I doubt that it would compel me to accept that such objects would exist. In my view, to exist is to be capable of participating in causal interactions, or in other ways being grounded by entities that are so capable. If we were to accept that abstract objects exist, then we would be forced to admit two very different forms of existing, so different that I fail to see in what way they could be two different species of the same genus. The idea that it is impossible to think of abstract objects only in terms of universal features of concretely existing reality, is, I think, a stronger argument in favour of the view that existence and reality do not coincide, rather than the view that one part of reality exists outside time and space.[1]

To sum up. The appearance of time consists in the beginning and ceasing to be of things and events in a certain order, an order we either describe in terms of the events passing from the far future towards the present, and then receding into the distant past, or in terms of being earlier than, simultaneous with, and/or later than each other. These events have a certain duration and they appear to consist in the activity of substantial entities. These substantial entities, mostly what we ordinarily call things, have a less fleeting existence than events. Things often persist through the changes they suffer, while events are the changes which happen to things.

2. Considerations in relation to the study of time

I think the crude phenomenological description of the appearance of temporal reality given above is a description that most philosophers would accept as basically correct, at least for the purpose of the issue now under consideration. Strange as it may seem, in the debate on what time is really like there is no great

[1] For a recent overview on the topic of the existence of abstract objects see Bob Hale (1998).

controversy over the appearance of time, although there is controversy over the question whether the appearance of time itself provides a direct proof in favour either of a tensed or tenseless view.[2] It is agreed that time appears to be tensed and constantly changing with respect to future, present, and past, i.e. it is agreed that the tensed view is in better accordance with our experience of time. It is nevertheless a matter of deep philosophical controversy whether time really is the way it appears to be, and it is this controversy that is the subject of this dissertation.

Since the phenomenology of time is not an issue in the debate under consideration, I provide no discussion of different analyses of the experience of time in this work, such as can be found in the phenomenological tradition. The crude phenomenological description given above suffices for the purpose of discussing the debate over the real nature of time. This also explains the thoroughly realist approach taken in the discussion. The appearance of time is not the issue here. The issue is: what is time really like? Or, rather, what is the nature of the objective reality that gives rise to the appearance of time? This question only makes sense from a realist perspective, i.e. on the assumption that there exists an objective reality independently of minds and that it is the features of this objective reality that is the object of investigation. There is an implicit assumption in this controversy, namely that there is a distinction to be made between subjective experience and objective reality, and that time, if it exists at all, is really a feature of objective reality. A further implicit assumption is that we may be mistaken about the nature of objective reality. That is, the question 'what is time really like', presupposes the possibility that our experience of time may be mistaken and therefore that the way we talk about time may be false. Otherwise we would be content with a straightforward phenomenological analysis of experience and a semantic analysis of language.

One may, however, object to talk about 'the appearance of time' in this context for entirely different reasons. Strictly speaking, time has no distinct or independent appearance (LePoidevin 2000). Not like a table appears to be distinct from the chairs around it. Time permeates our experiences of every phenomenon, but we have no experience of time independent of our experiences of other phenomena. Every phenomenon appears to be in time, but there is no phenomenon 'time' distinct from the phenomena occurring *in* time. Admittedly, we often talk and think about time in terms of moments, instants, and/or intervals of time, which are items that we may think as being independent of the things and/or events that exist at those moments. That is, as items contingently

[2] See for instance, Oaklander & Smith (eds.)(1994, part III).

occupied by certain things and events.[3] But, these items, i.e. times or moments, have no appearance independently of the things or events existing 'at' those times. The idea of moments of time existing independently of the things and/or events existing at those moments of time, is an abstraction from our experience of the concretely existing temporal reality. We can perhaps *think* empty time, but we never *perceive* empty time. The appearance of space differs in this respect from the appearance of time, in that we do perceive empty spaces, and do not just think them.

The duration of temporal intervals only appears to us as the duration of events, or of experiences, and in the persistence of things around us and of ourselves. The temporal relations between moments of time, those of simultaneity, earlier than, and later than, only appear as relations holding between occurrences of real phenomena that are simultaneous with, earlier than, or later than each other. The future appears to us in the continuous realisation of events and things we were expecting to happen, and/or to come into existence. The present appears to us in our immediate experience of the world and the events occurring in it, while the past appears to us as the cessation of events and as memories of those no longer existing events. Time appears to us as a feature of all appearances, but has no distinct appearance of its own. Time is therefore one of the most familiar aspects of reality and one of the most elusive.

That time is familiar is clear from the ease with which we talk and orient ourselves in time. Time is not a problem in everyday contexts, not even for young children. In philosophy, however, the objective nature of time is an eternal puzzle. One reason why time is so enigmatic, may be that in order to identify time as a distinct object of investigation one must abstract it from our continuous experience of reality as a whole, and yet it must at all times be studied as a feature of reality as a whole, not as distinct from it. That is, time can only be identified as an abstraction, but it cannot be studied only as an abstraction, if only for the simple reason that if the initial abstraction is faulty one will be studying a *chimera*. There is a problem already in the identification of the object 'time' which is under investigation.

Another reason for why time is such a difficult issue may be that because time is a feature of almost everything, temporal considerations enters into almost every philosophical issue in every field of philosophical inquiry. Consequently,

[3] The view that time is independent of the things existing in time, is called the substantival view of time. For the purposes of this work, it is not important whether or not time is distinct from the things and events existing in time, since whatever can be said about the tensed or tenseless nature of things and events, also applies to the tensed or tenseless nature of moments of time.

the metaphysics of time is potentially relevant for every philosophical inquiry and vice versa. I think this is the most difficult aspect of the philosophical study of time. To give some examples, the question of whether the future and past exists or not, has consequences: (i) for the assignment of truth values, or modality, to propositions about the future and past (which is a problem in logic), (ii) for what we can know, if anything, about the future and past (which is a problem in epistemology), (iii) for the problem of reference to future or past events (a semantic problem), and (iv) for the problem of free will (which is a problem for the philosophy of mind, of agency, and of ethics). The metaphysics of time may have consequences for all these issues. Conversely, anything found to be indubitably true in any area of philosophy may have implications for one's metaphysics of time. For instance, if one is persuaded that the principle of bivalence is in fact true, i.e. the thesis that all propositions are unqualifiedly either true or false, then one should hold that the future exists, at least on the assumption that truth is correspondence to facts. If the future does not exist, propositions about the future cannot correspond to the future and so cannot be true. And, if one holds that the future exists, then one should hold that becoming present does not involve beginning to exist. Conversely, if one holds that things only begin to exist when they become present, then one should hold that the future cannot exist.

There is not only a problem in the relation between the metaphysics of time and other fields of philosophical inquiry, e.g. logic, semantics, and ethics, but also with the relations between different notions within the field of metaphysics. It is the problematic relations between metaphysical notions that is the subject of this dissertation. Take *existence*, for example. The nature of existence is lurking in the background of most of the philosophical puzzles about time. The following example given by Quentin Smith and Nathan Oaklander is typical in this respect:

> Consider, for example, the birth of my first grandchild. Since that event is in the relatively distant future, it does not yet exist. Nevertheless, it will (I hope) eventually take place—that is, the event in question will come into existence. Subsequently, the event will cease to exist as it recedes into the past. It would thus appear that the passage of time involves events moving from the nonexistent future to the existing present to the nonexistent past. But if the future does not exist, how can it become present? How can what is not become what is? How can something (the present) come from nothing (the future), and what is (the present) become what is not (the past)? Questions like that have led some people to wonder how our experience of time could ever reflect the real nature of time. (1994, p. xi)

Consider as well Leibniz' law, i.e. the principle that 'if *a* and *b* are identical, then they have all properties in common'. This principle concerns the metaphysics (and also the logic) of the identity of things, and is often found to be self-evidently true (Kripke 1980, p. 3). This principle is central in certain attempts to 'prove' that things cannot change its intrinsic properties from time to time and yet remain the same, or rather, to 'prove' that it involves a contradiction to assume that things persist as strictly identical entities through changes. The argument goes as follows. If an object *a* persists through a change, then (i) *a* exists both before and after the change (requirement for persistence), and (ii) *a* has different properties after the change than it had before (requirement for change). The contents of (i) and (ii) are then assumed to be properly expressed in terms of (iii) *a* is *F* at one time *t*, and not-*F* at another time *t**. From the further assumption that Leibniz' law is true, it follows, it is argued, that if *a* existing at *t* is identical to *a* existing at *t**, then *a* at *t* and *a* at *t** must have all properties in common. That is, it allegedly follows that *a* at *t* must be both *F* and not-*F*, and *a* at *t** must be both not-*F* and *F*, which is contradictory. Thus, it is argued, *a* existing at *t* cannot really be identical to *a* existing at *t**, and therefore there is no strictly identical object *a* that has two incompatible properties at different times. David Lewis calls this the *problem of temporary intrinsics* (1986, p. 202-5).

The question is, whether this argument is a 'proof' of the impossibility of persistence through changes, or a *reductio ad absurdum* of the practice of applying Leibniz' law across times, since it leads to the apparently absurd conclusion that things do not really persist through changes. It seems to me that even the possibility of thinking of this proof as a *reductio* indicates that Leibniz' law may not be as self-evident as it is often thought to be, since it is obviously not self-evident how that law should be applied in metaphysics. I am not denying that Leibniz' law is true, I just do not think that it is self-evidently true to anyone except those who have come to the conclusion that it cannot be doubted after having thought long and hard about it. After all, it requires some understanding of the use of symbolic logic to even understand properly the idea behind the formulation of the principle.

Whether or not one takes the argument against the possibility of persistence through change as a *reductio* of the practice of applying Leibniz' law across times, depends, firstly, on whether one thinks that the identity of a thing resides in its properties or in the substance that has the properties, and secondly, on whether one thinks Leibniz' law is self-evident *a priori* of, or independently of, what one thinks is the nature of persistence. Is the nature of identity

ontologically prior to, or independent of, the nature of persistence and change, so that we can decide whether a certain conception of persistence and change is true on the basis of our beliefs about the nature of identity? Could we really determine the nature of identity without considering what is the nature of persistent and changeable objects, given that it is first and foremost persistent and changeable objects that we think of as having an identity at all? It seems to me that these two issues are mutually dependent on one another and that this kind of mutual dependence between metaphysical notions is a part of the difficulty with coming to grips with the nature of various features of reality, not the least time.

Causality is another notion closely related to time and existence. According to a common belief, causes are prior to their effects and bring their effects into existence. The coming into existence of effects is of course assumed to occur in connection with the effect becoming present. But, if the future exists, as some believe it does, then effects do not come into existence by becoming present. Consequently, causality cannot involve production if the future exists. Conversely, it is reasonable to believe that the future does not exist if effects are in fact produced.

Ideally, the construction of a theory of time should take every field of philosophy into consideration and incorporate them all into a metaphysical model of reality as a whole, since arguably there are mutual interconnections between the metaphysics of time and every other feature of reality. In historical retrospect, those philosophers that have had the most interesting things to say about time are those that have done so in the light of a metaphysical system aiming to account for reality as a whole, e.g. Aristotle, Leibniz, Spinoza, Kant,[4] and J.M.E. McTaggart, just to name a few. Having said this, it is not difficult to understand the exasperation in St. Augustine's famous remark:

> For what is time? Who can easily and briefly explain it? Who can even comprehend it in thought or put the answer into words? Yet is it not true that in conversation we refer to nothing more familiarly or knowingly than time? And surely we understand it when we speak of it; we understand it also when we hear another speak of it. What, then, is time? If no one asks me, I know what it is. If I wish to explain it to him who asks me, I do not know. (*Confessions*, Ch. 14)

I for one, do not take his exasperation as an indication that the appearance of time is a complete mystery. The difficulty lies in giving an account of the temporal reality that lies behind this appearance. If temporal reality includes all of reality, there are temporal features of every aspect of reality. Consequently, to

[4] One might object to the inclusion of Kant here, since his philosophy is not obviously described as a metaphysical system.

give an exhaustive account of the objective nature of time is tantamount to giving an account of the temporal features of every feature of reality as a whole. And who can easily and briefly explain that?

It is the difficulties with making a certain metaphysical conception of time fit into our overall conception of temporal reality that is an exasperating enterprise, because it requires that our conception of time is compatible with our conceptions of existence, identity, persistence, substances, properties, relations, truth, reference, modality and causality. Time is at the very core of our belief-structure, and therefore our conception of time has to be compatible with all of it, if that structure is to make up a coherent whole. Because of that, a change in our conception of time may threaten to upset the entire structure. That, I think, is part of the reason why philosophers are not so prone to changing their minds on matters of time. To modify our view of time, is to modify our view of the world.

The present dissertation is not an attempt to construct such an all-embracing theory of time, and therein lies of course its greatest weakness. But, it is a weakness it shares with most other contributions to the discussion at hand.[5] It is even doubtful whether the construction of an all-embracing theory of time can at all be accomplished by a single person, because it calls for mastery in almost every field of philosophy. It is more likely that such a theory may grow forth in a dialogue between members of the scientific community, each contributing with their special expertise. I hope this dissertation may qualify as a valuable contribution to that sort of dialogue, even though it is the result of only 6 years efforts to try and understand some parts of the philosophical puzzle about time. It is an attempt to give some preliminary answers and perhaps suggest some new aspects to some of the innumerable questions hiding behind the seemingly straightforward question 'what is time?'

At the same time as this dissertation should only be seen as addressing some parts of the philosophical puzzle, one of its goals is to point out the need to discuss time in a broader perspective than is often the case, notably the need to discuss the nature of time in relation to the nature of change, persistence, *and* causality. The thesis that there is a natural link between different views of time and different views of persistence, is well known and much debated. Not so for the thesis that there is a natural link between endurance in tensed time and causal production, and between perdurance in tenseless time and causal correlation, nor between tensed time and causal production, and between tenseless time and causal correlation. Writers that in one breath argue for the

[5] William Lane Craig makes an admirable effort to deal with the debate from an holistic approach in two companion volumes (2000*a* & 2000*b*).

view that things perdure in tenseless time (Lewis 1986, pp. 202ff), argue in the next breath that causes bring their effects into existence (Lewis 1970). Sally Haslanger (1989) is one of the few that has noted the connection between different accounts of persistence and different accounts of causality, but she makes no explicit connection to how different views of persistence and causality are linked to different views of time. Time, change, persistence, and causality are interdependent features of temporal reality and should be studied together; time appears to us as a feature of a reality which is continuously changing, change appears to us as a variation between times in the properties of persistent objects, and most changes are causal. Hugh Mellor (1981 & 1998) is one of the few that discusses under the assumption that time, persistence, change, and causality, are interdependent features, but as I will argue, I think he fails to consider that there are two very different accounts of causality.

However, the philosophical problems about the nature of time that I do discuss are fewer than those that I do not discuss. Firstly, I do not discuss the question of whether time is continuous, dense, or discrete, which partly turns on the logic of infinity and on considerations from quantum physics. Secondly, I do not discuss the question of whether intervals of time have the same extension in every inertial system, a question that has to do with relativity theory and the conventions of time measurements. Thirdly, I do not discuss the question whether time has a beginning or end, which is a cosmological question. Fourthly, I omit entirely the whole field of the topology of time, i.e. whether there is just one single time order in the universe, or if the history of the universe branches off in different independent series of temporally ordered events. Also, whether time is linear or circular. However, the question whether there is, or is not, a difference between future, present, and past, and whether things begin and cease to exist, can be intelligibly discussed independently of these issues, although they are all relevant to the question ‘what is the nature of time’.

There is one issue that one may think that I should have given better attention, and which I wish I could have given attention, and that is the question of the direction of time, i.e. is it really the case that the relationship between earlier and later events is asymmetric and not symmetric? Is it really the case that we cannot change the past but can prevent certain events from happening in the future? Are causes always prior to their effects in time? Is it really impossible to travel backwards in time, and if so, why? I briefly touch upon this issue in the paper ‘Causal Production as Interaction’, where I state, as opposed to argue, some of the things I think my view of temporal reality entails about the direction of time, e.g. why causes always are temporally prior to their effects.

No discussion or background account is given of the problem of the direction of time, nor will I do so here.

I do not include any material on the subject of the direction of time despite the fact that that subject has definitively been on the agenda from the beginning of my Ph.D. studies. The reason is that discussions about the direction of time are usually discussions about the possibility of giving causal explanations of the direction of time, and I have found that they usually fail to consider the philosophical relevance of the fact that there are two very different accounts of causality: (i) the view that causes bring their effects into existence, i.e. the production view, and (ii) the view that certain kinds of causes merely correlate to certain kinds of effects, i.e. the correlation view. To give a causal theory of time, is to account for the direction of time in terms of the temporal precedence of causes over their effects, or in terms of certain asymmetrical features of the causal structure of the world as a whole (Reichenbach 1956; Salmon 1984). I came to the conclusion that before one considers how the direction of time can be given a causal account, one must be very clear on the difference between the two views on causality and how they relate to different views on time. I have come no further in this dissertation.

The task of clarifying the difference between a production and correlation view of causality, and how the difference affects the discussion on time, turned out to be more extensive than I thought from the beginning. Partly because discussions about the nature of causality are just about as complicated as discussions about the nature of time, and partly because I simply could not find any account of causal production with which I was satisfied. My attempts to clarify the difference between a production view and a correlation view soon turned into an attempt to develop an original account of causal production. In this work I do not discuss the direction of time, but I think my discussion of the nature of causal production and how I contrast that view with the correlation view of causality, sets a new stage for such a discussion.

It is for similar reasons that two other questions are also left out of account: the question whether there could exist a time in which nothing happened, i.e. can there be time without change, and the question of what gives unity to time, i.e. why is it that the extinction of the dinosaurs and the building of the Sphinx are parts of the same temporal reality. The first issue has to do with the question whether time presupposes change, or whether change presupposes time, or whether they are interdependent. Since many or most changes are causal, this is an issue that cannot be properly addressed without considering the relationship between time, change, and causality. But, since there are two different accounts

of time, of change, and of causality, then I think the question of the interrelations between these different accounts has priority over the question whether there can be time without change.

I do not discuss what gives time its unity, because that is an issue that I think has to do with the connection between persistence and time. I think time receives its unity because different times are different states of the very same permanent substance. But, this is a view whose substantiation presupposes an account of how a permanent substance can persist through causally produced changes. In this dissertation I attempt to lay the grounds to such an account, by discussing the relationship between persistence and change on a more local scale, i.e. what happens in causal interactions between parts of the permanent substance.[6]

I do not only leave out certain issues concerning the nature of time, but also certain approaches to the issues that I do discuss. Most notably, I leave out strictly semantic approaches to the question 'what is time really like?' My reasons for this are metaphilosophical. It seems to me that semantic analysis is an inadequate tool for the attempt to answer the question 'what is time really like?' This question, as pointed out above, only makes sense from a realist perspective, since it presupposes a distinction between subjective experience and objective reality. It does not call for analysis of how we actually talk and think about time, but for a discussion of whether the way we actually talk and think about time corresponds to what time is really like. To approach this question *only* from a semantic perspective is to assume that we already talk and think about time as it really is (Ludlow 1999), or assumes that no other answer can be found, either because we cannot acquire any knowledge of how the world is really like (Hume 1739; Kant 1781), or because we cannot think and talk in any other way than we actually do.[7] It is in any case unintelligible to attempt to give an answer to the question 'what is time really like' by providing a semantic analysis. I do not myself attempt to provide any argument or justification of the assumption that we can acquire knowledge of the world, or that we can change our ways of thinking of the world. It is implicitly assumed in the particular discussion about the nature of time that I address, that the attempt to acquire

[6] The questions of whether there can be time without change and what gives time its unity are interrelated. Thus e.g. Lowe, develops an argument to the point that persistence gives time its unity, which is based on the premise that time essentially involves change (1998, p. 121ff).

[7] It is often claimed that this is Peter Strawson's view in (1959), but to be fair one has to point out that Strawson acknowledges in that work that our conceptual scheme has undergone significant changes during the history of philosophy. He only argues that a certain kernel of our conceptual scheme has not changed.

knowledge of the world and to form new ways to think about the world, is an intelligible and worthwhile task.

As already mentioned, the question 'what is time really like' implicitly presupposes the distinction between the objective and the subjective. But it also presupposes that experience might be misleading as a guide to how objective reality really is. Furthermore, it implies that we might have false ideas about the world. These assumptions are incompatible with any attempt to give an answer to what time is really like *only* by way of semantic analysis. Arguably, the way we ordinarily talk and think about time, mainly reflects time as it appears to us. A semantic analysis of how we talk and think about time, can only give us answers to how we actually talk and think about time and thus only gives us an idea of what time appears to be like. But, then the question remains unanswered of whether time really is the way we talk and think about it.

During the last fifty years or so, the debate regarding the nature of time has been focussed on semantic issues. For instance, whether tensed discourse can or cannot be reduced to tenseless discourse, or vice versa, and whether the possibility to reduce one to the other entails that one of them is more basic than the other (Smart 1963). However, this approach, I think, was not motivated by the nature of the subject but by the 'existential crisis' that metaphysics went through during this last century, as a result of the positivist trend and the so-called linguistic turn. But times have changed, hopefully to the point that there is no longer any need to justify the claim that it is possible to go beyond semantic analysis of concepts, i.e. to inquire into the basic features of objective reality, and not just into the contents of the concepts we happen to have at any given time.[8]

Oaklander and Smith write in the preface to the anthology *The New Theory of Time*, that there has been a reaction within the philosophy of time to what many philosophers have argued before, namely against the idea "that if we can determine what we mean or intend to express by the use of temporal language, then we will have an accurate picture of what reality must be like if our words and thoughts about time are to be true" (1994, p. xiii). I take it that the reaction is not against the validity of this claim as such. If we are clear on what we mean and intend by our words and thoughts, then surely we know how reality must be if our words and thoughts are true. The reaction is against the idea that by becoming clear on how the world must be like if our words and thoughts are true, we are getting any closer to finding out what the world is really like. We

[8] Such justifications have been given by Lowe in (1998), Ch. 1, and Thomas Nagel in (1997).

may be very clear on how the world must be in order to make our words and thoughts true, but still be very much in the dark about how the world actually is. I may be very clear on what the world must be like if the proposition 'the Earth is shaped like a cube' is to be true, but that clarity brings me no closer to finding out the correct shape of the Earth.

The reaction Oaklander and Smith are talking about, is a reaction against the idea that the correct method to investigate the objective nature of time is to determine what we mean or intend by our words and thoughts. It is a reaction against the idea that semantic analysis can substitute metaphysics, and of course against the idea that metaphysics is an unintelligible enterprise. If we can be mistaken about reality, the way we actually think and speak about reality is not a good clue to how reality in fact is. It may be a starting point to a discussion of the nature of reality, namely as an inventory of existing views about the nature of reality, but a semantic analysis cannot give an answer to which of these views are correct.[9]

But what, then, is metaphysics? To my mind, metaphysics ought to be characterised as a philosophical discipline admitting no other authority than the clarity of a reasoned argument. But, this is only the most general methodological trait of metaphysics. Something more may be said by considering what it is an attempt to think clearly about. Metaphysics, as I conceive it, has as its aim to find out what the world is really like; to lay down the most fundamental structure of reality. Since reality encompasses nothing less than everything, it would be remarkably foolish to restrict one's study of reality to some particular method, i.e. *only* to semantic, logical, or phenomenological analysis, and assume that any one of these methodologies gives us privileged access to reality. After all, these methods do not even have as their objective to lay down the features of reality, only of language, of valid inferences, and of experience, respectively

In present day philosophy, the idea of metaphysics is heavily influenced by the idea that there is a distinction between the subjective and the objective, and

[9] This is e.g. the main weakness of Peter Ludlow's discussion about time in (1999). He argues that natural languages have implicit metaphysical commitments, which I will not deny. But he also argues, or, rather, presupposes that there is some connection between natural languages and objective reality, such that a thorough analysis of those languages will give us an indication as to what is the correct metaphysics of time. On this point I disagree, although I think that such an analysis is valuable as a way to find out which metaphysical views are in some sense 'natural' to us. I for one think that one has to have good reasons to reject our natural view of the world, even though they often are false. The view that the Earth is flat was surely a 'natural' one to our ancestors, but it is flat out false. My understanding of Ludlow's linguistic-philosophical approach owes much to Görel Sandström. See (Sandström & Ingthorsson 2000).

that we are fallible in our attempts to form correct conceptions of the world. I take it to be a methodological consequence of this that metaphysics should take into account all methods that can plausibly provide us with clues to what the world is really like, and hope that even though one of these methods is inadequate, they may together prove to be adequate. Metaphysics is the task of finding an order in the chaos of various results of different semantic, logical and phenomenonlogical analyses, of hypotheses about the nature of the multifarious features of reality, and of the host of empirical observations of the world. It is the quest for an order that is compatible with, or explains our thoughts and experiences of the world. Metaphysics must consequently approach the task at hand systematically and with an open mind.

Finally, it may be asked, what is it that metaphysics can do that empirical science cannot do better, e.g. physics? Both are trying to find out the truth about objective reality, but physicists do not only produce logically coherent hypotheses about reality, they also perform systematic observations to support their hypotheses. Jan Faye, Uwe Scheffler and Max Urchs have the following to say about that, with special reference to the metaphysical study of time:

> […] apparently, science has very little to say about the way we think about time and the nature of time itself. This is because we cannot define time in terms of any other concept; on the contrary, we use it in the specification of other concepts. Time seems to be a fundamental concept which we have to accept as a precondition for our understanding of our own life and the whole universe around us. This does not imply, however, that time itself cannot be an object of inquiry, or that it can only be grasped intuitively. Even if we cannot provide a formal definition of time, something instructive and important about time can always be said concerning how it is related to other fundamental concepts like space, event, thing, causation, free will and human experience (Faye et al. 1997, p. 1).

I take them to mean that metaphysics is the study of those features of reality which cannot be directly studied by empirical observations, but which are often presupposed in the empirical study of physical phenomena. It is the study of those features of reality whose nature can only be inferred in terms of what we need to assume in our metaphysical systems in order to explain our experiences of the world.

I will not pretend to know the methodology and nature of empirical sciences to the degree that I be competent to compare them to the kind of metaphysical study in which I am engaged. I am however convinced that there is a value in the division of labour between the two modes of finding out about the fundamental features of reality, the philosopher's way, and the physicist's way. This value is in direct relation to the idea that different ways of getting to know about the fundamental features of reality may be singularly fallible, and

therefore inadequate, while their combined efforts stand a better chance to be adequate. With these preliminary comments, let me now proceed to present the background to the problems discussed in the three articles.

3. Two views on time

There are mainly two kinds of answers to the question 'what is time really like', one being the view that time is more or less as it appears to be, i.e. tensed, and the other being the view that contrary to what appears to be the case time is not tensed but tenseless. This is not to say that the tenseless view entirely rejects the validity of our experience. It does hold that events are earlier than and later than each other, like they appear to be, but it does reject the reality of one of the most catching features of our temporal experience, namely the distinction between future, present, and past.

The tensed view of time is the view that the apparent transition of events from future to past through the present, represents an objective feature of reality, but there are significant differences between various tensed accounts of how these features should be explained. For the purposes of this dissertation we may distinguish between three different kinds of tensed accounts. Firstly, there is the view that tenses represent different positions of events existing in time and that change of tense is a matter of events changing positions from the future to the present, and from the present to the past (Heller 1992; Smith 1993). On that view, all moments of time exist, albeit in different 'zones' of time, and pass in a uniform way from the far future towards the present, and then recede into the distant past. For the purposes of this dissertation, this view can be considered to be equivalent to the view that tenses are properties (either monadic or relational) that events possess, because both views deny that becoming present and ceasing to be present has to do with events beginning or ceasing to exist. Secondly, there is the view that the present and past exists, but not the future (Broad 1923; Tooley 1997). On that view, new states of affairs are constantly added to reality by coming into existence in the present, but no state that has once been added to existent reality ever ceases to be existent and real. Thirdly, there is the view that only the present exists, while the future and past does not (Aristotle, *Physics*, Bk. 4, Ch. 10; Augustine *Confessions*, Ch.28; Craig 2000).[10] On that view, to become present is to begin to exist, and to become past is to cease to exist.

[10] To attribute this view to Augustine may be problematic due to his considerations concerning the creation of time by God, but according to Erwin Tegtmeier in (1997, p. 102ff), Augustine should be considered as a presentist.

The tenseless view denies that tenses are objective features of reality and claims that the earlier than and later than relations are the fundamental characteristics of time. According to the tenseless view, what is existent and real is not confined to the present; contrary to what appears to be the case, all moments of time are equally existent and real. This claim is called the *principle of temporal parity*.[11] Temporal parity really means that, objectively speaking, those events that we *think* of as being in the future, and perhaps think of as non-existent, really do exist, albeit in a different temporal location than the location we exist at when we think of them. That is, to hold temporal parity to be true is to hold that there is no difference in terms of existence and reality between 'future', 'present', and 'past' moments of time. According to temporal parity, the battle of Waterloo has not really ceased to exist, it just exists in a different temporal location than the one we exist in.

The tenseless view claims that the experience of *now,* and of events passing through *now*, is a mere subjective illusion. It denies that there is anything special with the things and events that we experience as occurring *now*, at least in terms of existence and reality. That we experience some things as occurring *now*, some as having occurred in the past, and that we expect other things to occur in the future, is just a product of our limited perspective on a reality which does not really contain these features. That something exists *now* (whenever you read this text), just means that it exists at a position in time which is simultaneous with your reading of this text. That something is past (whenever you read this text), just means that something exists at a moment of time that is *earlier than* your reading of this text, and that something is future (whenever you read this text), just means that it exists *later than* that very reading of this text. For the purposes of this dissertation, I have not been able to discern significant differences between various tenseless accounts of time. Detensers have different views about the ontology of objects existing in time, or, rather, about what the tenseless view of time entails about the ontology of objects existing in time, but not, as far as I can tell, about the ontology of tenseless time itself.

The articles contained in this dissertation all concern the question whether a tensed or tenseless view of time is correct, but they contain no explicit discussion of which of the tensed views mentioned above is correct. It is however obvious that I assume that it is the view that only the present exists that is the correct tensed view, i.e. what is often called 'presentism'. There are a number of reasons for this. Firstly, the tenseless view is often formulated in terms of a denial of the claim that only the present exists and is real, i.e. as a

[11] For reference, see William R. Carter and H. Scott Hestevold (1994).

denial of presentism. Consequently, presentism is the natural rival to the tenseless view. Secondly, like Craig (1998), I think presentism is the only view that can cope with McTaggart's argument (discussed below) that the tensed view is contradictory, which is undeniably the most serious objection to the tensed view. The third reason is that I think the other two tensed alternatives are incompatible with the account of causality that I develop in the third article herein, 'Causal Production as Interaction', and with the view of persistence that my account of causal production requires. Indeed, I think they are incompatible with my views on causality and persistence for the very same reasons that I think the tenseless view is incompatible with it.

The tenseless view rejects the central idea of presentism, namely that things and events begin and cease to exist. This is in effect also denied by the first tensed view above, since it also holds that all moments of time exist, and pass from one tensed 'time-zone' to another, i.e. change tense. From my perspective, it does not matter whether one takes into consideration those variants of the first tensed view that claim that by changing tense the events go through some more dramatic ontological metamorphosis than just changing position in time, e.g. that they become 'determined' when they enter the present, or that they briefly acquire the characteristic of being 'actual'. On those views, to become determined or actual has nothing to do with beginning and ceasing to exist. I do not deny that things and events become determined and/or actual, but I think that to become determined is to come into existence, and to be actual is to exist. I also think that ceasing to be actual is to cease to exist.

The second tensed view claims that things and events begin to exist, but deny that they cease to exist, and that is enough to make it incompatible with my views on the nature of persistence and causality. The first tensed view excludes both beginning and ceasing to exist, although it admits of beginning and ceasing to be present and/or actual, and the second view denies that things cease to exist once they have begun to exist, although it admits of ceasing to be present.

Basically, my objection to the first and second tensed views have to do with my views on causal production, presented in the paper 'Causal Production as Interaction'. According to the first view, there really is no exchange of properties other than tense. According to the latter view, new substance must be constantly added to reality, apparently out of nothing since what is added cannot have come to exist out of those things that cease to exist, because nothing ever ceases to exist. The creation of substance out of nothing violates the old materialist principle that nothing comes into being out of nothing. That principle is one of the fundamental principles of the causal account I present.

Consequently, when I speak of the tensed view of time, I identify that view with presentism.

What, then, are the important issues about which tensers and detensers argue? I think the dispute really circles around three basic issues: (i) whether the tensed view is inherently contradictory, (ii) whether the tenseless view can account for change, and (iii) whether the tensed view can account for causal production. These are in any case the three basic issues addressed in this dissertation.

The contemporary debate between tensers and detensers can be seen as an unresolved dispute about the validity of J.M.E. McTaggart's famous argument for the unreality of time. A first version of the argument was published in 1908 in an article in *Mind* (1908), but it reappeared in 1927 in a revised form as Chapter 33, 'Time', of McTaggart's classic work *The Nature of Existence* (1927*a* & 1927*b*). There have certainly existed tensed and tenseless accounts of time before McTaggart, but he was the first to distinguish clearly between them and to mount what remains today as the most serious objections to each view, (i) that the tensed view is contradictory, and (ii) that the tenseless view cannot account for change. Admittedly, the debate on whether the tenseless view can or cannot account for change is not discussed in relation to McTaggart's argument anymore (I hope this dissertation will revive the connection), but the importance of his argument should not be underestimated. As Richard Gale says: "If one looks carefully enough into the multitudinous writings on time by analysts, one can detect a common underlying problem, that being that almost all of them were attempting to answer McTaggart's paradox." (1968, p. 6)

McTaggart distinguishes between two ontological conceptions of time, crudely corresponding to the tensed and tenseless views of time. He then argues that the tensed view involves a contradiction and that the tenseless view contains no change. On the assumption that change is essential to time, McTaggart draws the conclusion that reality cannot really be temporal at all, since the tenseless view contains no change and the tensed view is contradictory. McTaggart develops a third alternative view of reality, which he calls the *C* series, according to which reality is neither temporal or material, but spiritual (1927*b*, sects. 347ff). One could in fact describe the debate on the nature of temporal reality as involving three positions, one tensed, one tenseless, and a third timeless. For the sake of convenience I will however talk as if there are only two positions involved, the tensed and tenseless.

The proponents of the tensed and tenseless view alike reject McTaggart's final conclusion that time is unreal, but for completely different reasons. Proponents of the tenseless view tend to accept McTaggart's claim that the

tensed view entails a contradiction but reject his claim that the tenseless view does not contain change; there can be change in a tenseless reality and therefore time is real. On the other hand, the proponents of the tensed view agree with McTaggart that the tenseless view cannot account for change, but reject his claim that the tensed view entails a contradiction; reality can be tensed and therefore time is real.

Tensers and detensers have diametrically opposed and strangely incommensurable views on the validity and even on the very meaning of McTaggart's argument that tensed time involves a contradiction. Tensers generally fail to understand why detensers find McTaggart's argument to be valid and detensers fail to understand why the tensers fail to understand that McTaggart's argument is valid. Consequently, they just keep repeating the same responses to each others arguments, incapable of understanding why the opponents thinks their arguments have any force and why they do not see the force of the response to those arguments. Smith describes the situation thus:

> The debate between tensers and detensers about the soundness of McTaggart's paradox has been going on for more than 50 years now, and there is no sign that a resolution is in sight. Indeed, a reader of the literature on McTaggart's paradox might well come away with an impression of futility, a sense that the debate repeatedly ends in the same impasse, with the tensers predictably making a certain move and detensers predictably responding with a certain counter-move. (1994)

As I have already said, McTaggart also argued that the tenseless view cannot contain change, but on this point his argument is not given much credit these days. McTaggart's reason for thinking that the tenseless view does not contain change, is that events hold permanent positions to one another in terms of being earlier than and later than each other. It is never the case that an event which is at one time earlier than another, is at another time later than that same event. The standard reply by detensers is that McTaggart completely overlooks the fact that there are other kinds of change than events changing position in time, notably changes in the intrinsic properties of things from one time to another, e.g. like a leaf is green in the summer but yellow in the fall. According to this reply, the tenseless view of time can account for change because it can account for the possession by things of different properties at different times, and this, it is argued, is a kind of change McTaggart's argument does not address at all (Oaklander 1984, p. 42; Smart 1972).

However, even devoted detensers have admitted that there are great difficulties with accounting for change in terms of the exchange of intrinsic properties by things in tenseless time (LePoidevin 1991), for reasons generally believed to have nothing to do with McTaggart's argument (I think falsely). The

difficulty is, that even though the tenseless account of change can account for one aspect of change, namely the possession of different properties at different times, it cannot account for another aspect of change, namely that the different properties must be possessed by one and the very same entity existing at different times. According to this objection, detensers can account for variation in the properties of a thing, but not for the persistence of the thing whose properties vary. The difficulty of accounting for change in tenseless time turns on the nature of persistence.

4. Two views of persistence

A widely accepted characterisation of change is that it involves the possession by one and the very same entity of different properties at different times. Change requires that something has different properties at different times and yet is the same object at both times. In other words, change requires that a strictly identical entity *x* exists at two different times, which is a requirement for the persistence of *x*, and that *x* has different properties at the different times. For the layman, it may appear to be a triviality to point out that change requires both persistence of an object, and difference in properties of the object, but the sense in which an object persists over time is a matter of great philosophical controversy.

There are two competing philosophical views on the nature of persistence. There is, firstly, what I take to be the common sense view, that things persist by remaining in the present against what is metaphorically described as the 'flow', or 'passage' of time. While there is a constant passage of times from future to present, and from present to past, persistent things remain in the present from the time they come into being until they cease to exist. According to this view, the *whole* thing is contained in the present and remains there in the continuous process of new times becoming present. Thus it comes to exist at different times. This is often described in terms of the thing being 'wholly present' at many times in succession. As described above, the view that things persist by being 'wholly present' at many times in succession requires that time is tensed, i.e. that reality changes with respect to which moments of time are future, present, and past. Tense allows the thing to be present at one time now, but present at another time in the future.

It is difficult to see how things could be 'wholly present' ('present' is here used in the tenseless sense of existing at a time) at many times in succession if time really is tenseless, because tenseless time does not contain any passage allowing the thing to exist in its entirety at a single time and later exist in its

entirety at a different time. On the tenseless view, if a leaf exists at *t* and at *t'*, it must exist, objectively speaking, at them both, without having 'passed' from one time to another, since the tenseless view holds that all moments of time are equally existent and real. That is, the leaf exists in its entirety both at *t* and at *t'*. This view apparently contradicts a widely accepted feature of existence in time, namely that one and the very same thing cannot coexist at two times, and be wholly contained in each time, any more than an object can occupy a certain space and yet be wholly contained in each and every part of that space. Further, if the thing cannot 'pass' from one time to another, neither can it 'pass' from one state to another, i.e. change. If the leaf is green at *t*, but yellow at *t'*, it must exist both at *t* and at *t'*, and be both green and yellow, which contradicts the belief that one and the very same thing cannot possess incompatible properties.

The problem of how things can have different properties at different times when they do not pass from one time to another, or from one state to another, is what has been called *the problem of temporary intrinsics*, although it is here presented in a different fashion than is usual. Lewis, e.g., does not present it as a problem that is *generated* by assuming temporal parity to be true, but, on the contrary by assuming only that the thing exists at different times (1986, p. 202ff).[12] As a solution to this problem, Lewis suggests that persistent things do not just have spatial parts, like a person has arms and legs, but also temporal parts located at different times. According to this hypothesis, it is different temporal parts of me that write the different letters 't'-'i'-'m'-'e', of the word 'time', and those different parts of me do not begin or cease to exist at the times they are located, nor do they begin or cease to write the letters they write, they simply exist at those times writing the letters they write. Each temporal part of me also has the corresponding temporal parts of all the spatial parts of me, i.e. a temporal part of me may be described as a state of me at a given time. This view has come to be known as the *perdurance* view of the nature of persistence. The traditional view that things exist 'wholly', and exclusively, at different times by passing from one time to another, has been given the name *endurance* view of persistence.

Some endurantists, e.g. Lowe, are reluctant to use the term 'endurance' as a term for the traditional conception of persistence, because it presents endurance merely as a negation of the perdurance theory, i.e. only as the view that things do not have temporal parts (1998, p. 106-7). I share this reluctance, partly for the

[12] My account may here be somewhat premature, since it draws partly on my discussion in 'Temporal Parity and the Problem of Change'. In that paper I argue that Lewis' argument presupposes temporal parity, which is a denial of tense and of passage in or of time.

reason cited above, but also because I think it gives the false impression that 'perdurance' and 'endurance' are two theories about the same thing. Like Haslanger (1989), I think that the view that things perdure is really the view that nothing persists, rather than an alternative theory of the nature of persistence.

To sum up, according to the view that things perdure, the existence of a thing at different times consists in the fact that the thing is composed of temporal parts existing at different times. Change in a perduring entity consists in the fact that the various temporal parts of the thing possess different properties; the existence of a leaf as it changes from being green to being yellow, consists in the fact that one temporal part of the leaf is green and exists at *t*, and another part is yellow and exists at a different time *t'*. According to the view that things persist by enduring, a thing exists at different times by 'passing' from time to time. That an enduring entity changes, consists in the fact that the thing loses one property and acquires another as it 'passes' from time to time. According to the perdurance view, the changing entity does not properly speaking lose or acquire any properties, it just has different properties in its different aggregate parts. We may misperceive the thing as losing and acquiring properties, when all we are really doing is perceiving different parts of the temporal aggregate one after another.

It is widely argued that there is a natural connection between the endurance view of persistence and the tensed view of time, and between the perdurance view of persistence and the tenseless view of time.[13] The tensed view allows for passage in time, which is required for the endurance of things in time, while the tenseless view denies passage and therefore must adopt a perdurance view of persistence. The tensed view fits naturally with an endurance view of persistence, in the sense that endurance requires time to be tensed, and the tenseless view fits naturally with a perdurance view of persistence, because the tenseless view is incompatible with the endurance view of persistence.

The alleged link between tenseless time and perdurance is acknowledged to be a serious problem even by devoted detensers, because, like most tensers[14], they entirely reject the temporal parts account of change. Mellor (1998, p. 70-1) and Peter Simons (2000*a* & 2000*b*) claim that perdurance is not an explanation of change, but a reduction of change to a set of changeless facts. That the different temporal parts of a thing have different properties, it is argued, is no more a change than the variation in properties between different spatial parts of a thing. In summertime, an oak has green leaves and brown bark, but this variation in the properties of the different parts of the oak does not amount to a

[13] For reference, see Carter & Hestevold (1994) and Lowe (1998, Ch. 4).

[14] Mark Heller (1994) is one exception.

change. If variation between spatial parts is not change, then why should a variation between temporal parts of an entity be considered a change? If none of the parts of the thing loses a property and acquires another, then neither does the thing to which those parts belong. The *illusion* that a perduring entity loses a property and acquires another may arise when someone observes the different parts in succession, failing to recognise that he is observing a series of parts and not one and the same entity passing from time to time, and from state to state. How such an illusion may arise in the mind of a perduring subject, i.e. in a subject whose various mental states belong to different temporal parts of their brains (or whatever it is that has the mental states), is another related puzzle, but it is one I will not discuss here.[15]

Mellor and Simons are among the detensers that deny that the tenseless view of time is committed to a perdurance view of persistence, and to the view that change amounts to no more than variation between parts. They think that the temporal parts account of change is a reduction of change, not an explanation of it, and they argue that things can endure in a tenseless time. Others, e.g. Robin LePoidevin (1991) admit that the tenseless view appears to be committed to a temporal parts view of change, and that this is a serious problem. He thinks however that the tenseless view is nevertheless a better option than the tensed view, because he believes that the tensed view involves a contradiction.

Mellor claims that the arguments aiming to prove that the tenseless view is committed to a temporal parts account of persistence and change, are inconclusive. He says that there have been two main objections to the idea that things can endure in tenseless time: (i) that the tenseless view of time reduces change to changeless facts, and (ii) that it has no means to distinguish variation in time from variation in space (1998, p. 84). Mellor responds by arguing that even though *facts* exist tenselessly, on the tenseless view, and therefore do not change, this does not entail that *things* cannot change (1998, Ch. 8). As for the latter objection, Mellor argues that variation in the properties of a thing between times is different from variation in the properties of the different spatial parts of a thing in the sense that the former variation is due to causal factors while the latter is not (1998, Ch. 8,9, and 10).

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[15] How an experience which has the appearance of being continuous, can arise in a perduring subject, is a problem that is remarkably often overlooked in discussions about the relationship between our experience of time and various metaphysical theories of time. Oaklander, e.g. makes no mention of it in his introduction to a selection of papers on the topic 'Time and Experience' in (Oaklander & Smith 1994, pp. 289-92). Maybe this is because detensers still resist the idea that the tenseless view of time commits to a perdurance view of persistence.

In short, Mellor argues that things can endure in tenseless time because even if facts do not change, things do, and because the difference between having one property at one time and another contrary property at another time is causal, while having different properties in different spatial parts is not. The problem with Mellor's answer to the first objection is that it does not help him avoid the difficulty of explaining how the thing can be equally existent and real at many times and exist 'wholly' at every one of those times. Of course, a fact, then meaning 'existing state of affairs', does not change. If a leaf is green, we may say that it is in a state of 'greenness', but when the leaf turns yellow it is not the state of 'greenness' that changes into a state of 'yellowness', it is the leaf that changes. But, contrary to the tensed view, the tenseless view does not allow that states of affairs begin and cease to exist as the thing changes. That is, the tenseless view denies that the state of affairs which is the leaf being green, ceases to exist, and it denies that the state of affairs which is the leaf being yellow begins to exist. Nevertheless it is bound to hold that the existence of those states is constituted by the possession of certain properties by the leafs. Consequently, if things are constitutive parts of states of affairs, there cannot exist a state of affairs involving a green leaf unless the leaf exists in that state, and there cannot exist a state of affairs involving a yellow leaf unless the leaf exists in that state. On the tenseless view, if it is a fact that the leaf is green and it is a fact that the leaf is yellow, albeit at different times, then the leaf exists in both states of affairs. But, how can the leaf be equally existent and real in both states of affairs without contradiction unless by being constituted by temporal parts?

Mellor's answer to the second objection, as I have said, involves the claim that variation in time is causal, but variation in space is not. On that account, a person's backside changes from being pale to be sunburnt because it is exposed to sunlight, i.e. because of the causal influence his backside is subject to. On the other hand, the difference between a person's backside being sunburnt but his belly being pale, is not causal. The difference between the spatial parts is due to the fact that one of the spatial parts has been exposed to a causal influence which the other has not been exposed to. The spatial parts of a thing can change relatively independently of one another, while a thing cannot have a property at one time independently of which properties it had at earlier times.

However, there are two fundamentally different accounts of the nature of causality. There is, firstly, the view that causes bring effects into existence, i.e. that causes produce effects, which is a view that is prima facie incompatible with the central tenet of the tenseless view of time; the claim that all moments of

time are equally existent and real. If causal production is incompatible with tenseless time, Mellor cannot appeal to causal production to explain why things need not have temporal parts. Secondly, there is the view that causes do not produce effects but are merely correlated with them, but this is a view that naturally implies a perdurance view of persistence (Haslanger 1989), and therefore does not straightforwardly offers support to Mellor's claim that things endure in tenseless time. Consequently, simply to claim that variation in time is causal, while variation in space is not, does not automatically explain that variation in time is not a variation between parts and therefore not analogous to variation in space. Mellor must either argue that tenseless time is not incompatible with the view that causes bring their effects into existence, in particular that the view that everything coexists is compatible with the view that causes bring their effects into existence, or he must argue that a combination of tenseless time and a correlation view of causality does not entail a perdurance view of persistence.

The nature of causality is of utmost interest in this context, not only with respect to the possibility of giving an account of change in tenseless time, but also with respect to the possibility of giving an account of coming into existence in tensed time that is not *creatio ex nihilo*. That is, an account that explains that the present does not come into being out of the non-existing future.

5. Two views on causality

As in the case with time and persistence, we find two basic views of the nature of causality, one being in accordance with the common sense conception that causes bring their effects into existence, i.e. that causes produce their effects, the other involving the rejection of the common sense conception. In philosophy, the reality of causal production is a matter of great controversy, or, at least, whether it is possible to make causality intelligible in terms of production. According to a competing view, causes are merely correlated to their effects and do not produce them. I call these two views the *production view* and the *correlation view* of causality, respectively.

In turn, there are two different kinds of correlation views, of which only one is relevant to this discussion. There is, firstly, the view that causes are as a matter of fact merely correlated to their effects and do not produce them. Secondly, there is the view that we cannot at all make claims about the objective nature of causality, only about how causation appears to us in experience and that as a matter of experiential fact causation does not appear to us as production by causes of effects, but only as correlation between events (Hume 1740). Only

the former of these two views can be described as claims about the objective nature of causality, i.e. as attempts to answer the question 'what is causality really like'. In accordance with the realist approach presupposed in this dissertation, I will restrict my discussion to claims about the objective nature of causality, and therefore only consider the view that as a matter of objective fact causes are only correlated to their effects, but do not produce them.

A standard picture of causal production has been around at least since Aristotle (*Physics*, book 2, Ch. 3). The general idea is that new states of affairs are brought into existence when an already existing substance changes due to an external influence, without which the change would not have occurred and the new state of affairs never exist. Typically, the external influence, or cause, is depicted in terms of an '*extrinsic motive agent'*, basically some object possessing causal powers, which *acts* upon another object and produces a change in it. Accordingly, a *cause* is the action of some object upon another object and an *effect* is the change produced in the object acted upon.

The standard picture depicts the causal production of changes as essentially involving three components: (i) that change requires a substance which can be altered, i.e. an enduring substance, (ii) that the alteration is initiated by some influence external to the altering substance, and (iii) that the character of the alteration is determined by the forms of the given substance and of the efficient cause. These components relate to three basic metaphysical convictions about coming into existence in physical reality. The first of these convictions is the old materialist principle that nothing comes into being out of nothing or passes into nothing, the *genetic principle* for short, since it says that everything has a natural origin.[16] The second is the conviction that a distinguishing mark of causal changes in the natural world is that they occur as a result of some kind of action, basically any kind of influence exerted by one substance upon another, let us call that the *principle of action*.[17] The third is the *principle of lawfulness*, which says that the world changes in a regular way, i.e. according to general laws.[18] These principles form the metaphysical framework on which the standard picture rests.

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[16] The term 'genetic principle' is from Mario Bunge (1959, p. 24). Craig Dilworth calls it 'the principle of (the perpetuity of) substance', (1996, p. 53).

[17] The principle of action is the 'production-version' of what is often called 'the causal principle', or 'the principle of causality'. For reference, see Bunge (1959, p. 26), and Dilworth (1996, p. 57).

[18] Again I borrow a term from Bunge (1959, p. 26). Dilworth calls it 'the principle of the uniformity of nature' (1996, p. 55).

As should be obvious, causal production is thoroughly wedded to an Aristotelian substance ontology in which a distinction is made between the properties of a thing and the substance which has the properties, and between a substance and the substratum of that substance (*Metaphysics*, Bk.12, Ch. 2). The distinction between substance and property allows an explication of alterations in ordinary things, i.e. it allows that properties begin and cease to exist while the thing persists, while the distinction between substance and substratum allows an explication of the beginning and ceasing to be of ordinary things while the substratum persists; it may be added that it persists permanently.

What is important to note is that Aristotle's account of change is based upon the assumption that there exists a permanent matter substratum which has the capacity to alter and persist through those alterations. And, that the reason for assuming the existence of the substratum, and to assume that it has the capacity to alter and persist through alterations, is that this assumption is necessary in order to explain change. The notion of a permanent matter substratum is basic in Aristotle's metaphysics, and of the standard picture of causal production.

Let us now return to Mellor's claim that causality explains why things can have different properties at different times without having temporal parts, and that this explains why changes in the properties of a thing really bears no resemblance to variation between the spatial parts of a thing. Clearly the standard picture of causal production involves the idea that some determinate states of a thing begin and cease to exist when that thing is caused to alter, while the substance of the thing that has those determinate states persists through this creation/annihilation of states. That is, it involves the idea that things change by losing and gaining properties, not by having different properties in different temporal parts. However, the standard picture of causality is not easily reconciled with the tenseless view of time endorsed by Mellor. Aristotle indeed intended the standard picture to explain a certain problem that arises from the view that only the present exists: the problem of becoming; the problem of how something that does not exist (the future) can begin to exist, and how what exists (the present) can turn into something that does not exist (the past).

The problem of becoming does not arise on the assumption that temporal parity is true, because on that view nothing comes into being at all. According to temporal parity, everything exists on an equal basis, the future and past just as much as the present. If temporal parity is true it is impossible to think that anything is ever produced or otherwise brought into existence (except perhaps that time as a whole came into existence in one original act of creation). Production, on Aristotle's account, requires that a substance ceases to be in one

determinate state, in order that it may alter into a new determinate state. But, the tenseless view denies that determinate states of affairs cease to exist.

Tenseless time is incompatible with causal production, in the standard sense, because it denies creation and annihilation of states of affairs. The alternative is to account for the apparent regularity displayed in the world, i.e. the relations between causes and their effects, by assuming that events are somehow correlated in a uniform way. However, the correlation view of causality offers no clear solution to the charge that in tenseless time things can only vary their properties over time by having different temporal parts existing at different times.

According to the correlation view, the breaking of a window is merely correlated to the hitting by the brick and does not come into existence as a result of the hitting. This does not mean that the correlation view itself excludes the possibility that states of affairs come into existence in a correlated manner. It is when the correlation view is combined with a tenseless view of time that this is an unavoidable consequence, because the tenseless view rejects becoming. On a tenseless correlation view of causality, the state of 'brokenness' of a window is thus a state of affairs that simply exists at a certain time, just as its state of being whole simply exists at some other moment of time. Again we have the problem of how the window can exist in a state of 'brokenness' and in a state of being whole, without beginning to be in one state and ceasing to be in another. And, in order to avoid the contradiction that the window is both whole and broken, and exists at two mutually exclusive positions in time, the detenser is again forced to assume that it is one part of the window that is whole and another that is broken.

I repeat that I think it is possible to conceive of a combination of a correlation view with a tensed view of time, and an endurance view of persistence. We could conceive of enduring things as changing according to a pre-established harmony, in a way that lets changes in one thing be correlated to changes in something else, even though no object really influenced any other. It is however beyond the scope of this dissertation to consider whether any plausible reasons can be given for endorsing such a view.

Proponents of the tenseless view of time, e.g. Mellor, cannot avoid the charge that the tenseless view depicts change as a mere variation between the temporal parts of a thing by appealing to causality without distinction. Only the production view offers an explanation of variation in properties of things that do not have temporal parts, but tenseless time, I argue, is incompatible with production. The combination of a tenseless view of time and a correlation view of causality entail a temporal parts account of persistence. Consequently, it

seems doubtful that the tenseless view of time can avoid the conclusion that variation in the properties of a thing persisting in a tenseless time must be a variation between its temporal parts.

The standard picture of causal production is a possible solution to the paradox of becoming in time, and it is an explanation of the difference between variation in time and variation in space, and yet the reality of causal production has been rejected by a number of eminent thinkers. Causal production has not been thought to be contradictory, although it may obviously be guilty of that by association with the tensed view of time. No, the most important reason to reject the standard picture has been its failure to account for the necessary connection between causes and effects.

No doubt, Hume's analysis of causality has been most influential in this respect. Moving from the premise that we can only form concepts out of the material provided by our senses, i.e. out of our impressions, Hume argued that the contents of our minds only allow us to make sense of the *idea* of the causal relation in terms of contiguity, succession, and a constant conjunction of events associated with an impression of an inner feeling of necessity, a necessity which was not really a part of the relation between the events. Hume argued that since we have no impressions of the central notion of the production view, i.e. of a necessary connection between cause and effect, we could not make sense of the causal relation in those terms.[19]

Today, the thesis that as a matter of objective fact causes are merely correlated to their effects, but do not produce them, i.e. the correlation view of causality, is not in general made dependent on an empiricist epistemology, at least not explicitly. I will in any case consider the correlation view as a genuine claim about the nature of causality in objective reality in accordance with the realist approach of this discussion, rather than as a claim about how we must *think* causality given some epistemological constraints. But then of course, to the extent that they take a realist approach to causality, they must reject the *reality* of substance (or, rather, of a substratum), of forces, and of production. Hume's argument raised a certain suspicion concerning the notions of substance, of force, and of the notion of a necessary production, a suspicion that has inspired many present day thinkers to try to account for causality without employing these notions, even though they do not explicitly endorse a

[19] G.E.M. Anscombe (1971) and Galen Strawson (1989) argue that Hume's point was epistemological not metaphysical. Strawson even argues that Hume explicitly held the view that in objective reality there exist causal powers, forces, and necessary connections, even though we could not know their ultimate nature (1989, p. 3).

correlation view of causality and/or reject a production view (Mackie 1965; Lewis 1973; Mellor 1995; Persson 1996).

I take the production and correlation views of causality to be the two main rival theories of the objective nature of causality. However, because I think the cost of accepting the correlation view is tremendously high, then I can only understand the correlation view to be a kind of 'back-up' theory that amounts to the claim that causality can only be a matter of correlation because the production view must be false. To my mind, if causality is mere correlation then nothing makes anything else come into existence or go out of existence. On the further assumption that time is tenseless then nothing can come into existence or go out of existence at all, things do not endure, and they do not really change. To my mind, to accept the correlation view of causality is a step towards the conclusion that reality is not really temporal. I think we should better reconsider the possibility of providing a production view of causality before we settle for the correlation view and a tenseless view of time. The main difficulty, as I have said, is to account for the necessary connection between cause and effect in terms of production.

Within the realist approach to the nature of causal production, we can distinguish between two different accounts of the nature of the necessary connection between cause and effect. Firstly, there is the view that the necessity is a matter of lawful, and hence invariant, production by causes of effects. This view is usually connected with the view causal relations are essentially relations between certain kinds of causes and certain kinds of effects. On that account, causal relations are necessary in the sense that certain kinds of causes always and invariably produce certain kinds of effects, in accordance with a general law of the form 'if *C* happens, then (and only then) *E* is always produced by it' (Bunge 1959, p. 47). On this account, the necessity is a general feature of causation, manifest in type-type relations.

It appears to be thought that the so called 'singularist view' of causality, i.e. the view that particular causes produce particular effects, independently of other cases of production, cannot give an account of the necessary connection between cause and effect in terms of a lawful connection. The singularist position is in any case often characterised as a rejection of general laws, or, at least, as being compatible with the claim that there are no general laws. In Michael Tooley's words:

> To adopt a singularist view of causal relations is to hold that it is logically possible for two events to be causally related without that relation being an instance of any law, either basic or derived., This in turn suggests, and would seem to support, a more radical conclusion—namely, that it must be possible for events to be causally related even in a world that contains no laws at all (1997, p. 93)

I do not think that the view that particular causes produce particular effects independently of other cases of production, suggests anything of the kind, even though this view may perhaps be endorsed by philosophers calling themselves singularists.

The characterisation of the singularist view as involving the rejection of general laws fails to appreciate the difference between the idealist doctrine that general laws exist independently of concrete reality and somehow determine what happens in the world, from outside as it were, and the view that general laws merely express the general nature of happenings in the world. We could describe the difference between the two views of the nature of general causal laws in the following way: according to the former view general laws determine causal relations, while according to the latter view causes determine effects in power of their universal properties, and therefore in a general way even though this kind of cause only occurs once. That is, Tooley's characterisation of the singularist position above fails to appreciate the difference between thinking of a causal relation being determined *by* general laws, and thinking of causes determining effects *in accordance with* a general law, or simply *lawfully*.[20] On the latter view, laws do not determine anything, they are merely the way something (an effect) is determined by something else (a cause).[21] Provided that the way something determines something else is general in nature, then even singular causal relations may manifest a general law.

The universality of singular productions can be illustrated in the following way: if it be assumed that the outcome of an interaction is completely determined by the intrinsic properties of the interacting things, and we assume that properties are universal, then this entails that whenever two things of a certain kind interact in a certain way, the very same kind of effect is always produced. We would then have, in principle, a constant and invariable type-type relation, even though there existed but one instance of it. That is, something universal can be instantiated in one particular case.

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[20] For reference, see Bunge (1959, p. 22ff). I think my account is in accordance with David Armstrong's characterisation of singular causality in (1997, p. 202ff).

[21] For a discussion of other kinds of determination, see Bunge (1959, p. 17ff).

To my mind, the difference between the view that causality is essentially a matter of type-type relations and the singularist view, is not that the former allows lawful, and hence necessary production, while the latter does not. The difference is that the former holds that general laws are ontologically prior to particular causal relations, while the latter holds that particular causal relations are ontologically prior to general laws.

There is, however, a second kind of necessary connection, a 'genetic' connection. According to this view, a particular effect is necessarily connected to its particular cause because it was that particular cause that in fact brought it into existence. I am not sure that this view is anywhere explicitly held in connection with causality, but the idea of a necessary connection of this kind can be found e.g. in Kripke's discussions in (1980, p. 112ff). According to Kripke, it is not possible to think that a certain person *x* could have come from some other parents than it actually came from, because the attempt to think of *x* coming from a different sperm and egg than *x* actually came from, is a thought of the production of a totally different person *y* which may more or less resemble *x*; it is not the thought of *x* having different parents. According to Kripke the identity of a particular thing *x* is necessarily connected to *x*'s natural origins, so to try to think that *x* could have had some other natural origins is to try to think of *x* as not being identical to itself, which is impossible. In 'Causal Production as Interaction' I argue that singular causes and effects are necessarily connected in a similar way, although I allow for the possibility that their relation may also be an instance of a general law. I think however that the genetic link is logically independent from such general laws.

I think that one reason to why the singularist view is associated with the rejection of general laws may be that the singularist position is often supported by the observation that we are able to detect causal relations even though we have no knowledge of general laws. This fact has been taken as supporting the idea that being an instance of a general law is not a part of the *concept* of causality (Ducasse 1926); that concept of course being what enables us to recognise causal relations. The assumption that being an instance of a general law is not part of our criterion of identity for the recognition of causal relations, does not, however, entail that causal relations exist independently of general laws. There may be other general features of causal relations (besides being instances of general laws) by which we do recognise causal relations, even though they were in fact also essentially instances of general laws.

Traditionally, it has been held that a distinguishing mark of causal changes is that they occur as the result of the action of something upon something else, i.e.

that effects are produced by efficient causes (Bunge 1959, p. 33). Since Hume, it has been seriously questioned whether we can immediately observe efficient causation in the world. Even realists such as Evan Fales accept Hume's thesis that we do not observe efficient causation in outer experience (at least for the sake of argument). However, Fales argues that knowledge of action and forces is given through our inner experience of the effort exercised by our own body (1990, p. 11-4). However, it can be called into doubt whether our knowledge of the way we ourselves act efficiently in the world, really is applicable to causality in the world of inanimate material bodies.

A number of eminent thinkers have argued that the concept of causality is indeed biased by that of agency, e.g. F.P. Ramsey (1929), R.G. Collingwood (1940), D. Gasking (1955), and G.H. von Wright (1974). And, I think they are correct in thinking that the concept of causality is biased by agency to the degree that we (falsely) think of causes in terms of 'extrinsic motive agents'. I do not think that the idea that causality involves production and a necessary connection between cause and effect is influenced by agency. I think the bias from agency only has to do with the idea that production is a matter of 'extrinsic motive agents' acting on passive states of affairs, effectively producing a change in that state of affairs. In other words, I think the distinction of substances into 'active' and 'passive' substances, sometimes called 'agents' and 'patients', is not applicable to the world of inanimate material objects. Perhaps intentional agents are different from inanimate objects in that sense, but I do not think a brick hitting a window is active in a way that the window is not.

In fact, I think the distinction between 'agents' and 'patients', and the idea that it is the 'agents' that should be identified as the causes doing the producing, is one important reason for why it has been so difficult to make sense of the necessary connection between cause and effect in accordance to the standard picture. According to the standard picture, the essence of causality is expressed by what is sometimes called the causal principle, i.e. 'if *C* happens, then (and only then) *E* is always produced by it'. But, when *C* is taken to be such things as the hitting by a brick of a window, then it is not difficult to show that it is not the case that whenever a brick hits a window (and only then) the window always breaks. If the window is bullet-proof, it will not break. That is, it has turned out to be difficult to show that the standard picture applies to the multifarious instances of causation in the world.

Apart from the difficulties of accounting for the necessity of the causal relation, then it has been pointed out that classical mechanics seriously threaten the assumed distinction between 'active' and 'passive' substances, i.e. of the

idea that some substances act on other substances, the latter merely receiving the causal influence of that action (Bunge 1959, p. 170-1). According to classical mechanics the interactions of material things are always reciprocal, in the sense that at the same time as one thing acts upon another, the thing acted upon reacts to that action with a force equal to the force of the action but in the opposite direction. That is, according to classical mechanics, there are no pure actions of one thing upon another, only interactions between things and those interactions are thoroughly reciprocal. The lesson drawn by this in classical mechanics is that 'action' and 'reaction' are not two different kinds of influence, one being the cause to the other, but just two different terms for two different influences of one and the same kind. According to classical mechanics, it is a matter of subjective choice which things we consider to be doing the 'acting' and which the 'reacting' (Maxwell 1877, p. 26-7; Hertz 1956, p. 185). In 'Causal Production as Interaction' I present an account of causal production in terms of interactions and suggest that there is a 'genetic' connection between an interaction and the change produced by that interaction, namely that the new state of affairs is necessarily constituted by the very same substances as were involved in the interaction.

It may appear to be a provocative oversimplification to claim that there are only two different accounts of the fundamental nature of causality: the production view and the correlation view. After all, there are counterfactual accounts (Lewis 1973) and accounts of causality in terms of necessary and/or sufficient conditions (Mackie 1965). And, there are process ontological accounts (Salmon 1984, pp. 139ff) and probabilistic accounts.[22] However, to my mind, counterfactual accounts and accounts in terms of necessary and/or sufficient conditions cannot be understood as independent metaphysical theories of the objective nature of causality. They are different attempts to analyse the *concept* of causality, or the meaning of causal statements*, in the light of metaphysical conceptions* about the objective nature of causality; they are attempts to say something illuminating about causality on the basis of some more basic idea. The attempt to analyse the concept of causality in terms of counterfactuals is based on the idea that causes bring their effects into existence, i.e. on a production view of causality (Lewis 1973).[23] The attempt to analyse the concept

[22] For a critical discussion of probabilistic accounts of causality, see Salmon (1980).

[23] An interesting, and surprising observation, is that Lewis suggests an analysis of the concept of causation that presupposes a production view, when he also endorses a tenseless view of time, and even more surprinsing that he takes the suggestion that causes produce their effects to come from Hume. But, of course, Lewis can argue that the concept of causality

of causality in terms of necessary and/or sufficient conditions is likewise based on the idea of production, but coupled to insights about the different importance of various factors in causal circumstances. Typically, the efficient cause is considered to be both a necessary and sufficient condition, and the given state of affairs on which the cause acts is considered only as a necessary condition, since it is considered to be causally inefficient. As far as I can see, neither a counterfactual or conditional analysis account for the production of effects by causes, they presuppose it.[24]

Probabilistic accounts of causation are most easily understood as being claims about how we can make sense of causality in terms of the idea that *independently* of what causality really is, causes at least increase the probability of their effects. That is, as attempts to use the tools of probability theory to characterise the causal relation in metaphysically neutral terms, or independently of any particular metaphysics of causation (Hitchcock 1997). In this sense, probabilistic accounts are to be understood as the claim that 'whatever the real nature of causality, causes do at least raise the probability of the occurrence of their effects'. Of course, both on the production view and the correlation view, causes and effects are connected in a way that allows us to assume that we may rightly judge from the occurrence of the cause, that the effect will surely follow.

Probabilistic accounts are, like Hume's thesis, epistemological and not metaphysical, even though they need not necessarily presuppose the view that we cannot know anything about the objective reality itself. Rather, they are attempts to say something illuminating, and useful, about what causality consists in, without committing to any particular metaphysics of causality.

Admittedly, there are those that speculate in the possibility that the most fundamental level of reality, i.e. the quantum level, is essentially probabilistic and not causal. These speculations arise from the success of quantum mechanics, which is a statistically founded theory. But, since I am not a physicist, nor a philosopher of physics, I am not in a position to discuss that issue. Let me just say that there is in any case an interesting difference between providing (causal) explanations on the quantum level, and on the level of ordinary middle-sized objects, *if* one assumes that the quantum level is the most

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should be analysed in terms of production, since this is admittedly the common sense view, although in reality no such production occur.

[24] Bunge traces the suggestion that causality should be defined in terms of conditions back to Galileo, and criticises it for being too general to distinguish causal determination from other kinds of determination (1959, p. 33). For an overview of different kinds of determination (e.g. mechanical, statistical, structural, and teleological), see Bunge (1959, p. 17ff).

fundamental level of reality. On the level of middle-sized ordinary objects, causal explanations are typically explanations of some phenomena with reference to an underlying (causal) mechanism. The most fundamental level of reality cannot be explained in terms of underlying (causal) mechanisms. The most fundamental level of reality can only be described and not explained, which may then legitimise a purely statistical approach on that level. However, I take it to be a matter of controversy whether quantum theory describes the most fundamental level of reality, and whether the legitimacy of a probabilistic description on the quantum level shows that causality is fundamentally probabilistic also on the level of ordinary middle-sized objects.

Process ontological accounts of causality are not, I think, alternative views to the production vs. correlation view of causality. They can however be thought as alternative views of the nature of the causal relata. This is a point that I think is often missed by substance ontologists. In his book *Causation and Universals*, Fales first distinguishes between four proposals as to what is to count as the relata of causal relations, of which (a), the category of *events*, is the most commonly held. The others are (b) that they are *states of affairs*, (c) that one of the relata are particulars, i.e. *things*, in the ordinary sense, and finally (d) that the relata of causality are *properties* (1990, p. 52). Later, Fales considers the possibility that processes might be conceived as causes but identifies processes with a relation of events, i.e. he thinks processes reduce to a relation between events (1990, p. 67). However, as far as I can tell, there are two very different kinds of process ontologies only one of which can be reduced to a relation between events.

Firstly, there is what is often called process philosophy, e.g. the philosophy of Whitehead, which holds that what we perceive as persisting entities are really a series of very short-lived entities, each moving from potentiality to actuality in that brief moment. On that account, a process is a series of causally related events (Griffin 1998). Secondly, there is the view that the concept of a process is primitive, or at least that it need not be understood in terms of a series of causally related events. On that view, processes are causal in the sense that they possess causal powers and they produce changes in each other when they interact (Salmon 1984, p. 139ff). On Salmon's account, processes are the relata of causal relations, but are not themselves a relation between events. For purpose of the discussion in this dissertation, the important point is that process ontological accounts can be given in terms of correlation or in terms of production, and do not therefore constitute an alternative view of causality in

that respect. But, at least some process ontologies are alternative views on what is the nature of the relata of the causal relation.

I have now completed the initial presentation of the issues that the papers contained herein address. With respect to different view of time, my focus is on the questions (i) whether the tensed view of time is inherently contradictory, and (ii) whether the tenseless view can account for change. I argue that the latter question turns on the notion of persistence, and with respect to persistence it is the question (iii) whether a tenseless view of time is committed to a perdurance account of persistence or if it is also compatible with an endurance account, that is of most interest. From question (iii) I turn to consider the nature of causality, because some thinkers, e.g. Mellor, claim that a causal account can be given of endurance in tenseless time. I pointed out that Mellor's claim is problematic because there are two very different accounts of causality. There is the view that causes produce their effects, and there is the view that causes are merely correlated to their effects but do not produce them. With respect to the issue of causality the interesting questions are (iv) whether tenseless time is compatible with a production view of causality, (v) whether a causal account of endurance in tenseless time can be given in terms of correlation, (vi) whether it is possible to make causality intelligible in terms of production, and (vii) whether it is possible to make the idea of a necessary connection intelligible in terms of production. I will now give a brief account of how the different papers relate to these issues.

6. Interconnections between the articles

As I have already mentioned, the debate over the issue of whether a tensed or tenseless conception of time is correct, can be considered to be an unresolved dispute about the validity and meaning of McTaggart's famous argument. A first important step towards a solution of the debate, is to provide an account of McTaggart's argument that both tensers and detensers can recognise as intelligible. The first article contained herein, 'McTaggart and the Unreality of Time', is an attempt to provide such an account.

In that paper I argue that McTaggart's argument has always been mistakenly considered as a self-contained argument, independent of the metaphysical system that he advocated, despite the fact that McTaggart himself explicitly stated otherwise. Consequently, every commentator has felt free to interpret the meaning of the argument in accordance with his/hers own metaphysical conviction. Naturally, this has produced a number of incompatible readings of the argument. By giving the outline of McTaggart's metaphysics, I demonstrate

how his conclusion follows from the fundamental principles of his metaphysics. The most interesting observation of that exegesis, from the perspective of the overall picture that I address in this dissertation, is that the metaphysics that McTaggart presupposes is directly incompatible with the view that only the present exists. In fact, McTaggart presupposes that the future and past exist on an equal footing with the present, i.e. he presupposes temporal parity. My conclusion is that McTaggart did not show that the tensed view is inherently contradictory, only that it is incompatible with the assumption that temporal parity is true.

In 'Temporal Parity and the Problem of Change' I build upon the results of my investigation of McTaggart's argument, in particular the fact that he presupposes temporal parity. I argue that the principle of temporal parity must be understood to be equivalent with the claim that time is not tensed but tenseless. That is, the principle of temporal parity is the negation of the tensed view, and equivalent to the tenseless view. Understood in this way, McTaggart's argument is merely a demonstration of the fact that the tensed view of time is incompatible with its negation, the tenseless view. On this account, those who claim to prefer the tenseless view of time because they think that McTaggart's argument is valid, must already think that temporal parity is true, and so already hold the view that time is not tensed but tenseless. In other words, it involves a vicious circle to adopt the tenseless view on the grounds that the tensed view has been shown to be contradictory.

I also argue in 'Temporal Parity and the Problem of Change', that Lewis' problem of temporary intrinsics is of the same basic form as McTaggart's argument against tensed change. In particular, that it also presupposes the principle of temporal parity. The presupposition that the principle of temporal parity is true, I argue, is the common root to two of the most controversial claims in the philosophy of time and persistence today, (i) McTaggart's claim that the tensed view is contradictory, and (ii) Lewis' claim that the possession by a strictly identical entity *x* of incompatible properties at different times involves a contradiction. I agree with McTaggart and Lewis, to the point that *if* temporal parity is true, tensed change is contradictory and things cannot be 'wholly present' at different times, or possess incompatible properties. I just do not accept their assumption that temporal parity is true.

In the second half of the paper I further discuss the metaphysical consequences of holding temporal parity to be true, arguing that it is incompatible with a production view of causality, commits the tenseless view of time to a correlation view of causality, and excludes the possibility of giving

natural explanations of empirical phenomena. It restricts the intelligibility of metaphysics to the description of the existent and real. This is a discussion that is then continued in *Appendix B*, where I consider Mellor's and Simons' attempts to show that things can endure in tenseless time. I argue that they do not adequately overcome the restrictions set on their metaphysical endeavour by the principle of temporal parity.

In 'Causal Production as Interaction' I turn to the task of providing an account of necessary causal production in terms of interactions between coexistent things. I argue that to think of causality in terms of interaction provides an explanation to how something is produced out of something else so that there is a necessary connection between that which produces and the product, and in a way that involves causal influence between things. I suggest that if we abandon the idea that causes are essentially external to the changing thing, it is possible to construe causal production in terms of reciprocal interaction between coexistent entities. This view takes seriously the lessons thought by classical mechanics that there is always a reaction to every action, and that the action and reaction occur simultaneously with equal force in opposite directions.

I suggest, briefly, that a new state of affairs is produced by the interaction of things, out of the very substance those things are made; the state which is produced is made of the same substance as were involved in the interaction. The necessary connection between cause and effect, on this account, consists in the fact that the cause and the effect are made of the very same substance. This does not, however, exclude that the production occurs in accordance with general laws.

On the surface, the paper may give the impression that this is all its wants to do, contribute to the philosophy of causality. But, its main purpose is nevertheless to contribute to the philosophy of time, in ways perhaps not explicitly stated in the paper. In addition to further strengthen the thesis that tensed time, endurance, and causal production are interdependent notions, thus excluding the possibility of a combination of endurance and tenseless time, this account of causality offers an explanation of how new states of affairs come into existence out of presently existing states of affairs, not out of the non-existent future.

In *Appendix A*, I point out that there is a neglected causal aspect to persistence, namely that persistence is not just merely a matter of existence during a period of time, but also a matter of resisting influences working to destroy a thing. I suggest, on the basis of the account of causality offered in

'Causal Production as Interaction', that the proposed account of causal production in terms of interactions, may perhaps also provide a basis for a causal theory of persistence, and not just of change.

With respect to the overall picture of this dissertation, my account of causal production is the final contribution to the debate on whether a dynamic or static view of temporal reality is correct. This contribution consists partly in a clarification of the possibilities open to each view, and partly in the development of a new dynamic view of temporal reality. To repeat: as far as I can tell the three major objections to a dynamic account are (i) that it is inherently contradictory (which I respond to in the first and second paper), and (ii) that it cannot account for the necessary connection between cause and effect (which I respond to in the third paper), and (iii) that it invites paradoxes of becoming *ex nihilo* (which is argued against in all three papers). In somewhat more detail, the articles contain arguments for the following theses:

1. The principle of temporal parity is in effect the negation of the view that time is tensed, i.e. it is equivalent to the view that time is tenseless.
2. The tensed view of time, the endurance view of persistence, and the production view of causality are interdependent views, which together combine in a dynamic view of temporal reality.
3. The tenseless view of time, the perdurance view of persistence, and the correlation view of causality naturally combine to form a static view of temporal reality.
4. McTaggart's and Lewis' famous arguments professing to prove that the dynamic view contains contradictions presuppose temporal parity, and thereby presuppose what they aim to prove, notably that temporal reality cannot be dynamic, and therefore must be static.
5. The dynamic view is not inherently contradictory.
6. The tenseless view of time is incompatible with the view that things exist exclusively at many times, i.e. endure.
7. The tenseless view of time is incompatible with the view that change involves the possession by a strictly identical entity *x* of different properties at different times.
8. The tenseless view is incompatible with the idea that causes bring effects into existence.
9. The dynamic view can account for becoming without assuming *creatio ex nihilo*.
10. The dynamic view can account for the necessary connection between causes and their effects

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I

MCTAGGART AND THE UNREALITY OF TIME[1]

1. Introduction

John M.E. McTaggart's (1866-1925) famous argument for the unreality of time really is a peculiar artefact in the history of philosophy. Despite that McTaggart's conclusion has been generally rejected, his views on tense has been widely accepted, e.g. in modern tense-logic.[2] His terms for the different ways events appear to be positioned in time, the A- and B-series, have even come to be used to characterise the two dominating views in the philosophy of time today: the A- and B-view of time, or as is often said, the tensed and tenseless view of time.

McTaggart distinguished between two ways that events appear to be *positioned* in time and claimed that they implied quite different ontological conceptions of time. On the one hand events are *earlier than* and *later than* each other, and on the other hand events are either *future*, *present* or *past*. McTaggart claimed that events hold permanent positions in terms of being earlier than and later than each other, but were continuously changing their positions in terms of being first future, then present, and finally past. Taken separately, both ways imply a conception of time as being constituted by a *series of positions*. McTaggart chose to call that series whose positions are determined only as earlier and later than each other the *B-series*, but the series whose positions are determined as future, present and past the *A-series*.

The so called A- and B-views correspond crudely to McTaggart's A- and B-series in the way that the B-view denies that the distinction of time into future, present and past are objective features and holds that the relations of earlier than and later than are the fundamental characteristics of time. The B-view claims that the experience of *now* and the transitory relation of events to *now* is a mere subjective creation. The A-view, on the other hand, holds that the apparent transition from future to past through the present is the fundamental characteristic of time and an objective feature of reality in some way or another.

A second more controversial part of McTaggart's argument is his claim that because the relations of the B-series are permanent it cannot on its own account for *change* and, assuming change to be an essential characteristic of time, that

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[1] This paper was earlier published in *Axiomathes* **9**(3): 287-306, 1998.

[2] Needham (1975, p. 1).

the B-series could therefore not be properly characterised as temporal. According to McTaggart the positions of the B-series were dependent on the reality of the A-series for being in time at all.

A third equally controversial part is the claim that the change of positions in A-series fashion involves a contradiction and that time must therefore be unreal. It is the ontological nature of this alleged contradiction that is the subject of this paper. A naive form of the contradiction can initially be stated like this:

1. Future, present and past are incompatible properties, but
2. in time every event appears to possess them all, and
3. these two propositions entail the contradiction that events have incompatible properties.

The proponents of the B-view tend to accept McTaggart's claim that the A-series entails a contradiction but reject that the B-series does not contain change.[3] The proponents of the A-view have on the other hand rejected McTaggarts claim that the A-series entails a contradiction and claim that they cannot see that he, or the proponents of the B-view, gives any satisfactory justification for this claim.

2. The A- and B-views on the notion of succession

Nathan Oaklander has suggested that the disagreement between the A- and B-view on McTaggart's claim that the A-series entails a contradiction revolves around the ontological status of succession.[4] Oaklander, himself a proponent of the B-view, refers to the debate between himself and Quentin Smith, a proponent of the A-view, as being representative for this disagreement. Oaklander argues that Smith cannot account for the successive possession of incompatible temporal properties: "Smith simply claims that an appeal to succession avoids the contradiction that McTaggart finds in temporal attributions, but he does not offer an argument."[5] And Smith rebuts: "*But Oaklander gives no justification for this assumption*. Like McTaggart he simply *asserts* that whatever possesses the three temporal properties must possess them simultaneously."[6]

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[3] Whether or not the B-series does contain change is a controversial issue that cannot be addressed properly here. I will be content with simply stating McTaggart's claims on this issue.

[4] Oaklander (1996)

[5] Oaklander (1994, p. 195).

[6] Smith, (1993, p. 174).

Both Smith and Oaklander recognise that the arguments of both sides are in some sense incommensurable to the view of the other on this matter:

> Indeed, a reader of the literature on McTaggart's paradox might well come away with an impression of futility, a sense that the debate repeatedly ends in the same impasse, with the tensers predictably making a certain move and the detensers predictably responding with a certain countermove.[7]

The situation can be summarised like this. The B-view demands that the A-view gives a plausible account of the successive possession of temporal properties while the A-view demands that the B-view justifies that there is a problem with this kind of succession at all. This is a curious stalemate situation and I think it might be interesting to consider again the reasons why McTaggart claimed that the A-series entails a contradiction and consequently rejected both views.

I will attempt to show that McTaggart's claim that the A-series entails a contradiction is neither wholly unfounded nor obscure, by showing how his idealistic ontology of the general nature of the existent and real guides his reasoning in every step of the argument for the unreality of time. This has to the best of my knowledge never been done. The argument for the unreality of time in *The Nature of Existence* (NE)[8] has always been treated by commentators as a self-contained argument independent of the rest of McTaggart's ontological system.[9] I will try to show that this is a mistake, and that it is because of this that McTaggart's reasons for claiming that the A-series entails a contradiction have been considered to be obscure. McTaggart himself clearly intended the argument and its conclusion, which is in vol.2 [of NE], to be treated as dependent on the ontology that he had presented in vol.1. I have no ambitions, nor hope, in proving him right, but I hope that my account may provide some kind of clarification that may be useful in making the debate between the proponents of the A- and B-views regarding the alleged contradiction of the A-series less incommensurable. But I am afraid it is not going to be an easy reading. McTaggart's argument has been muddling the brains of philosophers for some 90 years now, which indicates that it is indeed no easy matter.[10]

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[7] Smith (1994a, p. 202).

[8] McTaggart (1988)

[9] This is the case even with C.D. Broad in his admirable *Examination of McTaggart's Philosophy* (1938, vol. 1, p. 9).

[10] McTaggart first presented his thoughts on this matter in an article in *Mind* in 1908 (1934). I will however only discuss the mature version of it contained in (1988).

3. The structure of McTaggart's reasoning in The Nature of Existence

The argument for the unreality of time is to be found in the beginning of the second volume of NE.[11] In the first volume of that work McTaggart 'determines' the nature of the existent in general without, as he claims, taking anything specifically existing into consideration.[12] McTaggart himself characterizes his ontology as an idealistic ontology in the spirit of Berkeley, Leibniz and Hegel.[13] In the second volume, however, he looks at certain empirical features of existing entities, e.g. that they all appear to be *temporal* and some of them *material*. Both features are such, he concludes, that they can impossibly belong to anything really existing, *according to the general nature of the existent and real that he determined in the first volume of NE*:

> It will be possible to show that, *having regard to the general nature of the existent as previously determined*, certain characteristics, that we consider here for the first time, *cannot* be true of the existent[...][14]

This structure of NE is made exquisitely clear by McTaggart but is apparently overlooked by most readers of the argument for the unreality of time. I believe that this is the main reason why the outlook of McTaggart's argument is still a subject of controversy.

The purpose of this paper is to provide the reader with a short account of the fundamentals in McTaggart's ontology and to show how it affects the argument for the unreality of time, especially how it relates to the alleged contradiction of the A-series. I hope that this will contribute to a deeper understanding of McTaggart's argument. But first we must get better aquainted with the argument and its baffling conclusion.

4. A short reconstruction of the argument

As mentioned earlier McTaggart distinguished between two ways that events are believed to be positioned in time and claimed that they implied two quite different ontological conceptions of time. The way events are perceived to be simultaneous with certain events, earlier than some other events and later than the rest, gives us a conception of a *series* of *positions* that runs like beads on a string from *earlier* to *later* or conversely, i.e. the B-series. Events are also perceived to be either *future*, *present* or *past* and this gives us a conception of a

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[11] McTaggart (1988, vol.2, Ch. 33)

[12] McTaggart (1988, vol.1, Ch. 3).

[13] McTaggart (1988, vol.1, sect. 52).

[14] [italics are mine, RI], McTaggart (1988, vol.2, sect. 298). McTaggart makes an almost identical statement in vol.1, sect. 54.

series of positions that runs from the far future to the present, and from the present to the distant past, or conversely, i.e. the A-series. It might seem strange to describe the A-series to run from future to past *or conversely,* and it must therefore be noted that it is not the positions that change positions, but the events. The fundamental difference between the two series are that while events appear to change their positions in respect of A-series positions, from future, to present and to past, then their positions in terms of B-series positions are permanent and do not change; no event is at one time earlier than some other event and at another time later than that same event.[15] McTaggart assumed that time is universally believed to involve change, and because he could not detect any change in the B-series he concluded that it could not properly be called temporal.[16] The A-series however at least appears to involve change; the transition of events from the future to the present and into the past.[17]

McTaggart claimed that future, present, and past are clearly relations and not qualities, although, like all relations, they generate relational qualities in the entities they relate.[18] But he could not determine as to what entity exactly the events stood in these relations and consequently to what they changed their relations to. McTaggart began to look for this change in the relations that hold between the events in the series but concluded that it is not to be found there. Every event in the A-series is changing its positions uniformly in the same direction, which can be seen by the permanence of their B-series relations; no event is first future, then present and finally past in relation to another event. McTaggart claimed that the same problem arises when saying that it is relations to moments of time or positions of time that change, if these are taken as separate entities, because these are entities that themselves must aquire their temporal properties through a relation.[19]

McTaggart came to the conclusion that the A-series is dependent on some thing or other outside the series to which the entities in the series, whatever they may be, events or moments of time, change their relation to, but which itself does not change.[20] McTaggart did not himself introduce the notion of ‘now’ as this something outside the series. He rested content in saying that it would not be easy to find such a term, but there must exist one if the A-series is to be real.

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[15] McTaggart (1988, vol.2, sect. 305-306).

[16] McTaggart (1988, vol.2, sect. 309-310).

[17] For an account of other possible kinds of changes and how McTaggart rules them out see (McTaggart 1988, vol.2, sect. 309-315).

[18] McTaggart (1988, vol.2, sect. 326-328.

[19] McTaggart (1988, vol.2, sect. 327).

[20] McTaggart (1988, vol.2, sect. 327).

But even if the existence of such an entity was granted, and thereby the reality of the relational properties of future, present and past, there remains a contradiction he claimed.[21]

Future, present and past are then taken as relational properties that events possess by holding a relation to something unknown, whether this is some sort of container-time, a *now* or whatever, is left unsaid. They are however incompatible temporal positions because nothing can be future, present and past in relation to the same thing all at once. And yet in time *as a whole* every event *has them all*, and this, McTaggart claims, involves a contradiction. It is at this point readers usually begin to be baffled and even resentful. Events, it is objected, are never future, present and past simultaneously, but well enough successively, and in that there is no contradiction. This is indeed Broad's main reason for rejecting McTaggart's conclusion:

> I cannot myself see that there is any contradiction to be avoided. When it is said that pastness, presentness and futurity are incompatible predicates, this is true only in the sense that no one term could have two of them simultaneously or timelessly. Now no term ever appears to have any of them timelessly, and no term ever appears to have any of them simultaneously. What appears to be the case is that certain terms have them successively. Thus there is nothing in the temporal appearances to suggest that there is a contradiction to be avoided.[22]

Well, it is at least clear from the text in NE that McTaggart was perfectly aware of the fact that events do not appear to be nor are believed to be future, present and past simultaneously but well enough successively:

> It may seem that this can be easily explained. Indeed, it has been impossible to state the difficulty without almost giving the explanation, since our language has verb-forms for the past, present, and future, but no form that is common to all three. It is never true, the answer will run, that *M is* present, past, and future. It *is* present, *will be* past, and *has been* future. [...] The characteristics are only incompatible when they are simultaneous, and there is no contradiction to this in the fact that each term has all of them successively.[23]

It seems then that his reasons stem from some other source than a simple mistake in analysing the experience of time or the proper rules of temporal

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[21] McTaggart (1988, vol.2, sect. 328). Broad believed that McTaggart considered the necessary existence of an unknown entity to be a convincing but not conclusive reason to accept the other parts of his argument, Broad calls this the Subsidiary Argument (Broad 1938, vol.2, pp. 317-318). Nevertheless, McTaggart proceeds, for the sake of argument, *assuming* the existence of such an entity in relation to which the members of the series hold the simple relational properties of futurity, presentness and pastness (see also (McTaggart 1988, vol. 2, footnote 1, p. 22).

[22] Broad (1938, vol.2, p. 313).

[23] McTaggart (1988, vol. 2, sect. 330).

predication. He is aware that events never appear to hold the temporal positions simultaneously but well enough successively, he is aware that language does not imply that an event has all three tenses simultaneously, and yet he claims that a proposition about any event *e* that it 'has been future, is present and will be past,' implies that *e has them all* and that this involves a contradiction. Why does Broad, Smith and other A-view proponents see succession as a simple solution to the contradiction while McTaggart and B-view proponents like Oaklander do not, even when the appearance of succession is an admitted empirical phenomenon by all?

The B-view is in fact committed to accept one sense of successive possession of properties; the possession of different properties at different times. Hugh Mellor even goes so far as saying: "A change, then, is a thing having *incompatible* real properties at different times."[24] But if the proponents of the B-view can admit that a thing can change in the sense of first being red at *t* and then not red but, lets say blue, at *t'*, thus having in succession, or at different times, properties that are clearly incompatible, why can they not accept that an event can first be future and then present? Well the answer is that the B-view accepts the possession of incompatible properties as long as they are possessed one at a time. The contradiction involved in having A-series temporal properties, according to the B-view, is that events *never* possess any *simple* A-series temporal characteristic at any single time *t*, but always a combination of the three incompatible properties future, present and past, at any time. This could be made clear by McTaggart's views on beliefs that "[...]assert that the presence of one characteristic implies the presence of another".[25] On his view anything possessing the characteristic of being a unilateral triangle implies that it has an angle sum of 180°, which entails no contradiction. Now, being blue does never imply the possession of being red, or any other incompatible property, but being either future, present or past always implies the possession of the other two; an event that is future is in a sense determined to possess the property of being present and past. Future events are bound to become present, which in a sense

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[24] [italics are mine, R.I.] Mellor (1981, p. 110). Mellor's account of change is in line with how Russell once defined change: "Change is the difference, in respect of truth or falsehood, between a proposition concerning an entity and a time *T* and a proposition concerning the same entity and another time *T'*, provided that the two propositions differ only by the fact that *T* occurs in the one where *T'* occurs in the other." (1972, p. 469). Mellor however claims that it:"[...] will not do to define change as variation through time, if time itself can only be defined as the dimension of change." Mellor therefore proposes that change must be explained in terms of causation, but without accepting the reality of tenses (Mellor 1981, p. 7-8).

[25] McTaggart (1988, vol.1, sect. 26-31).

implies that presentness *inheres* in the event at the same time that it is future, and so does pastness.[26] Succession is of course no solution to the contradiction of having at every moment different combinations of incompatible characteristics but there is controversy regarding the claim that this kind of implication is equal to actually possessing the implied characteristic.

It seems then that the B-view of time is dependent on showing that successive possession of temporal properties is not possible because they, as opposed to other properties, can never be had one at a time. The B-view must show that if anything has one of them it has them all. The disagreement, then, between the A-and B-view is not about succession in general but whether or not temporal properties can be possessed in the usual sense of succession. This provides us with an interesting contrast to McTaggart. To him it is equally contradictory that a substance has incompatible colour properties in succession as having temporal properties in succession. He would claim that the incompatible properties really belonged to numerically distinct substances that were parts of a compound substance, united by some common property, other than colour, and that this compound substance was misperceived as changing although in reality its parts have always possessed these properties and always will possess them. So to me it seems that in relation to McTaggart the B-view will have to provide an account of the possibility of change that allows the possession of incompatible properties other than tenses. Mellor, for one, argues that causation will do the job.[27]

5. The infinite regress of temporal properties

In sect. 332 of NE vol.2, McTaggart claims that if it was objected that temporal properties were not had simultaneously but successively it would unavoidably result in a vicious infinite regress of ever more complex combinations of incompatible tenses. This section, and adjoining sections, is apparently believed to be the key sections of the whole argument. Modern writers like Mellor and Michael Dummett have provided defences of the soundness of McTaggart's infinite regress argument, but I will attempt to explain the contradiction without invoking this line of reasoning.[28] I believe that my account is logically independent of it. My explanation only assumes, as I believe McTaggart does,

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[26] Smith proposes a tensed theory of such inherences, admits that there is an infinite regress of inherence relations, but claims that it is not vicious. A full account of Smith's theory is found in (1993). For a comprised account of his views on the infinite regress see Smith (1994b, 180-194).

[27] Mellor (1981, p. 8).

[28] Mellor (1981, pp. 92-102) & Dummett (1960).

that the notion of successive possession of A-series temporal properties presupposes that at *some* point t_1 in time an event *e* actually is future, at *some* point t_2 in time *e* actually is present, and at *some* point t_3 in time *e* actually is past. I assume that all can accept this to be necessary truth conditions for *speaking* truly about the *successivity* of futurity, presentness and pastness; if an event *e* never 'is future' it can never be 'has been future' either, and if e never 'is present' it can never be 'will be past', and if e never 'is past' it will always be false that e 'will be past'. I will attempt to show how the presupposition of just these three necessary facts entails a contradiction, if McTaggart's ontology is presupposed.

The proposed explanation is consequently not open to objections that tenses are possessed successively, or to objections that sentences like 'has been future' only appear to imply simultaneous possession of incompatible tenses (e.g. being future now) when failing to recognise the proper nature of temporal predication. Expressions like 'will be past' do for instance not refer to the present, but to some other time when *e* possesses a different property than it does at the time the expression is uttered. E.J. Lowe and Evan Fales, among others, have claimed that McTaggart's problem is based on a confusion concerning the indexical nature of predicates like 'present' and 'now'. They claim that the indexical nature of these predicates enables us to pick out successive moments in time.[29] But McTaggart is in fact assuming that the reality of time is dependent on the truth of what they are claiming, i.e. that it is necessary that events possess temporal predicates successively, and that language does appear to pick out the times when events possess this and that temporal property. It is the existence of the reality thus described by language that he is rejecting *because it is in conflict with the ontology that he has previously determined*. My explanation will focus on how the notion of time, as involving the successive possession of temporal properties by events, clash with what McTaggart thinks is the necessary characteristics of anything existing and real. At this point let it suffice to say that McTaggart's ontology requires that time, as well as every other really real entity, must be shown to be an existing whole, a substance, or compound substance constituted by *coexisting* parts, if it is to be real at all. If every event is then supposed to have at least three incompatible positions in such a coexisting whole, i.e. positions they cannot coexist in, how can the positions be coexistent constituents of time? Well, they cannot! It would require that every event had three coexistent incompatible temporal properties and that involves a contradiction.

[29] Lowe (1987) & Fales (1990, p. 265).

Usually we need an answer to a problem, but in this case we need to explain what the problem is in order to understand the answer. In order to fully understand this explanation we must first become familiar with the fundamental principles in McTaggarts ontology and use it to clarify the ontological status of the notions of event, position, series of positions, moments of time, and their mutual relations in McTaggart's philosophy.

6. McTaggart's ontology: Criteria of reality for time as a 'series'[30]

To acquire proper understanding of McTaggart's train of thought it is necessary to become familiar with his ontology of the nature of the existent. There is no room for a thorough exposition of his argumentation on this matter. I will only present relevant conclusions about the nature of such notions as *existence*, *reality*, *substance*, *property* and *relation* in the form of postulates and only provide a short clarification when needed. I will also present his views on how our beliefs relate to the real facts they are about. This involves notions like *belief*, *assumption*, *fact*, *truth* and *falsity*. When this is done I will try to show how McTaggart's views on these matters determines his conclusion about the nature of time. McTaggart himself believed these notions to be indefinable, i.e. only ideally determinable, and much of what he proposes to adopt about them to be widely accepted.[31]

Reality admits of no degrees; either something is real or it is not.[32] We often say that something can be real *for* someone without really admitting that this something exists. We might grant someone to have had an experience of seeing a ghost even if we do not believe that ghosts really exists. The ghost is therefore only real *for* someone in the sense that the *experience* of seeing a ghost exists as a mental state in a consciousness while the subject of that experience does not correspond to anything objectively real in the world.

Existence is coextensive with the real; everything that exists is real, and there can be nothing real that does not exist. Even if this was false, i.e. that something was real that did not exist, it would be of no practical consequence to us.[33] There is therefore no sphere of possible existents that have not yet been realised; existence does not admit of degrees either.[34] *Possibilities*, other than those simply informing about our ignorance of what actually does obtain, are always

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[30] For a critique of McTaggart's ontology see, Broad (1938) & Airaksinen (1975)
[31] McTaggart (1988, vol.1, sect. 2, 60, 67 & 78).
[32] McTaggart (1988, vol.1, sect. 2, Ch. 1 & 2).
[33] McTaggart (1988, vol.1, sect. 6 & Ch. 2).
[34] McTaggart (1988, vol.1, sect. 35 & 40).

assertions about the implication of one characteristic by another and then correspond to existing facts.[35]

That which exists must have some other nature than existence, viz. it must have *properties*.[36] The existence of properties presupposes the existence of *substances* that holds the properties; there can never exist a property without substance and there can not be any substances without properties:

> Something must exist, then, and have qualities, without being itself either a quality or a relation. And this is Substance[...] This is the traditional definition of substance, and it is the one I propose to adopt.[37]

Substances can form groups by force of a common property and every such group is a *compound substance*.[38] Every human individual is e.g. a substance, but they also stand in a special relation to all other human individuals through their common property of being human and thus form the compound substance 'humankind'. *Events* are a class of substances having properties and holding relations.[39]

All substances stand in *relation* to every other substance in one way or the other, and only between them, or their properties, can there be relations.[40] All substances in the whole Universe thus make up a single compound substance and all determine one another.[41] Reality is in this sense the totality of all existing substances, the properties they hold and the relations they stand in. This is the sense in which McTaggart means that all 'changes', however minor, determines the nature of all substances in the Universe.[42] The fall of a sand-castle on the English coast determines the nature of the Great Pyramid because their mutual relation is part of their nature. According to McTaggart substances possess negative properties and can determine other substances and be related by them no less than through positive properties.[43]

One should notice that the formation of compound substances, in McTaggart's sense, is by no means restricted to substances co-present in time

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[35] McTaggart (1988, vol.1, sect. 35).
[36] McTaggart (1988, vol.1, sect. 59).
[37] McTaggart (1988, vol.1, sect. 67).
[38] McTaggart (1988, vol.1, Ch. 14, 15 & 16).
[39] McTaggart (1988, vol.1, sect. 5 & vol. 2, sect. 306).
[40] McTaggart (1988, vol.1, sect.78-79).
[41] McTaggart (1988, vol.1, sect. 135, 137, 138).
[42] Of course meaning *apparent* changes, (McTaggart 1988, vol. 2, footnote 1, p. 347).
[43] McTaggart (1988, vol.1, sect. 61)

and space and one should therefore not associate them with 'things' in the usual sense.[44]

I must also stress the point that even though properties and relations are in a sense universal, in McTaggart's account, they *cannot have independent existence*, i.e. there cannot exist a real relation 'larger than' per se, if nothing really is larger than something else. We might however be able to have an idea of such a relation even if it did not really exist but then it would be an idea of something unreal. From this follows that there cannot be any real relations to non-existing entities.[45] There can e.g. not exist any real relations to mythical creatures like the Phoenix, but we can imagine them and then the *idea* of the Phoenix, as well as the *idea* of the relation we imagine it to have to us and other things, exists as a mental state in our consciousness. It might be objected that we seem to be able to have a relation in time to not yet existing or not any more existing things, i.e. to the conference we will attend next week or to deceased relatives. It will however become clear that on McTaggart's account it is a mistake to treat not-present things as not existing: "Now tomorrow's weather is existent, for existence is as much a predicate of the future and past as of the present."[46] On McTaggart's view relations presuppose something existing as having a relation and if temporality is a relation then it requires the existence of what it relates.

Now we have the foundation of the structure that McTaggart applies to what he calls 'Absolute Reality'.[47] It is a world constituted by substances, their properties and the relations that hold between them. The Universe is one single compound substance. The parts of this compound substance are not only the things or matter in the Universe as obtain at each moment of time but every qualitatively distinguishable entities of any kind in the entire history of the Universe, not forgetting the qualitative states of our consciousnesses. Each and all are substantially existing entities joined by relations. This is indeed the view from eternity. But something must be said of the relation between Absolute Reality and our beliefs about it.

Beliefs are mental states that assert that something is true of reality, they must therefore always be either true or false.[48] Mental states are real qualitative states of a consciousness and consciousnesses are substances.[49] *Truth* is a relation of

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[44] McTaggart (1988, vol.1, sect. 59 & 130).
[45] McTaggart (1988, vol.1, Ch. 8).
[46] McTaggart (1988, vol.1, footnote 1, p. 7).
[47] McTaggart (1988, vol.2, sect. 296).
[48] McTaggart (1988, vol.1, sect. 8).
[49] McTaggart (1988, vol.2, sect. 433).

correspondence between beliefs about reality and *facts*.[50] *Facts* are:"[...]either the possession by anything of a property, or the connection of anything with anything by a relation."[51] That is to say, facts consist of independently existing substances having properties and which hold real relations to other independently existing substances. It is important to realise that McTaggart here uses *fact* as a universal term for any existing *state of affairs*, regardless if they appear to be, or are believed to be, events, things, thoughts or whatever, as long as they consist in independently existing substances having properties and holding relations. This is a use that may be confusing. Especially if one is used to treating facts as true propositions that can be true *about* states of affairs, and even such as do not obtain or exist.[52] In McTaggart's terminology *facts* are not in any way distinct from the state of affairs that exist and beliefs can never be true about non-existent states of affairs (see above about truth).[53]

McTaggart's view of facts bears close resemblance to the view of 'states of affairs' held by later Cambridge philosophers, but, contrary to e.g. the early Wittgenstein, McTaggart does not allow for the reality of possible, or non-existent, states of affairs.[54] There exists no negative facts in McTaggart's

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[50] McTaggart (1988, vol.1, sect. 10).

[51] McTaggart (1988, vol.1, sect. 10).

[52] McTaggart goes to great length in showing that the truth and falsity of beliefs do not presuppose the reality of true and false propositions, but only a direct relation between belief and existing facts (McTaggart 1988, vol.1, ch.2).

[53] At times McTaggart speaks as if facts are something that are 'about' states affairs and thus implying that they are distinct from them, but it should be clear that this is only a manner of speaking that he allows himself to indulge in, for the sake of convenience, when he has already given the meaning of the term.

[54] McTaggart's account of facts is very similar to that of the logical atomists: "The most general account given by the atomists of an atomic fact was that it was a fact consisting either in the possession by a particular of a characteristic or in a relation holding between two or more particulars", (Urmson 1960, p. 17). Wittgenstein however, in his *Tractatus*, saw a fact as always consisting of at least two things forming a state of affairs: "2. What is the case -a fact- is the existence of states of affairs. / 2.01 A state of affairs (a state of things) is a combination of objects (things)", (Wittgenstein 1961, p. 7). In a translation of *Tractatus* from 1922 by C.K. Ogden and F.P. Ramsey Wittgenstein's *Sachverhalten* is translated with 'atomic facts'(Wittgenstein 1922), whereas in the translation cited above of D.F.Pears & B.F. McGuinness in 1961, it is translated with 'states of affairs'. The change of terminology from fact to state of affairs is motivated, I assume, because a *Sachverhalt*, a state of affairs, is something that can be real without actually existing, while a *Tatsache*, a fact, is a *Sachverhalt* or *Sachlage* that exists in actuality. A state of affairs in Wittgenstein is therefore something that can be real as a possibility without actually existing, while a fact is a state of affairs that exists. This is a distinction not allowed by McTaggart, and I therefore use 'state of affairs' as synonymous with fact.

ontology although substances possess negative properties.[55] *Falsity* is instead the absence of a relation of correspondence between a belief and any real fact.[56] Truth, in McTaggart's sense, is purely metaphysical, not epistemological, it holds whether or not you know there is a relation of correspondence or not.

7. The Universe is a compound substance, but can it be temporal?

McTaggart believed that everything we know empirically appeared to be in time, and he wished to inquire whether the appearance of the changing relations of events in time is compatible with the general nature of relations that he so carefully determined. Can the substances in McTaggart's 'Absolute Reality' form a compound substance that is *in* time? The question is misleading, but it is usually posed in this form so it might be enlightening to consider it in contrast to a more 'McTaggartian' formulation: can the substances in 'Absolute Reality' form a compound substance characterised by changing relations thereby *constituting* time? The former question depicts reality as something in time, like a rabbit in a hat, but according to McTaggart´s ontology any real entity, *even time itself,* must be either an existing substance, a property of an existing substance, a relation holding between existing substances or a compound substance constituted by substances who are the parts of reality:

> Having, as it seems to me, succeeded in proving that there can be no time without an A series, it remains to prove that an A series cannot exist, and that therefore time cannot exist. This would involve that time is not real at all, *since it is admitted that the only way in which time can be real is by existing*.[57]

The second question implies just this: reality itself, or that part of it we are familiar with, must be temporal if time is to be real. Let us then not be confused by the choice between time being a compound substance or a relation because relations cannot exist independently of the substances that hold the relation. There can therefore not exist a relation that successively holds between different substances, but perhaps there can exist substances that hold different relations.

According to McTaggart then, if there exist a temporal relation it must hold between two coexistent substances and thereby unite the substances it relates into a compound substance, i.e. an existing state of affairs. Given then that existence and reality are coextensive and neither allow of any degrees, how can anything existing have properties successively and hold a relation between the 'times' when it has these different properties without actually existing

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[55] McTaggart (1988, vol.1, sect. 62).

[56] McTaggart (1988, vol.1, sect. 19).

[57] [italics are mine, RI] McTaggart (1988, vol. 2, sect. 325).

simultaneously in these different states? And how can time exist if the positions in time are positions that are held successively and therefore do not coexist? Broad indeed notices that McTaggart's argument "[...]seems to presuppose that all events 'co-exist', and stand to each other timelessly or sempiternally in determinate relations of temporal precedence".[58] Broad gives a very well stated, and to my mind correct, account of McTaggart's thoughts on this matter, but does not relate it to McTaggart's argument on the ontological nature of relations in general. He presents it as a "[...]'muddle'[...]at the back of McTaggart's mind".[59] But as we have seen McTaggart made it quite clear that the argument is entirely dependent on his ontology and there the dependence of relations on the coexistence of related terms is perfectly clear. Well, before we answer that question we need to be clear on the nature of the notions of positions, series of positions and moments of time involved in the 'time-series.'

8. The sense of positions, series of positions, and moments of time

In order to understand the notion of 'series of positions' we must first understand the ontological status of *position*. Positions are determined in terms of relations: being to the left to someone, being east of Eden, being fifth in line, earlier than *e*, etc. But relations cannot have independent existence in McTaggart's ontology; they presuppose the existence of substances. Positions must therefore consist in the existence of a particular substance in a particular relation to other substances. I propose that for McTaggart a position should always be understood as a state of affairs. We are here considering temporal positions and they involve the position of events in a series of positions. Events are not by themselves *temporal* states of affairs, or temporal facts, according to McTaggart's characterisation, because he believed that future, present and past are relations, and that events are therefore dependent for their temporality on having a relation to some other substance. It is evident that McTaggart believed that the substantiality of positions is provided by the events themselves and that positions can therefore not be existent apart from the existence of an event holding certain relations:

> The contents of any position in time form an event. The varied simultaneous contents of a single position are, of course, a plurality of events. But, like any other substance, they form a group, and this group is a compound substance.[60]

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[58] Broad (1938, vol.2, p. 307).
[59] Broad (1938, vol.2, p. 299).
[60] McTaggart (1988, vol.2, sect. 306).

Remember now that the relations of future, present and past do not hold mutually between the events but to something unknown. The positions of the A-series can therefore not consist solely of the simultaneous event-content, but also of an unknown entity outside the series of events and the relation holding between them; together they form a state of affairs. The place of that position in the series of positions must however be determined as the relation holding between the positions, or rather, between the successive states of affairs constituted by the different relations that the event-content holds to the unknown entity. Considering then what I granted as necessary conditions of successive possession of temporal properties, i.e. that the facts *e* is future, *e* is present and *e* is past, must obtain singularly at some time or other. These facts should be considered as different states of affairs constituted by *e,* an unknown entity and the relation that holds between them; these different states of affairs are the proper constitutive parts of the series of positions.

The A-series is then a series of states of affairs, or a series of *configurations* of existing substances, that consist of the different relations that events hold to an unknown entity outside the series. It must now be clear that it was in a sense misleading to claim that events change positions, implying that they do this in a way analogous to how passengers change seats on the bus, because it is the events themselves that *constitute* the positions. Rather we should say that change in the A-series consists in the event successively *constituting* different positions when its relation to the unknown entity changes. The temporal characteristic of the series is provided by the events successively partaking in different states of affairs or configurations, and consequently being constituent parts of the states of affairs it partakes in. Each state of affairs or configuration has in its turn a position in the series of configurations and it is this series of configurations that McTaggart identifies with time.

We have now got an entity, time, that divides into parts of parts. First there is time as a totality, whose constituent parts are positions, i.e. states of affairs holding a relation to other states of affairs. The constituent parts of the positions are the events holding a certain relation to an unknown entity. Every event can be further divided into parts but we need not go further for our present purposes. If we now apply McTaggart's ontology it will be clear that the reality of time, as a compound substance constituted by positions, is dependent on the *coexistence* of the positions; a compound substance is a compound of related substances and as we have seen relations require the coexistence of what is related. The existence and reality of the positions per se depend in their turn on that their constituent parts coexist in the relations required for being that position. This is

however incompatible with events possessing temporal properties in succession, which in McTaggart's view is equal to participating in different states of affairs. Being future is holding a certain relation to an unknown entity, being present is holding another relation to that same entity. Holding incompatible temporal relations in succession means that events must be constitutive parts of many, and mutually exclusive positions, or states of affairs; states of affairs they cannot coexist in.[61]

Going from the bottom up: Events are required to be constitutive parts of many positions, if events cannot coexist in all these positions, then the positions fail to coexist in the required sense for constituting a series of positions, and time falls short of existence. It is thus demanded on the one hand that positions must coexist in time, which means that events must coexist in all the positions they are constituent parts of; but on the other hand it is also demanded that events be in different positions successively, which means that they cannot coexist in all the positions they are constituent parts of because succession excludes coexistence. I myself see no way to satisfy both these demands at the same time and have to conclude that they contradict each other. One of them will have to be rejected. If succession is rejected, we reject change and time, but if the other is rejected the reality of time must be defined in some other terms than coexistence of constituent parts.

Regarding the relationship of all this to moments of time, if they be taken as separate entities as they are in theories of 'Absolute Time', where moments of time are considered to be homogeneous entities of time 'containing' the concrete event content. I will let it suffice to say that according to McTaggart's ontology they must be substantial enough to hold the properties of future, present and past, properties they must aquire by holding a relation to something that is outside of time. And, because all substances hold relations to all other substances, they must be parts of the temporal states of affairs that constitute and determine positions in time. So, if we originally had a problem with the coexistence of singular events in three different positions, we are not going to get a smaller problem with the coexistence of different positions involving moments of time and the different relations they hold to events in addition to their relations to the unknown entity outside time. McTaggart grants, for the sake of argument, the possibility of moments of time being real entities distinct

[61] I have here characterised the contradiction in McTaggart's sense as involving relations but it makes no difference if we would substitute the relations with properties, because properties are only real when held by an existing substance just as relations are only real when holding between existing substances.

from events, but claims that this does not solve any problems because whatever holds regarding the temporality of events, holds regarding the temporality of moments of time.[62] So whether the parts of time involve events, moments of time or positions do not really affect the conclusion, but granting the possibility of them all as separate entities and then trying to sort out the relations between them can maybe complicate the problem beyond recognizability.

Let me summarize: According to McTaggart's phenomenological analysis, time depends for its *nature* upon being constituted of successive parts, i.e. parts that do not coexist, but according to McTaggart's ontology, time depends for its *existence* upon being constituted of coexistent parts.

9. Time as a substance

I hope I have made it quite clear that the argument for the unreality of time must be understood as a *demonstration* that time cannot be a substance, or alternatively, that substance cannot be temporal, *given McTaggart's conception of what substances are like and how they relate to each other in 'Absolute Reality'*. It is clear that all preconceived ideas about time as a 'dimension' of change, or as some kind of objective relation independent of the events that are or come to be related by it, obscure proper understanding of McTaggart, and it is necessary to rid oneself of such prejudiced ideas of what is being dealt with before delving into the argument. Ideas of time as something apart from the substance in the universe are ruled out already in McTaggart's ontology by the fundamental postulates that:

1. nothing can exist and thereby be real that is not a substance, or for its existence dependent upon substances,
2. every substance is in relation to all other substances,
3. relations can only hold between existing substances.

Time must consequently be shown to be an existing whole if it is to be real at all: "By objectively real time, I mean a common time in which all existent things exist, so that they stand in temporal relations to each other."[63] The sense of 'temporal' is here quite simply 'changing'.

10. Conclusion

In my opinion McTaggart did prove what he intended to prove in the argument for the unreality of time, i.e. that our conception of time is incompatible with a

[62] McTaggart (1988, vol.2, sect. 327).
[63] McTaggart (1988, vol.2, sect. 343).

certain internally consistent systematisation of certain widely accepted notions regarding the nature of the constituents that supposedly are in time. This does not of course amount to proving that time actually is unreal, nor that tensed change is contradictory, although McTaggart himself came to this conclusion believing as he did in the truth of his ontology. I hope therefore that my account of McTaggart's argument has shown that it does not provide a conclusive proof against either the A-view or the B-view, *unless it can be shown that the proponents of these views hold the same ontology as McTaggart*. I hope this detailed explanation may help the proponents of the A- and B-views to sort out their positions regarding the ontological status of the notions treated by McTaggart. I see no other way out of the presently stalemate situation.

I hope also to have succeeded in showing that McTaggart was not confused or mistaken concerning the proper use of temporal expressions, nor concerning the temporal characteristics of our experience. His understanding of these matters was not inadequate or mistaken in any way, but in fact exquisitely clear. He just rejected the belief that reality is as it appears to be. He claimed that there is another more fundamental reality beyond our experience, whose ontology he claimed to have determined. In his view this ontology was a measure of the truth of our beliefs about reality, beliefs that are derived from the merely apparently real.

McTaggart did not in any way reject the *experience* of time, as a matter of fact the justification of the experience of time was absolutely necessary for the completeness of any theory about reality in McTaggart's opinion. McTaggart believed that his account of what he called the C-series, did explain how the experience of time and change could emerge in a timeless, changeless reality and thus establish time as a *phenomenon bene fundatum*; a well founded phenomenon.[64] The terms of the C-series, which he claims to be a non-temporal series, stand in the transitive and asymmetric relations of *included in* and *inclusive of*, but this is not the place for an account of the C-series.[65]

McTaggart's quest for a consistent ontology of the real and existing led him into an idealistic philosophical system that clashed with certain empirically grounded notions. Philosophical systems aiming to include everything often tend to clash with some of our well entrenched everyday notions. In McTaggart's case, it proved to be, among other things, time.

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[64] McTaggart (1988, vol.1, sect. 53, 613 & 619).

[65] McTaggart (1988, vol.2, Ch. 47-50).

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II

TEMPORAL PARITY AND THE PROBLEM OF CHANGE[1]

Abstract

I discuss the general form of arguments that profess to prove that the view that things endure in tensed time through causally produced change (the dynamic view) must be false because it involves contradictions. I argue that these arguments implicitly presuppose what has been called the temporal parity thesis, i.e. that all moments of time are equally existent and real, and that this thesis must be understood as the denial of the dynamic view. When this implicit premise is made explicit, the arguments turn out to be either circular, they presuppose what they profess to prove, or mere demonstrations of the fact that the dynamic view is incompatible with its own negation. Furthermore, I discuss the metaphysical consequences of accepting the temporal parity thesis, arguing that it deprives us of the means to provide natural explanations to empirical phenomena

1. Introduction

It seems to be universally admitted that *change* involves, in some sense, the possession by an entity of different properties at different times, but there is disagreement as to what exactly this difference amounts to. The disagreement is often presented as a dispute about whether change has to be a difference in the properties of a *strictly identical* entity existing 'wholly' at different times, i.e. of an *enduring* entity, or if it can be the variation between distinct *temporal parts* of a compound entity, i.e. of a *perduring* entity. The problem of change is then presented as turning on the nature of *persistence*.[2]

The dispute about the nature of persistence is often presented as a dispute about whether time is tensed or tenseless.[3] According to the tensed view, the transition from future to present and from present to past, allows that one and the very same entity can at present be in its entirety at one particular time, but in the future be in its entirety at another time. In other words, tense allows one and

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[2] David Lewis (1986; pp. 202ff); D. H. Mellor (1981; 1998); Sally Haslanger (1989); Trenton Merricks (1994); Mark Heller (1992).

[3] William R. Carter & H. Scott Hestevold (1994); E. J. Lowe (1998); Michael Loux (1998).

the very same entity to be 'wholly present' at many times in succession, i.e. *endure*. Consequently, if time is tensed, endurance is possible. According to the tenseless view, on the other hand, there really is no such transition in time; contrary to what appears to be the case, what is existent and real is not confined to the present. This claim is sometimes called *the temporal parity thesis*, i.e. the claim that all moments of time, even those that appear to be 'in the future' and/or 'in the past' are as equally real and existent as what appears to be 'present'.[4]

In tenseless time nothing 'passes' from one time to another, and yet some things undeniably exist at many times, i.e. persist. According to temporal parity, persistent entities are equally existent and real at all the times at which they exist, i.e. it is not the case that where they *appear* to be located 'at present' objectively represents where they uniquely exist. Rather they exist, objectively speaking, at all the times at which they exist. However, it is not possible that a thing is, objectively speaking, equally existent and real at many times, and 'wholly present' at each and every one of those times, at least not if being 'wholly present' means to exist *exclusively* at the time involved.[5] Nothing can exist exclusively at a single time, and yet be equally existent and real at many other times. An object can only be equally existent and real at many times by having different parts of itself existing at various times, i.e. by being composed of temporal parts, or, in other words *perdure*.

It has been argued that one's preferred time-view, should dictate one's preferred persistence-view according to two linkage thesis: 1) if time is tensed, persistent things *can* endure, and 2) if time is tenseless, persistent things *must* perdure.[6] The tensed view of time goes naturally with an endurance view of persistence, not because tensed time necessarily entails endurance, but because it

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[4] Carter & Hestevold (1994)

[5] What various philosophers mean by the phrase 'wholly present' is not always clear. I, like C.J. Klein (1999) and Haslanger (1989) understand 'wholly present' as implying that the things exists objectively speaking in its entirety at one single time, and 'no-when' else. In this sense to be 'wholly present' is to exist *exclusively* at a single time. Often the sense of what it involves to be 'wholly present' is not given with direct reference to existence at a time, but in terms of not having temporal parts (Mellor (1981; 1998); Peter Simons (2000*a;* 2000*b)*; Theodore Sider (1997)). I prefer to understand 'wholly present' as exclusive existence at a time, because it avoids possible confusions with the way universals are 'wholly present' at a variety of places and times, in each and every particular in which the universal is instantiated. The way universals are 'wholly present' at various places and times, may perhaps be used metaphorically to convey the sense in which enduring particulars are 'wholly present' at different times, but, whatever one might want to call a universal instantiated in a set of particulars spread out in time, it is not an enduring entity.

[6] For instance, Carter & Hestevold (1994).

makes endurance possible. On the other hand, it is argued, the tenseless view of time entails perdurance, because a tenseless view of time is incompatible with endurance.[7]

The disagreement about the nature of change can however also be formulated with relation to causality. The dispute about the nature of causal change turns on the question whether causality involves *necessary production*, or if it merely involves a relation of *constant conjunction*, or *correlation* between distinct entities.[8] On the former view, change involves the objective gain and/or loss of properties by a strictly identical entity, while on the latter view change is a regularity relation, or correlation, between temporally distinct entities. Further, that on the former view, the gain/loss of a property by an entity involves the production/destruction of a state of affairs, i.e. its coming into/going out of existence, while on the latter view there is no such gain or loss of properties, or beginning/ceasing to exist; there is merely a correlation between two distinct events, or states of affairs whose existence is given without explanation as a fact of experience.[9] On the latter view, nothing is really brought into existence by the cause; existent entities just happen to occur in ordered pairs according to the thesis: If *C* occurs, then and only then, an occurrence of *E* always follows. I will refer to these two views as the *production,* and *correlation views* of causality respectively.

It has been argued that perdurance goes naturally with a correlation view of causality,[10] and there is a straightforward way in which a production view combines with an endurance account of persistence. If everything at all times is equally existent and real, according to the temporal parity thesis, then (i) things must perdure if they exist at many times, and (ii) nothing can give rise to or produce anything else because everything is as equally existent and real as

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[7] This claim is denied by e.g. Mellor (1981; 1998), and Simons (2000*a*; 2000*b*). The sense in which they claim things endure is however very different from the sense in which the adherents of what I call the *dynamic view* (see below) in general understand endurance. Simons e.g. thinks of enduring entities as something supervening on a base of occurrents (i.e. entities who are composed of temporal parts).

[8] See Haslanger (1989).

[9] Evan Fales distinguishes between four proposals as to what is to count as the relata of causal relations, of which (a), the category of *events*, is the most commonly held (1990, p. 52). The others are (b) that they are *states of affairs*, (c) that one of the relata are particulars, i.e. *things*, in the ordinary sense, and finally (d) that the relata of causality are *properties*. All these proposals depict the causal relation to hold between temporally distinct entities holding a one-sided relation, even though they do not explicitly involve events. For the sake of convenience I will allow myself to use these different terms for the causal relata at convenience in what follows.

[10] For instance, by Haslanger (1989)

anything else from any point of view. Consequently, if temporal parity is true, causality cannot involve production, but only correlations between the equally existent and real entities in the world. However, if causality does involve production, then substantial entities must endure to provide the stuff out of which new states of affairs are produced. A potter cannot produce pots without clay. But then what exists at one time cannot be equally existent to what exists at the next, because in order for a pot to be produced out of a lump of clay, the clay must cease to be a shapeless lump. If the clay does not objectively speaking cease to be a lump, before it begins to be a pot, it must objectively speaking be both a lump and a pot, or different parts of it are a lump and a pot respectively. In either case the existence of the pot did not come by through production.

The dispute about the nature of change is then nicely nested within three other disputes: (i) about the nature of persistence, i.e. do things endure or perdure, (ii) about the nature of time, i.e. is time tensed or tenseless, and (iii) about the nature of causality, i.e. does causality involve production or correlation. And, the alternatives within each dispute arguably fits with certain alternatives within the other disputes according to certain linkage theses: (i) that one's view of the nature of time should dictate one's view of the nature of persistence, and/or vice versa, and (ii) that one's view of the nature of causality should dictate one's view of the nature of persistence, and/or vice versa. I have not come upon anyone arguing that one's view of time should directly dictate one's view of causality, but only in relation to the persistence-view to which that time-view is associated. However, most philosophers do indeed prescribe to one of two combinations of the alternatives in the three disputes, according to the two linkage theses. Either they hold (a) a tensed-endurantistic-production-view, or (b) a tenseless-perdurantistic-correlation-view. Mark Heller (1992) is one of the few who have attempted to combine a tensed view of time with a perdurance-view of persistence, and D. H. Mellor (1981; 1998) and Peter Simons (2000*a*; 2000*b*) are two of the few that have attempted to combine an endurance-view (of a sort, see footnote 6) of persistence with a tenseless view of time. But, in general, philosophers do fit into one of the two alternatives I mention. By being so divided into two camps on these matters, philosophers appear to be divided not just over the particular issues, i.e. change, persistence, time, causality, but over the nature of reality more or less as a whole. I will hereafter talk of the former view as the *dynamic view* (of reality), and the latter view as the *static view* (of reality).

It is, I think, generally accepted that the dynamic view is more in accordance with the *prima facie* appearance of reality.[11] There appear to be enduring entities, there appears to be something which is metaphorically described as the 'passing' of time, and there do appear to be changes that involve the causal production of new states of affairs. The static view denies that there are enduring entities, that time 'passes', and that states of affairs are causally produced; it reduces these appearances to mere appearance, i.e. nothing but products of our subjective perspective on a reality which does not in itself contain these features. Nonetheless, the dynamic view is by many rejected as a viable alternative to the static view. The main reason given for rejecting the dynamic view is that it contains contradictions.[12] For this purpose, proponents of the static view usually rely on some form or other of J. M. E. McTaggart's famous argument for the unreality of time.[13]

The main reason given for rejecting the static view, despite that it appears to solve the contradictions claimed to be inherent in the dynamic account, is that it solves the contradictions not by explaining what change, persistence and causality is, but by explaining that there really are no such things as change, persistence, and causality *as we intuitively know them*; it solves the knot by cutting it off.[14] In other words, experience tells in favour of the dynamic view, but since it is allegedly contradictory, that tells in favour of accepting the static view despite its apparent disparity with experience, and our intuitive understanding of what change, time, persistence, and causality is.[15]

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[11] For reference, see Loux (1998)

[12] The issue of whether causality involves production is different in this respect. It is not in general criticised for involving contradictions, but, in the spirit of Hume, for failing to account for the necessity of the causal relation, and for relying on metaphysically 'suspect' notions like 'force', 'energy', and/or 'substance'. I think the reason why accounts of causal production is not criticised in the same way relates to the point made in this paper, i.e. that the so-called problem of change requires temporal parity. The conception of causality as involving production is more clearly a denial of the temporal parity thesis, than is the tensed view of time. If causality involves objective production/destruction of states of affairs, then there can be no talk of all states of affairs throughout the history of the universe being equally existent and real. Obviously, arguments depending on temporal parity, cannot be applied to doctrines that explicitly deny temporal parity.

[13] For instance, Mellor (1981; 1998); Nathan Oaklander (1984).

[14] Haslanger (1989)

[15] I am here concerned with metaphysical arguments about the nature of change, as opposed to semantical arguments. I therefore entirely leave out the discussion of whether tensed discourse can or cannot be entirely translated into tenseless discourse, or vice versa. I do not think the metaphysical and the semantical issues coincide, although surely they relate to one another. However, it would take us too far afield to elucidate how exactly they do or do not overlap.

In section 2, of this paper, I will discuss the general form of arguments that profess to show that the dynamic view involves a contradiction, arguing that they all presuppose and depend upon what has been called the *temporal parity thesis*, i.e. the view that objectively speaking all moments of time are equally existent and real.

In section 3, I will argue that the temporal parity thesis must be understood as the negation of the dynamic view, i.e. as a denial of tense. Taken in this sense, temporal parity is not just an important corollary to the tenseless view, but equivalent to it; it amounts to the claim that time is tenseless. As a consequence, all arguments depending upon temporal parity to show that the dynamic view involves a contradiction, are merely arguments showing that the dynamic view is incompatible with its own negation. They are, by analogy, arguments trying to demonstrate that it is impossible to square the circle, or, that the world cannot be square, given that it in fact is circular. Further, arguments that depend on temporal parity cannot be used show that the tenseless position must be true because it is the only alternative to the allegedly contradictory tensed position. Such arguments turn out to be circular on closer inspection, since they presuppose what they profess to prove, i.e. that time must be tenseless. In other words, I will argue that what appears to be a straightforward deduction of a contradiction from given premises is really a vicious circle.

In section 4, I will argue that temporal parity sets such constraints to any metaphysical endeavour to make meaningless all questions about the coming into existence, or origin of, particular entities of any kind, whereby the only questions left to ask, and answer, will be those about the structure of existent reality. Like Sally Haslanger (1989), I think this approach deprives us of the means to provide natural explanations to empirical phenomena.

2. The contradiction of change

Arguments to the point that change involves a contradiction, whether it is changes in intrinsic properties, or tense, can all be seen as versions of McTaggart's famous argument for the unreality of time (1927*b*, Ch. 33).[16] The basic form is this:

1. There are incompatible properties *F* and *G*
2. There is an entity *a*,
3. There are distinct times *t* and *t**

[16] William Lane Craig has in a similar vein argued that McTaggart's paradox is "a special case of what Lewis has called the Problem of Temporary Intrinsics" (1998).

4. At *t*, *a* possesses *F*, and at *t*, a* possesses *G*,
5. 1, 2, 3 and 4 entail the contradiction that *a* possesses incompatible properties.

If *F* and *G* stand for any two incompatible tenses and the entity *a* is an event, then we have the usual form of McTaggart's argument. If *F* and *G* are other kinds of temporary intrinsics, and *a* is a thing, we have David Lewis' *Problem of Temporary Intrinsics*. Of course, the conclusion of the argument, as spelled out above, depends upon implicit assumptions, e.g. Leibniz' law, which says that if *a* and *b* are identical then they have all properties in common. That is, if *a*, existing at *t*, is identical to *a*, existing at *t*,* and if *a* is *F* at *t*, and *G* at *t*,* then it must follow that *a* is *F* and *G*. When Leibniz' law is made explicit, we have the exact form of *Lewis' Problem of Temporary Intrinsics* (1986, p. 202ff). However, I think the argument also presupposes temporal parity. It is only on the assumption that *a*'s possession of *F* and *a*'s possession of *G* are *equally existent and real* states of affairs that *a* can be considered to possess incompatible properties. I think it is important to realise here that temporal parity makes the relativisation of existence to times a meaningless, or at least a merely subjective, notion. According to temporal parity, if *a*'s possession of *F* is a state of affairs that exists at *t*, and *a*'s possession of *G* is a different state of affairs that exists at *t*,* then these are in a sense coexistent states of affairs because their temporal location is irrelevant to their existence. According to temporal parity all moments of time coexist, although they have different temporal locations. When this coexistence of everything is kept in mind, one will realise that temporal parity requires that the reality of *a*'s being *F* at *t*, and *G* at *t*,* depends on the coexistence of *a*'s possession of *F* and *G,* at *t* and *t** respectively.

The term 'coexistence' is perhaps unfortunate because it is usually associated to existence at a time, which may cause confusion. Nathan Oaklander e.g. denies that the tenseless theory, is committed to accepting that all things coexist: "Like relations among universals, temporal relations between and among events, and the facts that they enter into, are not located at any time or any place. Yet, it does not follow that the *terms* of temporal relations coexist timelessly in the way universals do." (1998).[17] However, Oaklanders denial that in tenseless time all things coexist, is directed against the claim made by C. D. Broad that the tenseless theory entailed that everything coexists *timelessly* (1938, p. 307).

[17] This is a thoroughly puzzling passage. Surely, the *token* instances of the 'earlier than' relation-*type,* do exist (tenselessly) in time and space, even if one holds that the *type* does not. Otherwise all temporal relations are uninstantiated universals.

Broad's and Oaklander's views illustrate quite clearly the fundamental difference between the tensed and tenseless views with respect to the connection between time and existence. Broad thought (at least in 1938) that time, and tense, is essentially about concrete existence being confined in some sense to particular times, and therefore believed that to coexist must be to exist together either at one and the same time, or at all times. The alternative, for Broad, is that existence is altogether abstract so that things really exist in no time at all (like universals do). For Broad, then, if everything coexists, this must mean that everything exists (i) at one and the same time, (ii) at all times (everything exists always), or (ii) at no time at all. Oaklander, quite correctly, notes that the tenseless theory is not committed to any of these alternatives because it does not hold that existence is confined to a particular moment of time. According to the tenselesss theory, things can exist at different times, but without their different locations imposing any special ontological status on them, in terms of existence and reality. But then, I argue, everything does coexist. Not in any of the senses Broad intended, but in the sense that there is no room for saying that things located at one time exist, while the things located at some other time do not. On the tenseless theory, existence cannot be relativised to times. To talk only of the terms that hold the same location as being coexistent, can only be a figure of speech, on the tenseless view, since the theory denies that existence is confined to any particular moment of time. Now, I think that Broad's fundamental point can be made even given this fourth sense of coexist, namely that it is difficult to understand just in what sense entities that coexist in this fashion hold temporal relations, but that is not relevant for the present paper. What is relevant here is the fact that the claim that existence and reality is not confined to any particular moment of time is the fundamental thesis of the tenseless theory, and the basis of arguments professing to show that the tensed theory is contradictory

Let me continue to sort out some possible confusions. Some may object to the claim that McTaggart's argument and Lewis' Problem of Temporary Intrinsics really are two different cases of the same argument. There is, for instance, a widespread misunderstanding to the effect that it would make a fundamental difference to substitute *F* and *G* with intrinsic properties, e.g. like colours, instead of tenses, and conceive of *a* as a thing, instead of events. Thus Nathan Oaklander argues that:

> McTaggart argues that events do not change and concludes that there is no change in the B-series, but that follows only if events are the only things that can change. The standard reply to McTaggart is that change can occur in the B-series because it is "substances" or things that can change. Events are changes, they do not themselves undergo change (1984, p. 42).[18]

But, this reply fails to take proper heed of the ontology on which McTaggart bases his argument, and of how similar it is to the ontology of the static view. On the basis of this ontology, it is obvious that McTaggart's argument can be generalised to encompass any kind of incompatible properties and any kind of entity having the properties. This is indeed what Lewis has done, explicitly, and I think it is to be found implicitly in McTaggart's work.[19]

First of all, McTaggart treats events as a class of substances (1927*b*, sect. 306), and, secondly, it is obvious that McTaggart only proceeded to consider the possibility that events change tense, *after* having come to the conclusion that the other class of substances, i.e. things, do not really change properties because they are perduring entities and only vary between parts:

> "St Paul's Cathedral in the nineteenth century," and "St Pauls Cathedral in 1801," are both names of substances. But they are the names of different substances, since many assertions are true of St Paul's in the nineteenth century which are not true of St Paul's in 1801, and vice versa. And the second substance will be part of the first. If we take the substances which are named "St Paul's in 1801," "St Paul's in 1802," and so on to "St Paul's in 1900," they will together include all the content which is included in "St Paul's in the nineteenth century" (1927*a*, sect. 163).[20]

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[18] A similar objection is given by J. J. C. Smart (1972, p. 127).

[19] For a detailed account of how I think McTaggart's ontological system determines his conclusion in the time argument, see Ingthorsson (1998).

[20] McTaggart's manner of spelling out his metaphysics in terms of what makes assertions true, has been the source to many misunderstandings about his views. Thus for instance L. B. Lombard claims that McTaggart advocated a notion of change that did not concern the exchange of properties by an object, but did concern changes in the truth values of propositions about when events occur (1986, p. 81). This is plainly mistaken. McTaggart advocated a theory of truth as a direct relation of correspondence between mental states, i.e. beliefs, and existing states of affairs. He explicitly argued against the reality of abstract propositions (1927*a*, Ch. 2). According to McTaggart, truth is a relation between token beliefs, and token states of affairs, not between types of propositions and token states of affairs. Differences in truth values of different token beliefs of the same type about the same token state of affairs is thus dependent upon changes in that token state of affairs, i.e. no difference in the truth value of different beliefs of the same type about one and the same thing, unless there occurs a real change in that thing. Beliefs about St. Paul's, (and, mediately, linguistic tokens expressing those beliefs) are true by correspondence between the beliefs and the facts they profess to be about, and facts, according to McTaggart, consist of "either the possession by anything of a property, or the connection of anything with anything by a relation" (1927*a*, sect. 10), i.e. facts are existing states of affairs. The reality required to make

According to McTaggart, St. Paul's cathedral is, in short, a compound substance whose parts exist at different times and possess different and incompatible properties. That McTaggart presupposes a perdurance view of persistence, and thinks that whatever can be said about events applies to the temporal parts of things, is very clear in McTaggart's criticism of Russell in the time argument, when he notes that "Mr Russell looks for change, not in the events in the time-series, but in the entity to which those events happen"(1927*b*, sect. 315).

McTaggart claims that it does not make any difference whether we look for change in the events which happen to things or in the things to which events happen. The reason is that he believes that when we consider things we consider them as being composed of temporal parts. McTaggart draws the obvious conclusion that since St. Paul's cathedral, his poker, and all other temporally extended objects consist of temporal parts, they do not really change, but simply vary between parts (McTaggart calls the temporal parts *facts*, but he takes facts to be existent states of affairs, see footnote 19). McTaggart does not simply overlook the obvious, that it is things, or substances, that change. He has come to the conclusion that because temporally extended things consist of temporal parts, they cannot really change. Change's only hope is then that events, *or the temporal parts of things*, change tense.

McTaggart does not address the problem of temporary intrinsics in any detail because it has, on his view, an easy solution, namely to give up change and admit that the incompatible properties are not really possessed by one and the same entity, but by different parts of a compound. For him it is easy, because he does not see change as an essential part of reality, it is the price to pay for order, coherence, and, perhaps, simplicity and elegance. In other words, he realised that change was the logical price to pay. The problem of having incompatible tenses, on the other hand, he could not dispose of so easily, because contrary to other kinds of properties he found it to be in the essential nature of tenses to be possessed in succession by one and the same entity. To be blue does not imply the possession of any other (incompatible) property, so one and the very same thing can be permanently blue without any complications. But, to be future necessarily implies that the thing in question will be present, and past. Nothing can be permanently future, permanently present, or permanently past; indeed nothing can be past without having first been future and present. The solution of providing things with temporal parts that permanently possess the various

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all the true, but incompatible, beliefs and/or assertions about St. Paul's have corresponding states of affairs, is a multitude of distinct substances having different properties. There cannot be only one substance having all these incompatible states, so there must be a multitude of substances that are parts of a compound, i.e. a perduring entity.

incompatible properties that apparently occur in the world, cannot be applied to the problem of the possession of incompatible tenses, because it is impossible to think that tense merely involves that there is one part of something that is future, another part that is present, and a third part that is past. This would cancel the sense in which tenses were temporal.

What is really interesting here are the premises by which McTaggart comes to the conclusion that things must be composed of temporal parts, and why tensed change involves a contradiction. I will now presuppose what I have earlier argued (Ingthorsson (1998)), namely that the conclusion of the argument can only be understood in light of McTaggart's ontological system, in particular the fundamental principles (here presented as postulates) that:

P1. Nothing can be real that does not exist, i.e. that reality coincides with existence (1927*a*, sect. 2 & Ch. 2)
P2. Existence and reality have no degrees, either something exists and is real, or it does not (1927*a*, sects. 2, 35 & 40).
P3. Everything in existence, and therefore in reality as well, is constituted by substances that possess properties and hold relations (1927*a*, Ch. 4-6)

From this it follows that nothing can be real unless by being an existent substance, or a relation or property dependent for its existence upon being possessed by an existent substance. This means of course that time itself, if real, must be shown to be an existing substance, or, rather, compound substance. McTaggart is quite explicit about this: "[T]he only way in which time can be real is by existing." (1927*b*, sect. 325)

The only way in which time can be real by existing, on McTaggart's account, is by existing as a whole. On the assumption that time is either an ordered relation between events and the temporal parts of things, or consists of the orderly related events and temporal parts themselves, the 'time-series', then all those events must *coexist* in the ordered relations they hold, because relations are for their reality dependent on the existence of the substances that hold the relation. According to his system, it will not suffice that time, or the events in time, exists piecemeal, as theories of temporal becoming suggests. By analogy, one could say that on McTaggart's account events will never make up a time if an event ceases to exist whenever another event begins to exist, just like jigsaw-puzzle pieces will never make up a picture if one piece is removed whenever a piece is fitted. McTaggart's ontology requires, in other words, that every moment of time, every event in time, every temporal part of persistent things, coexists, i.e. that if they are real at all, they are all equally real and existent. This is what is known as the temporal parity thesis. Temporal parity just states what

follows from the above mentioned principles, P1, P2, and P3, when they are applied to time itself. It is the application of these principles to time that creates problems for the dynamic view.[21]

3. The circularity of the arguments against dynamic change

According to temporal parity, in order for it to be real that in time as a whole an entity is at one time future, at another time present, and at a third time past, that entity must coexist at three different and incompatible positions in time, which is impossible. Nothing could coexist at three different and incompatible positions in time, and yet the reality of tensed time, according to McTaggart's ontology of the real, requires that everything does.

According to temporal parity, in order for it to be real that in time an entity is at one time bent, and at another time straight, that entity must coexist in two different and incompatible shapes, which is impossible. Nothing can coexist as bent and as straight, and yet the reality of something possessing different properties at different times, according to McTaggart's ontology, requires that something does.

Temporal parity is often treated as an important corollary to the tenseless view, but I hold the stronger view that it is *equivalent* to the tenseless view.[22] The temporal parity thesis, as it is usually formulated, is a negation of the objective reality of tenses, and the thesis that only the present exists and is real, or that the present holds a privileged status in terms of existence and reality.

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[21] This is not of course the only problem of a dynamic view of time, but it is the most serious one. Other problems concerns, for instance, the construction of a semantics of a dynamic view (Arthur Prior (1967); Peter Ludlow (1999)), of an account of causal production (Mario Bunge (1959)), of a dynamic account of persistence and identity over time (Lowe (1998)).

[22] This view seems to be shared by Loux (1998, p. 207), and Michael Rea (1998). They use the term eternalism for the tenseless view of time, and describe it in very much the same way as I have here characterised the temporal parity thesis, notably that it is a denial of the view that only the present exists.

William R. Carter and H. Scott Hestevold describe the temporal parity thesis thus:

> *Temporal Parity*: For any times t_i and t_j, neither t_i or t_j exemplifies the monadic properties of pastness, presentness, or futureness. It is not true that the state of the world at t_i or t_j uniquely reflects "the way things really are." Rather, the way things *really* are includes both the way things are at t_i and the way things are at t_j (1994).

To hold temporal parity to be true not just commits to holding tenseless time as true, but is in fact equivalent to it; it is the thesis that time is not tensed, but tenseless.

But, if the arguments showing that change involves a contradiction depend on temporal parity, i.e. the denial of tense, then the argument that tenseless time must be true because tensed time is contradictory is circular. The alleged 'contradictory' nature of tensed time cannot then be used to justify one's preference of the tenseless view, because the 'contradictory' nature of tensed time merely consists in the fact that it is incompatible with the temporal parity thesis, i.e. incompatible with tenseless time.

Let us however not be too hasty. There is a way to ground the argument against tensed time in a way that is not so obviously circular, but which I think is unfeasible for other reasons. This involves seeing tensed time as directly incompatible, not with the temporal parity thesis itself, but with the principles P1-3 on which the temporal parity thesis rests. Arguably one could hold P1-3 as true, *a priori* of temporal considerations, i.e. before one has decided whether to hold the tensed or tenseless view as true. This is in fact the essence of McTaggart's reasoning.

In the first volume of *The Nature of Existence*, McTaggart sets out to build an ontological system by arguments that are entirely *a priori* of any empirical considerations, except two trivial one's: (i) that something exists, and (ii) the existent is diverse (1927*b*, sect. 294). Accordingly, he establishes *a priori* of any other empirical considerations (or at least independently of them), including temporal ones, the principles P1-3, listed above. When this metaphysical base is established, and one looks to empirical matters, such as the appearance of time, it has been determined *a priori*, that unless time can be shown to exist as a whole, it cannot be real. If time fails to meet those *a priori* requirements for being a reality, when we do consider its empirical features, then it cannot be real.

McTaggart's approach is faulty, I suggest, because it presupposes that fundamental metaphysical principles can be established *a priori*, or independently of empirical considerations. Especially that it presupposes that the

nature of existence can be determined *a priori* of *temporal* considerations. Surely, it is not possible to determine what it is to exist, without considering what it is to exist in time, or without experiences of what it is to exist in time, granted that everything existing does in fact appear to exist in time. When this approach to metaphysics is rejected, and it is admitted that empirical considerations are vital to the formulation of the basic principles of any metaphysical system, then the appearance of time must be regarded as important with respect to the soundness of principles like 'existence and reality coincide'. This makes it impossible to have accepted P1-3, without already having come to the conclusion that those principles are in accordance with existence in time, i.e. with what one believes is the correct view of the nature of time. Since P1-3, taken together, appear to be in conflict with the tensed conception of time, then one can only accept P1-3 to be correct if one accepts the view that time really is tenseless. It cannot in any case be argued that the tensed view of time (and of existence) is in itself contradictory, but only incompatible with the tenseless view of time (and of existence).

My conclusion is that P1-3 cannot intelligibly be separated from the temporal parity thesis, because they are about existence, and existence appears to us as existence in time. Consequently, even when we think of the arguments against the dynamic view as resting directly on the acceptance of P1-3, then the contradictions that appear only amount to an incompatibility between the dynamic view and its negation.

I do not want to argue this in detail here, but I think it is important to ask about the reasons for accepting the thesis that existence and reality coincide; is it self-evident, or does it indeed depend on our theories of what it is to exist in time? Do we really think, *prima facie*, that the past is real by way of existing, and not *despite* that it has ceased to exist? Do we really think that the 'ratio' between the circumference of a circle and its diameter is real by way of existing? Do we really think possibilities are real by way of existing? Do we think natural laws are real by way of existing? Are the natural numbers real by way of existing? It does not seem to me that it is self-evident that these questions should all be answered affirmatively, and I submit that any principle that is supposed to serve such a basic function as the principle 'existence and reality coincide' does in McTaggart's philosophy, should either be self-evident, or else explicitly be given the hypothetical status it deserves. Even the idea that fundamental principles of the nature of existence and reality, should be boundary conditions upon time, is arguably in contradiction to a long tradition in

the metaphysics of time which has seen time as a boundary condition of existent and real phenomena.[23]

There are questions about the validity of the principle that existence and reality coincide, that are, or should be, relevant to any metaphysical endeavour to establish that all moments of time are equally existent and real. Such a principle cannot be established *a priori* of temporal considerations, but only in light of a denial or acceptance of some theory about how the empirical features of time should be accounted for. As the situation is today in the philosophy of time, it can only be established in light of the acceptance of the static view, or denial of the dynamic view. In either case, arguments that presuppose temporal parity to show that the dynamic view contains contradictions, are circular.

If the *a posteriori* approach to metaphysics be admitted to be correct in contrast to McTaggart's *a priori* approach, the temporal parity thesis must be considered to be a denial of the dynamic view and thus any argument depending on this denial for showing that the dynamic view involves contradictions is circular. At the most it amounts to no more than a demonstration that the dynamic view is incompatible with its own negation (which is something we could know *a priori* of any such demonstration).

4. Temporal parity and the metaphysics of the static view

To hold that all moments of time are equally existent and real sets serious constraints to any metaphysical model of reality. More immediately, it says that everything is equally existent and real *from any point of view*. From any point of view, what appears as 'the future' is as existent and real as 'the present'. So is 'the past'. In such a model there is no place for causal production.[24] There can only be existent items permanently holding ordered relations. Whatever can be said within the framework of such a metaphysical system about the indeterminism of natural laws, about certain causes enhancing probabilities for the occurrence of certain effects, cannot change the fact that the fundamental thesis of the metaphysics says that the relata of both ends of any relation, including causal relations, coexist.

Any attempt to establish that on the static view it is in some sense indetermined what is on the other end of any relation, or that there are many possibilities about what is on the other end, would either have to be incompatible with the basic principle of the metaphysics of the static view, or involve the claim that there are no causal relations, i.e. that there are no relations

[23] Philip Turetzky (1998, p. 1)

[24] Haslanger (1989)

of *constant* conjunction; either anything, can be on the other end of any relation, or there are relations of something a bit less than constant conjunction. Perhaps any given kind of cause only holds a 0.8 correlation to some kind of effect. As a consequence it would follow that we could never *know* for certain on the basis of earlier events what will later follow. That is, we could not *know* 'beforehand' what is at the other end of the relation, even though of course there is (tenselessly) something at the other end. All questions about whether or not the history of the world is indetermined, uncertain, or contains many possibilities, will inevitably boil down to epistemological considerations, i.e. what we can know about the later stages of this totality of equally existent and real entities, from what we know about earlier and simultaneous stages of this totality. And, what we can know about the apparent regularity of the order we perceive it to have. That something is possible, on such a view, merely means that we do not yet know for certain whether it exists, either because its existence is 'in some place other than here', 'in the future', or 'in another possible world'.

The temporal parity thesis even sets restrictions on what is meaningful to ask within an epistemological context. There is no sense in asking about the origin of anything, the coming to exist of anything, merely the relations between what exists. On this account, the reality of anything must in some way or another be grounded in existence. I have already mentioned the question of the existence of the future and past, but there is also such things as possibilities, which are real but non-existent states of affairs, according to the common-sense view. They are typically conceived of as something that *might have existed* if things would have turned out otherwise, or ways in which things could have been different than they in fact are. However, if principles P1-3 are true, possibilities can only be real by existing. This is, I think, Lewis' view of the nature of possibilities:

> The world we live in is a very inclusive thing [...] Anything at any distance at all is to be included. Likewise the world is inclusive in time […] Maybe, as I myself think, the world is a big physical object […] But nothing is so alien in kind as not to be part of our world, provided only that it does exist at some distance and direction from here, or at some time before or after or simultaneous with now […] But things might have been different, in ever so many ways[…] Are there other worlds that are other ways? I say there are […] The other worlds are of a kind with this world of ours […] The difference between this and the other worlds is not a categorial difference. Nor does this world differ from the others in its manner of existing. I do not have the slightest idea what a difference in manner of existing is supposed to be. Some things exist here on Earth, other things exist

> extraterrestrially, perhaps some exist no place in particular; but that is no difference in manner of existing, merely a difference in location or lack of it between things that exist. Likewise some things exist here at our world, others exist at other worlds; again, I take this to be a difference between things that exist, not a difference in their existing (1986, pp. 2-3).

I read Lewis' modal realism as an attempt to draw out in full the consequences of the principles that existence and reality coincide, and have no degrees. Given those premises, even possibilities must exist in order to be real, and they cannot even exist as mere potentialities in actual states of affairs, since this threatens to introduce degrees of existence and reality. But, since they apparently do not exist in this world, then, on Lewis' hypotheses, there must exist other 'worlds' in which these possibilities do exist (in that world they do not exist as possibilities of course, since then they would not exist there, and would have to exist in some other possible world, etc. *ad infinitum*). This is all very well, as far as the logical consistency and elegance of the metaphysical system is concerned, but what is the price to pay? I think, like Sally Haslanger (1989), that it deprives us of the possibilities to provide natural explanations to many, or most, empirical phenomena.

5. Change, causality, and explanation

When the reduction of change to variation between temporal parts is rejected, it is usually done on the grounds that it is a flagrant violation of our intuitive understanding of what change is, and what persistent objects are like. It is presupposed that we know intuitively what change is, and how persistent objects are, and therefore have the means to judge whether any proposed theory of how persistent things change is adequate or not. Haslanger provides another reason to why the intuitive (read dynamic) conception of change, and persistence, are metaphysically speaking better than the static conception. She argues that the static view deprives us of the means to provide *natural explanations* of empirical phenomena (1989).[25] She moves from the assumption that natural explanations depend on the idea that the past constrains the present, in some sense. She does not want to give herself any detailed account of what would count as a natural explanation in this sense, but surely, causal explanations are the paradigmatic example of natural explanations. There is a straightforward

[25] Note that I am here talking about explanations of the natural origins of things, e.g. the existence of a table, a sparrow, a quilt. Other writers have claimed that the static view has 'explanatory advantages' over the dynamic view (Yuri Balashov (2000)), but then the term 'explanatory' is used in a different sense, notably 'descriptive coherence'.

sense in which causal explanations explain how the past constrains the present; by preceding their effects in time. But precedence in time is not enough to establish how the past constrains the present. Precedence merely establishes a succession, and, logically speaking, anything can follow in succession after anything, as Hume pointed out. And, if everything coexists, it is not clear to me how the past constrains the present in any sense. Or, to put it in words that are more in line with the static view, how the earlier constrains the later.

In a stronger sense, the sense I prescribe to, causes necessarily precede their effects by being what produces the effects, or what brings the effect *into existence*.[26] On this account, a natural explanation is an explanation of why something exists, of what has brought it into existence. It is an explanation of its natural origins (as opposed to its supernatural origins, e.g. being created out of nothing by a deity, or just 'popping' into existence for no reason at all). A natural explanation of why a certain table exists, would be that it was produced out of certain tree by a certain carpenter. The table came into existence by the tree's ceasing to be, but the persistence of the 'stuff' out of which the tree was made. Thus the table is *existentially dependent* upon the tree, in the sense that the existence of the table required that the tree ceased to exist in order to provide the 'stuff' out of which the table was produced. This kind of explanation is not possible on the static view, because it presupposes that the existence of the temporal parts of the wood, the table, and of the carpenter, are equally existent and real; the table is made out of completely different 'stuff' than the 'stuff' which constitutes the tree. No temporal part could cease to exist to provide the 'stuff' of any other part, without violating the temporal parity thesis.

On the static view, what matters is to explain the *structure* of existent reality, in a consistent and coherent fashion, but explanations of the coming into existence, and continuing existence of the parts of this reality are unintelligible. According to the static view, the only explanation to be given to the question why the pyramids have lasted (persisted) for so long, is simply that they have so and so many temporal parts. Questions about *why* any particular exists, or *why* it changes, or *why* it persists, is strictly speaking unintelligible, on the static account. It is only possible to say *what* appears to exists, *how* it appears to change, and *how* it appears to persists. Let me say that the essence of this criticism of the static view is that it is entirely descriptive, not explanatory.

[26] For reference, see Bunge (1959, p. 46).

6. Conclusion

It seems to me that what has hitherto been considered to be one of the most serious threats to a dynamic account of reality, the charge that it is self-contradictory and therefore necessarily false, is invalid. Arguments to the point that the dynamic account contains contradictions, rely implicitly on the temporal parity thesis, which is essentially in itself a denial of central tenets of the dynamic view, namely that only the present exists. When this implicit premise is made explicit, what appeared to be a valid deductive argument moving from self-evident premises to a not so evident conclusion, turn out to be either circular, by presupposing what it professes to prove, namely the falsity of the dynamic view, or mere demonstrations of the fact that the dynamic view is incompatible with its own negation. Since the dynamic view is better in accordance with common-sense, and has not been shown to be self-contradictory, its opponents must provide other reasons for rejecting it.

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III

CAUSAL PRODUCTION AS INTERACTION[1]

1. Introduction

The notion of causal production lies at the heart of the common conception of the nature of causality, i.e. the belief that causes bring their effects into existence. But, in philosophy, there is controversy regarding the nature of this alleged production. Not only is there controversy regarding its nature, but also about its reality. However, in this paper, I will confine my discussion to the nature of causal production, on the assumption that it is real.

Discussions regarding the nature of causal production, like discussions about causality in general, usually turn on the notion of a necessary connection between cause and effect.[2] I will however focus as well on the more fundamental question: what is causal production? That is, the problem of causal production, as I discern it, revolves around two distinct but interrelated questions: (i) what is causal production, and (ii) is there a necessary connection between cause and effect? Of course, any answer given to the latter depends partly on how one answers the first, because the first gives us the answer to what causes and effects are. In this paper I will present what I think is a partly novel answer to these questions.

A standard picture of causal production has been around at least since Aristotle.[3] The general idea is that new states of affairs are brought into

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[1] This article was first published in *Metaphysica* 3(1): 87-119, 2002.

[2] For reference, see Anscombe (1971). There are accounts of causation that depict the causal relation as something a bit weaker than a necessary connection, e.g. probabilistic accounts of causation. For an overview on different approaches to causality, see Sosa and Tooley (1993).

[3] According to Aristotle, causal production requires four ingredients, (i) a material cause, (ii) a formal cause, (iii) an efficient cause, and (iv) a final cause (*Physics*, book II, Ch. 3). The first three kinds of causes are included as *components* in what I call the standard picture (I prefer to use the term 'components' because the term 'cause' has come to be used for the efficient cause only). The material cause is the substance of the given state of affairs on which the efficient cause acts, and which provides the substance out of which the effect is produced. The character of the effect (i.e. its form, as opposed to its substance), is determined by the character of the efficient cause and of the given state of affairs. These three components are needed to characterise production in the world of inanimate material objects while the issue

existence when an already existing material substance changes due to an external influence, without which the change would not have occurred and the new state of affairs never exist. The kernel of this view comes out clearly in the well known slogan 'whatever comes to be is necessarily born by the action of a cause'. Typically, the external influence, or cause, is depicted in terms of an '*extrinsic motive agent'*, basically some object possessing causal powers, which *acts* upon another object, that object sometimes referred to by the term 'patient'. Accordingly, a *cause* is the action of some object upon another object, and an *effect* is the change produced in the object acted upon.

The standard picture depicts causal production as essentially involving three components: (i) that it requires a substance which can be altered, (ii) that the alteration is initiated by some influence external to the altering substance, and (iii) that the character of the alteration is determined by the form of the given substance and of the efficient cause. These three components relate to three basic metaphysical convictions about coming into existence in physical reality. The first of these principles is the old materialistic principle that nothing comes into being out of nothing or passes into nothing, the *genetic principle* for short, since it says that everything has a natural origin.[4] The second is the conviction that a distinguishing mark of causal changes in the natural world is that they occur as a result of some kind of action, basically any kind of influence exerted by one substance upon another, let us call that the *principle of action*.[5] The third is the *principle of lawfulness*, which says that the world changes in a regular way, i.e. according to general laws.[6] These principles form the metaphysical framework on which the standard picture rests.[7]

Note that the principle of action does not state that all changes are causal, only that causal changes occur as the result of some kind of action. The metaphysical framework of the standard picture allows non-causal changes of a certain kind. For instance, if the law of inertia is correct, a thing will continue in its motion in the absence of forces, and then a configuration of uniformly moving objects may change without the configuration, or the objects, having

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whether the production is done in order to achieve a goal, or a good, is only relevant in cases where there are intentional beings involved, acting with a purpose.

[4] The term 'genetic principle' is from Bunge (1959, p. 24). Craig Dilworth calls it 'the principle of (the perpetuity of) substance', (1996, p. 53).

[5] The principle of action is the 'production-version' of what is often called 'the causal principle', or 'the principle of causality' (Bunge (1959, p. 26); Dilworth (1996, p. 57)).

[6] Again I borrow a term from Bunge (1959, p. 26). Dilworth calls it 'the principle of the uniformity of nature' (1996, p. 55).

[7] My account of the 'standard picture' and its metaphysical base owes much to Mario Bunge's discussion of causality in (1959), in particular, Ch. 1.

being causally affected. Such change is in accordance with the genetic principle and it is lawful, but it is not causal. The standard picture of causal production should therefore not be identified with *causal determinism*, or *physicalism*, which is the view that no other kinds of determination exist than causal determination.[8]

It is also important to note that *logically* speaking these metaphysical principles are independent of each other with regard to the idea of coming into existence, i.e. of becoming. Everything may be thought to come into being in accordance with the genetic principle, but not in a lawful way, nor due to any action, and, it may be thought that something comes into being in a lawful way, a way that nevertheless violates the genetic principle and the principle of action. That is, it is possible to think that coming into being is always the coming into being of something out of something else, but nevertheless that every becoming is unique and spontaneous, and, it is possible to think of creation *ex nihilo* by a deity as falling under a general law, which is lawful becoming but violates the genetic principle and the principle of action. It is even possible to think of substance coming into existence for no reason at all, i.e. not out of anything else, not in accordance with any general law, and not because of any kind of influence, not even divine will; it is possible to think of becoming as violating all three basic principles. Consequently, the idea that nothing comes into being spontaneously out of nothing, but always out of something else in a lawful manner, and usually as a result of some kind of action, does not derive its appeal from any logical connection between the three basic convictions, nor between them and the idea of coming into existence. Its appeal must be derived from being confirmed by experience, and/or from its success in explaining experience.

I think it is safe to say that the standard picture and its metaphysical framework is the paradigm view of how reality works among laymen in western societies. It is believed that things just do not 'pop' into existence out of nothing, or alter in a random fashion without having been caused to do so. In physics, this view is thought to have its limits. It is thought to have considerable empirical support within the realm of classical mechanics, i.e. as applied to ordinary middle-sized objects moving at moderate velocities, but its validity is uncertain as applied to quantum phenomena.[9] Since I am not a physicist, nor a

[8] For a discussion of different kinds of determination, see Bunge (1959, pp. 6 ff).

[9] I take it to be commonly accepted within physics that although classical mechanics have been shown to fail when applied to objects moving at extreme velocities and when applied to the realm of micro-particles, then it has been established to hold good for macroscopic objects moving with a speed much less than the speed of light. According to what is called the

philosopher of physics, I am not in a position to discuss causal production on the quantum level, nor for very big, or very fast moving objects. Consequently, with respect to physics, my discussion will be restricted to the nature of causal production within the realm of classical mechanics. Or, more precisely, I will discuss whether an account of causal production can be given that is compatible with the metaphysical principles given above, and which makes sense of the conviction that there is a necessary connection between that which produces, and the product, i.e. between cause and effect? I think such an account can be given, with only minor modifications of the standard picture.

Traditionally, it is lawfulness that has been taken to be the important feature of the standard picture of causality, and the key to explaining the necessity of the connection between cause and effect. The genetic principle is often taken to be an obvious and trivial aspect of causal production, a mere boundary condition, despite that it is what above all distinguishes *natural* causation from what might be called supernatural causation, or 'magic', e.g. production *ex nihilo*. That is, the cause-effect relation has been considered to be necessary in the sense that certain kinds of causes always and invariably produce certain kinds of effects, in accordance to a general law of the form 'if *C* happens, then (and only then) *E* is always produced by it'. On this account, the necessity is a general feature of causation, manifest in type-type relations.

Surely causation has some general features that can be expressed by general laws, I do not dispute that, but, because I think the standard picture is mistaken, I have serious doubts that those features have to do with a one-way link between certain types of actions by 'extrinsic motive agents', and certain types of changes in 'patients'. However, I will not dwell on the problems of general causation. I think it is possible to give a coherent account of how something produces something else so that the two are necessarily connected, independently of general laws.

The account comes in two parts. The first part contains an analysis of causal production in terms of a certain kind of *interaction* between things. Briefly, I suggest that causal production always involves an interaction between things,

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correspondence principle, the relativity and quantum theories are more general theories which must yield the same results as classical mechanics when applied to the conditions in which the classical theory is known to hold good. Consequently, whatever these theories predict about very small and very fast moving entities, they ought to predict that ordinary middle-sized objects moving at moderate velocities behave like classical mechanics say they do (Weidner & Sells (1968, pp. 13-4); Albert (1992, pp. 43-4)). If what I will propose is compatible with classical mechanics as applied to the conditions in which they are known to hold good, then, according to the correspondence principle, relativity and quantum theories should yield the same result within those same conditions.

and that the causally relevant relationship between the interacting entities is in a specific sense symmetrical. In other words, contrary to what the standard picture tells us, I suggest that causal production does not just involve an action of an 'agent' upon a patient, but a *mutual* and in a certain sense *equal* action of two things upon each other. Further, that this mutual action occurs *simultaneously* in both directions. In other words, I suggest that interactions are thoroughly *reciprocal*. Consequently, I suggest that the conception of cause should be modified to encompass the actions of both 'agent' and 'patient' together, i.e. that interactions should count as causes, and that the conception of effect be modified to encompass the changes produced in both 'agent' and 'patient', when they interact.

The second part suggest that there is a necessary connection between an interaction and the state produced by the interaction, notably a *genetic link* between token states of affairs, as opposed to a lawful connection between certain types of actions by 'extrinsic motive agents', and certain types of changes in 'patients'.

The idea that the relationship between interacting entities is in a certain sense symmetrical, is not new in philosophy, nor in physics. In classical mechanics, it is generally accepted that interactions between material bodies are reciprocal, i.e. simultaneous, mutual, and with respect to forces quantitatively equal, but not so in philosophy. Among philosophers, Mario Bunge and Wesley Salmon, are two of the very few who have taken interaction seriously.

Bunge argues that the reciprocity of material interactions shows that the dichotomy of substances into 'agents' and 'patients', on which the standard picture depends, is ontologically inadequate (1959, p. 149). He draws the conclusion that the standard picture of causality is merely a methodologically useful approximation, but still rejects the idea that interaction provides a better account of causality. He rejects interaction because he thinks it displays the relationship between cause and effect as being symmetrical and therefore cannot possibly involve production of the effect by the cause (1959, p. 162).

Salmon, in his attempt to formulate a radically different approach to the problem of causality, suggests that an explication of the concepts of *production* and *propagation* is the key to coming to understand the nature of causality. He suggests that production should be explicated in terms of interaction (1980; 1984, Ch. 5-8).

I think Bunge is wrong to reject interaction as a possible account of causal production, and I think more needs to be said about the way interactions involve production than is provided by Salmon's analysis. I think philosophers have

been prevented from accepting an interaction-model of causality, because the term 'cause' has since long been restricted to what Aristotle called the 'efficient cause'. That is, causes have come to be considered as essentially something external to the changing thing, as if by definition, and that has prevented the thing acted upon from being even considered as a part of the cause, or to be more precise, to consider the interaction of 'agent' and 'patient' as being the cause to the effect. I suggest, somewhat in the vein of the agency view proposed by F.P. Ramsey (1929), R.G. Collingwood (1940), D. Gasking (1955), and G.H. von Wright (1974), that the conception of cause in terms of 'extrinsic motive agent' is biased by our conception of agency.

The agency view states that we could not *know* causality, or could not form the *concept* of causality, unless we knew from ourselves and our actions what it is to act as a cause. The agency view might then be taken to claim that the concept of *efficient cause* is derived from our knowledge of ourselves as active agents. This is indeed the view of Evan Fales. Fales accepts Hume's thesis that knowledge of *necessity* and *forces* are not given in outer experience, but claims against Hume that knowledge of *action* and *force* is given in our inner experiences of the effort exercised by our bodies (1990, pp. 11-14). The question is: to what extent does our nature as intentional agents, with all the cognitive capacities we have, memory, prediction, etc., bias our view of the objective workings of causality in the world of inanimate material objects? Is our conception of ourselves as 'efficient causes' really applicable to how changes are produced in inanimate material objects by other inanimate material objects? I think not, but I also think that it is possible to abstract the component of intention from our notion of efficient cause, to derive a more objective notion.

Some further comments on my approach to the issue of causality will, I think, be helpful to the reader. Firstly, my intention here is not to defend the thesis that causal production is an objective feature of reality against those who deny its reality.[10] I take the reality for granted. I want to present a new analysis of causal production which I think can be given considerable empirical support, and which tries to make sense of the idea of a necessary connection between causes and their effects. I nevertheless hope that my analysis will be interesting not only to those that already agree that there is such a thing as necessary causal production, but also to those that have rejected its reality because they have

[10] For critiques of the Humean view of causality, according to which causation is merely a correlation between types of events, see Bunge (1959, Ch. 3), and Armstrong (1983, part 1).

found the standard picture of causal production inadequate. I hope they will find reasons to at least reconsider their position.

Secondly, I am not trying to work out a *concept* of causal production that will encompass all *logically* possible alternatives. That is, I am not arguing that the idea of a deity creating the world out of nothing by an act of will is logically incoherent in itself, just as it is not logically impossible that things just emerge out of thin air, that fortune tellers really see the future, or that telepathy is real. I just do not see that there is any reason to consider such logical possibilities in one's theory of causality. There is no clear empirical evidence to the effect that anything has ever been created by an act of divine will, or emerged out of thin air, and even if empirical evidence was found to support e.g. *creatio ex nihilo* by a deity, this would only call for a need to distinguish between natural causation and supernatural causation. I argue under the assumption that it is the primary role of a metaphysical theory of causality to explain the *de facto* nature of causality as it appears in this world, not of every conceivable world, and therefore I restrict the scope of my discussion of causality to production of natural effects by natural causes. Here I find myself to be in perfect agreement with what Sally Haslanger says about the relation between metaphysics and rational explanation in (1989).

Thirdly, I take myself to be suggesting a crude picture of a novel alternative within the realm of classical mechanics, rather than presenting a fully developed theory of causality. Therefore, I will not be too much concerned with establishing the universal validity of my account. To repeat, since I am not a physicist, nor a philosopher of physics, I cannot discuss whether my suggestion is compatible with, or refuted by, relativity and quantum theories of physics, which deal respectively with the extremely big and fast moving, and the extremely small entities in the universe.

2. Causal production: a relation or a process ?

There is a tension between the standard picture of causal production, as I have presented it above, and what I take to be the received view in philosophy today, namely the view that causation is *primarily* a relation between temporally distinct events. The standard picture depicts the relation between cause and effect as a product of a more fundamental process, the action of something on something else. Of course, the standard picture does not deny that temporally distinct events are causally related, but it does depict those relations as something that comes into being as a *result* of a more fundamental process, causal production. The standard picture is an attempt to reconcile the idea that

causality involves a relation between two temporally distinct events with the ideas: (i) that the former event brings the latter into existence, i.e. produces it in accordance with the genetic principle, and (ii) that this production involves some sort of action of something on something else. It is impossible to puzzle these ideas together with only a cause, an effect, and a relation between them as components, if only for the simple reason that the cause cannot produce the effect by acting on it. If the effect only comes into existence by being produced by the cause, i.e. by the action of the 'efficient cause', the effect cannot be subject to the very same action that is supposed to produce it. This would require that the effect already existed when it is acted upon, and could therefore not have been produced by that very same action. Some account of what acts upon what is required, in order to introduce action into causality, and the cause and effect, construed as 'the event which produces' and 'the event produced' respectively, cannot be those things. So, if causation involves production through action of something on something else, the relation between cause and effect cannot be the most fundamental aspect of causality. On the standard picture, it is the things involved in the events that act upon each other, and thereby produce a change, i.e. an effect.

The standard picture implicitly depicts the relation between cause and effect as being itself a product of causation. The relation only comes into being as a result of the production of the effect. On this account, the so-called 'causal relation' is not causal in the sense that it is a relation that causes anything, but in the sense that it comes into being as a result of causal production. This is important, because it implies that the nature of causal production is not available by analysis of causal relations, *considered as accomplished feats*. The relations must themselves be considered as 'products' of the process to be investigated, and it is the investigation of the process that will explain the relation, and not vice versa. The question is, what kind of process produces the causal relation by way of producing the relata on the other end of the relation? According to the standard picture it is the 'extrinsic motive agent' that produces the effect by acting on the 'patient', i.e. some given state of affairs.

The peculiar kind of asymmetry involved in the causal relation, when causation is assumed to involve production, is not in general recognised by philosophers. Bunge is one notable exception. Asymmetrical relations, e.g. larger than, are determined by the characteristics of both relata, but the relation between cause and effect, in terms of 'producer' and 'product', is *one-sided* in the sense that only one of the relata, the cause, is assumed to determine the relation between the cause and its effect, by being what brings the other end of

the relation into existence; the relation comes into existence with the production of the effect. The relation between cause and effect is thus asymmetrical, or unidirectional, in the sense that the existence of the effect is entirely determined by the cause alone. The effect does not exist until the production is finished, and so cannot have any part in the actual producing. We may then say that the conception of effects as being produced by a cause implies that there is a relation of *one-sided existential dependence* between cause and effect, i.e. *e* because of *c* but not vice versa, but also that production cannot be reduced to a dependence relation of that kind.[11]

3. Causal production as Interaction

On the macro level, paradigmatic examples of causation involve the action of things upon other things, e.g. when a window is broken by being hit by a brick. According to the standard picture, it is the action of the brick upon the window that produces the breaking of the window. What is meant by 'action' requires some comment. Here it is intended to mean 'influence exerted by one object upon another', but this may not conform to all uses of the term. Actions of intentional agents are typically composed of a movement of the limbs, performed with the intention to achieve a certain goal, e.g. when a tennis player swings his racket to return a ball. We may use the terms 'striking the ball' as a description of the whole swing. But, the swing is strictly speaking only in part an action upon the ball. It is only when the racket comes into contact with the ball that it has any influence on it. We may unreflectively think of the whole movement as an action upon the ball, because the swing is initiated and guided by the intention to strike the ball. I suspect, that in an unreflective stance one may be prone to think of the way inanimate objects act on each other in a similar way, e.g. to think of the movement of a brick, prior to its collision with a window, as a part of its 'action' upon the window. But, of course, prior to actually touching the window, the brick exerts no influence upon it.

Does the brick even act at all prior to its encounter with the window? After all, to be in movement is not in itself an action, not if one is to take the law of inertia seriously, which says that material bodies continue in their motion in the absence of forces. A moving object, unaffected by anything else, continues in its motion without having to 'do' anything about it. At the very least, that kind of motion is not an action of the moving thing upon any other thing. In a sense, non-accelerating motion is really a state, a state of motion. We may say that the

[11] For an attempt to further explicate the concept of *existential dependence*, see Eugenie Ginsberg's paper (1931), with an introduction by Peter Simons.

stone we threw, ‘flies through the air’, as if it was performing a miraculous stunt, but of course this is just a figure of speech. So, when considering a brick acting on a window, we can only consider as an action the actual influence of the brick upon the window, and that influence only begins when they come into contact with each other.

One should also avoid confusing ‘action’, as used here, with the definition denoted by the term ‘action’ in classical mechanics. In mechanics, ‘action’ denotes the time integral of the kinetic energy of a material object, as taken between two times. On this account, an action is the summation of the kinetic energy of an object existing at different times, whether that object influences anything else or not. This may allow talk of pure motion as an ‘action’, but as Heinrich Hertz observed:

> the name ‘action’ for the integral in the text has often been condemned as unsuitable[…] these names suggest conceptions which have nothing to do with the objects they denote [*in mechanics, RI*]. It is difficult to see how the summation of the energies existing at different times could yield anything else than a quantity for calculation[…] (1956, p. 228)

Let us then return to our example, and point out that whenever a brick hits a window, the breaking of the window is not the only change resulting from the interaction. At the same time as the window breaks, the brick loses velocity, momentum and kinetic energy; it drops flat to the ground. It does this because of the resistance offered by the window, and this resistance is called a ‘reaction’. In fact, whenever anything acts upon anything else, that thing always suffers a change in itself, because the thing acted upon always reacts to the action. When a brick collides with a window, the window breaks, *and* the brick loses momentum and velocity. In other words, what is often conceived to be an action of one thing upon another thing, is really an *interaction* between the things.

There are some possible confusions, due to ordinary language use, that must be sorted out here. The first is, that sometimes the term ‘interaction’ is used about communication, where the communicating entities take turns at affecting each other, e.g. in conversation, or, to use a somewhat construed example of communication, when I slap you in the face and you slap back. This kind of interaction is not being discussed here. What is being discussed here is the collision between hand and face; between brick and window. The second is that sometimes, e.g. in the ‘communicative’ situations mentioned, ‘reaction’ is used for the ensuing response to some event, e.g. when someone ‘reacts’ to a slap in the face by slapping back. In this use, ‘reaction’ is used more or less as equivalent to ‘effect’. But, by ‘reaction’ I mean the physical resistance immediately offered by a thing when it encounters another thing, e.g. the

resistance offered by the face being slapped, or by the window being hit by a brick. That is, the breaking of the window is *not* a reaction, in this sense, but an effect; it is the resistance offered by the window *before it breaks* that is a reaction. In the same way, the pain, or humiliation, or anger, of being slapped in the face, is not a reaction, but an effect. It is the immediate resistance offered by the face to the hand that slapped it, that is a reaction, and this is a reaction that can be felt in the hand of the person that did the slapping, and may feel as painful as a slap in the face.

In what follows, the most important points of the argumentation will be presented in the form of numbered proposals, for the sake of clarity, at the end of my argumentation for that particular point. The argumentation will then continue assuming the truth of that proposal. The first proposal will be the lesson already described, and taught by classical mechanics, that whenever a material thing acts upon another thing, the thing acted upon reacts to that action:

P 1: There are no actions without reactions.

The reaction of the thing acted upon, and the change suffered by the thing acting on it, are often neglected in discussions about causality. And yet it has been noted that the fact that there is always a reaction seriously threatens the standard picture of causality:

> A severe shortcoming of the strict doctrine of causality is that it disregards the fact that all known actions are accompanied or followed by reactions, that is, that the effect always reacts back on the input unless the latter has ceased to exist […] In other words, the polarization of interaction into cause and effect, and the correlative polarization of interacting objects into agents and patients, is ontologically inadequate[…] (Bunge 1959, pp. 170-1).

The existence of a reaction undermines the standard picture because it shows that there are no strictly passive substances, i.e. substances who only receive influence but do not themselves influence other things, nor are there substances who influence other things without being themselves affected in any way. It threatens the supposed unidirectionality of actions.

It is clear that the standard picture needs to be modified in order to include the reaction of the 'patient', although it is still unclear whether this changes anything much, since it is still possible to hold that the reaction is only an effect of the action. That is, even if it is admitted that there are no actions without a reaction, then it can be argued that the reaction itself is produced, or provoked, by the action, and therefore counts as part of the effect produced by the action. Let us be very clear on this modified picture. When a brick collides with a window, there is supposed to be an action on behalf of the brick upon the

window, a reaction on behalf of the window upon the brick, and there are the two changes in the two things: (i) the breaking of the window, and (ii) the loss of momentum and velocity by the brick. The question is, does the action of the brick, produce the reaction in the window, and so in effect produce both the breaking of the window and the loss of momentum and velocity in the brick itself?

The action of the 'agent' has been considered to have causal priority mainly for two different but interrelated reasons: (i) because it has been assumed that there is a distinction to be made between active and passive substances, and (ii) because the action has been thought to be temporally prior to the reaction. Now, the first reason partly depends upon the second, at least when it has been pointed out that there are no genuinely 'passive' substances, i.e. substances that merely receive influence, but do not themselves influence other things. Ultimately the causal priority of actions over reactions depends on showing that the action is in some way temporally prior to the reaction, either because the action begins prior to the actual encounter, or because the reaction is temporally retarded in relation to the encounter.

The first possibility requires us to treat the motion of the 'agent', prior to the encounter, as part of its action upon the 'patient', and this, as I argued above, is to see it acting with a purpose, a purpose inanimate objects are incapable of having. Whatever a motion through space is, it is something different than the influence exerted by a thing upon another when they encounter one another. The second possibility requires that the thing acted upon initially 'gives way' to the intrusion of the other, without offering any resistance. Perhaps like a rubber band initially offers little or no resistance when it is stretched, but successively the resistance increases. This way of thinking of the relationship between action and reaction may have some appeal when considering a rigid object in motion colliding with a soft, elastic body at rest, but none when considering a soft elastic body in motion colliding with a rigid body at rest. In the latter case it is obvious that the resting body resists the moving body from the first instant they gain contact with each other. And, on closer inspection, the former example is not as convincing as it may first appear to be. In order for the reaction to be temporally retarded, it is not enough that it is initially very small, but must be entirely absent, because if the reaction is initially very small, so is the action. It requires no large effort to make an impression in a pillow.

We may perhaps not acquire decisive answers on this issue, by considering common-sense examples. What, then, does science tells us about the relationship between action and reaction? According to classical mechanics,

which is that part of physics that deals with the collisions of middle-sized material things, the reaction is always equal to the action, and occurs *simultaneously* in the opposite direction. This relationship is expressed in Newton's third law of motion, which says that the force by which object 1 acts on object 2 is equal to the oppositely directed force by which object 2 acts on object 1:

$$F_{1\,2} = -F_{2\,1}$$

Classical mechanics depicts the action and reaction as being thoroughly reciprocal. Action and reaction, or force and counterforce, as they are also called, are reciprocal "in the sense that we are free to consider either of them as the force or the counterforce" (Hertz 1956, p. 185). Now, firstly, if classical mechanics would have found that the reaction was temporally retarded in relation to the action, it could not consider them to be reciprocal in this sense. Secondly, classical mechanics does not consider interactions as being composed of ontologically different kinds of influences, an 'action' and a 'reaction', of which one kind is only a response to the other.

In mechanics, the terms 'action' and 'reaction' are indeed considered only to reflect the subjective aspect under which the scientist considers the interacting objects, i.e. as depending on which changes the scientist is interested in; the changes in the window, or the changes in the brick. This point comes out clearly in a passage by Maxwell:

> The mutual action between two portions of matter receives different names according to the aspect under which it is studied, and this aspect depends on the extent of the material system which forms the subject of our attention. If we take into account the whole phenomenon of the action between the two portions of matter, we call it Stress[…]But if[…]we confine our attention to one of the portions of matter, we see, as it were, only one side of the transaction—namely, that which affects the portion of matter under our consideration—and we call this aspect of the phenomenon, with reference to its effect, an External Force acting on that portion of matter. The other aspect of the stress is called the Reaction on the other portion of matter (1877, p. 26-7)

In classical mechanics, as paraphrased by Bunge, "physical action and reaction are, then, two aspects of a single phenomenon of reciprocal action."(1959, p. 153). I will now present as the second proposal what classical mechanics takes to be an empirical fact that:

P 2: Interactions are thoroughly reciprocal.

Bunge is one of the very few philosophers who have acknowledged the ontological significance of the fact that there are no actions without reactions. He takes it to show that the standard picture cannot be anything but an

approximation of causality, and yet Bunge rejects the idea that causality could be explained in terms of interaction, "if only for the simple reason that material objects are in a state of flux, so that generally the action has over the reaction the definite 'advantage'—to use an anthropomorphic expression—of priority in time."(1959, p. 162) He adds:

> The frequent asymmetry of interactions, as well as the fact that processes in which the antecedent disappears altogether cannot be described as interactions (although they involve reactions upon different objects), renders interactionism inadequate as a universal doctrine. Causation cannot be regarded as a particular case of interaction because the latter lacks the essential component of irreversible productivity. (1959, pp. 170-1)

To sum up, Bunge has four objections against interaction as a universal doctrine of causality: (i) that when we consider the fact that things are in a state of flux, actions are temporally prior to the reaction, (ii) that interactions are often so asymmetric that the reaction and its effect can be quantitatively neglected, (iii) that some processes, e.g. the spontaneous decay of various kinds of micro-particles, cannot be described as interactions, and (iv) that if the action does not give rise to the reaction then interaction contains no element of productivity, which he, like I, considers an essential component of causality. However, as I hope to show, these objections are really directed against a very different conception of interaction than the one I present here.

I will discuss the objections in a different order than they appear above, but begin with the first objection that the action is temporally prior to the action. I am afraid that this objection is based on a mistake, namely of not separating the reaction from the effect. When talking generally about interaction Bunge says that "the effect always reacts back on the input" (1959, p. 170), when discussing gravitational interaction he says that "[e]very change produced by m_1 on m_2 reacts back on m_1" (1959, p. 150), and when discussing the sense in which interactions are reciprocal, he only states that there is a reaction to every action, and that the reaction is equal to the action, but does not say that they occur simultaneously. In fact, he says that every action is accompanied or *followed* by a reaction (1959, p. 170).

Indeed, Bunge's third objection that interaction cannot handle processes where the antecedent ceases to exist, is only intelligible if one assumes that he does identify the reaction with the effect. Bunge uses an example of spontaneous decay of a micro-particle to illustrate his point, notably the conversion of a pion, into a muon with the emission of a neutrino:

> In this case, the parent particle (π) is unstable; it decays spontaneously (that is, without any known extrinsic cause, though presumably as a result of an inner process)[…]This is an irreversible, typically genetic process, the thing furthest from interaction–despite which meson theories usually treat this process as if it were a mutual action between coexistents. More exactly, the parent-child connection existing between the pion and its descendants is described as an interaction eliciting that very transition–despite the fact that the products are not yet born. (1959, p. 163)

If the muon and neutrino are 'products' of the decay of the pion, Bunge argues, then there cannot be talk of interaction *between* them and the pion. There cannot be an action by the pion on the products since they are 'not yet born', nor a reaction from the products on the 'parent particle' since it no longer exists. Note that Bunge does not object to the possibility of products reacting back on what produced them, but only to the possibility of such reaction in cases where the 'producer' ceases to exist in the process of producing the effect. I agree that the decay cannot be described as an interaction between the pion and its descendants, but for the simple reason that I do not think that interactions occur between the product and the producer.

I think that the example is really a worse anomaly for the standard view, than it is for the interaction-view I present. If the decay is spontaneous, in the sense that there is no external cause to it, then it cannot be considered as a case of causation at all on the standard picture, because this picture defines causes as being external to the changing entity. On the standard view, if there is no external cause to the decay, and the possibility that the product of the decay reacts back on its own production is excluded, then we are dealing with a spontaneous event; an uncaused change. In that case the example really falls outside the category of phenomena being discussed, namely causal production. However, if the decay is a result of an inner process, as Bunge suggests, then it can possibly be treated as a product of an interaction between the parts of the unstable pion that become the muon and neutrino respectively. This would however require that the pion be treated as a compound substance, which is an issue best left to physicists to answer. What matters here is, firstly, that Bunge identifies the reaction with the effect and therefore thinks that if the 'agent' ceases to exist in the process of producing the effect, then there is nothing for the effect to react back on. Secondly, he cannot see a process internal to the pion as being the cause to its decay, because he restricts the meaning of the term cause to 'extrinsic motive agent':

> Efficient causes are, by definition, extrinsic determinants[…] As understood in modern times, causal determinism asserts the universal operation of efficient causation. Now, by definition, of all kinds of cause, the efficient cause is the motive or active one, it is, moreover, an agent acting on things *ab extrinseco* and one that cannot act on itself. The efficient cause is, in short, an *external* compulsion, hence, an essential mark of (efficient) causation is externality (1959, pp. 173-4).[12]

It would seem as if the possibility of understanding the inner process of a pion as being the cause to its decay, require us to reject entirely the idea that efficient causation involves external compulsion, but I think this would be an exaggeration. Even on the interaction model, efficient causation involves external compulsion, namely the external *and* reciprocal compulsion that interacting things exert on each other. A brick is of course external to the window, and vice versa, but sometimes, an interaction may take place between the parts of a unity, producing the destruction of the unity. The interaction is then internal to the unity that is destroyed, but nevertheless involves external compulsion, namely the compulsion that the parts of the unity exert on each other. Interaction is not incompatible with the notion of external compulsion, it just does not *identify* the notion of 'cause' with external compulsion. Interaction requires that the notion of 'cause' as meaning the unique producer of a change, must be separated from the notion of external compulsion, because there cannot be a compulsion without a 'countercompulsion'.

Let us now turn to Bunge's second objection, that interactions are often so asymmetrical that the reaction can be neglected. This objection is really an argument in favour of the standard picture, not an objection to interaction, i.e. it is a justification of the application of what Bunge calls the *causal approximation*. He makes a point of the fact that interacting things always affect each other mutually with equal force, but then points out that when there are large quantitative differences between the things, the larger thing will hardly be affected at all by the interaction. Bunge uses gravitation, which is both considered to be a paradigm of causality and thoroughly reciprocal, to illustrate his point: "Only if one of the masses is much smaller than the other (for example, a stone as compared with the whole Earth), can the greater mass be regarded as the *cause* of the acceleration of the smaller one, and the reaction of the latter's motion be *quantitatively* neglected" (1959, p. 150).[13] That is, even

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[12] Bunge notes that external causes are insufficient to determine all kinds of changes, but he does not take it to imply that there is anything wrong with the thesis that causes are essentially external to the changing thing. Rather, he takes it to show that causality is but an approximation.

[13] Note again, that Bunge does not distinguish clearly between reaction and effect.

though the interaction really is reciprocal, then sometimes the effect produced by the reaction is so small that it can be *neglected*, and the interaction be treated as being approximately causal in the standard sense. Bunge argues that "[i]n some cases this involves no error at all" (1959, p. 150). It is justified to ask: according to which standards is the reaction negligible? The answer is 'in accordance with the explanatory interests of the observer': "by a suitable choice of the reference system (change from laboratory system to center-of-mass system) [...] an interaction problem is thereby transformed into an ideal causal problem" (1959, p. 151).[14] That is, Bunge argues that when the effect on one of the things is for all practical purposes negligible, then we are methodologically justified to do the kind of aspect-shift that Maxwell described so well, i.e. sometimes we are justified to neglect those aspects of reality that we have no explanatory interest in.

I will not argue that the application of the standard picture is not *methodologically* justified in many or most cases in scientific practice. I think Bunge does satisfactorily argue that it is so justified, as a useful approximation. But, the fact that interactions can always be approximated to fit the standard picture, by a suitable choice of which effect is to be neglected, is not an *ontologically* valid argument against interaction. There is clearly a tension between Bunge's ontological and methodological considerations. He makes a point of the ontological inadequacy of the standard picture, regarding the relation between the action and reaction, but he prefers the standard picture, both for its methodological utility in cases where there is a large quantitative difference between the effects produced in an interaction, and because he thinks interaction does not involve production. I have no methodological considerations. I am looking for an ontologically adequate account of causal production, and I think, contrary to Bunge, that interaction does involve production.

Bunge's fourth objection, that interaction does not involve production, is the most serious objection to interaction, but it is clear that it is directed against a

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[14] Bengt Molander also considers briefly the suggestion that the standard conception of causality should be replaced by a conception based on interaction. He dismisses it with the motivation that explanations of what happens in a given system in terms of interaction does not make causal statements of the form '*E* because *C*' about what happens in that system inappropriate or false (1982, pp. 140-3). That is, it will still be true that the brick breaks the window, although at the same time the window causes the brick to lose momentum. This is a motivation I find to be similar to Bunge's reasoning. I would agree with them to the point that causal statements are not inappropriate or false *as explanatory statements, in relation to what we want to explain*. But it does make the individuation of causes and effects dependent on a subjective choice of reference.

completely different conception of interaction than the one I advocate, namely against the view that the relation between cause and effect, then meaning action and reaction, is symmetrical. In Bunge's words: "Let us agree to call interactionism, or functionalism, the view according to which causes and effects must be treated on the same footing, in a symmetrical way excluding both predominant aspects and definitely genetic, hence irreversible, connections." (1959, p. 162) This view, he claims, may be regarded as a "hasty extrapolation of the mechanical principle of the equality of the action and the reaction" (1959, p. 162). Now, I agree that on my view there is not a relation of one-sided existential dependence between the action and reaction, rather a mutual dependence, but I take that to show that the reaction cannot really be an effect, and that the action alone cannot really be a cause. I do not take it to show that there is a symmetrical relation between cause and effect, rather I take it to show that we must re-examine the standard conception of 'cause'. I suggest that by abandoning the idea that causes are essentially what Aristotle called the efficient cause, i.e. something external acting one-sidedly on the changing entity, then it is possible to conceive of the interaction as a whole as the cause, and the change in the compound whole of interacting things as the effect. According to this view, the relation between action and reaction is symmetrical, but it does not follow from this that the relation between the interaction and the change it produces is symmetrical. Indeed I will argue that it is *a*symmetrical and that the interaction can therefore be considered to be the cause to the change. Bunge completely overlooks this possibility because he considers causes to be *by definition* external to the changing entity.

It is not impossible to conceive of interactions as involving production, when one considers not the reaction as being the product, but the effects produced in the interacting things themselves by their own interaction. It is in fact difficult to conceive of interactions without thinking of them as the production of changes in the interacting things, when, as here, interaction refers to the mutual influence of two things upon each other. The notion of force has always been understood in terms of production of changes. Newton defined it as "an action exerted upon a body in order to change its state, either of rest or of uniform motion in a straight line" (1686, p. 13), and Hertz defined it as "the independently conceived effect which one of two coupled systems[…]exerts upon the motion of the other" (1956, p. 185). If force, meaning the action of one thing upon another, cannot be separated from the changes it produces, then neither can interaction be separated from the production of changes, since an interaction consists in two reciprocal forces. That the forces are reciprocal means that neither can exist

without the other, and that, therefore, neither can produce the other. However, together they can produce a new state of affairs.

P 3: Interaction involves production.

I have so far argued that inanimate material objects cannot be objectively distinguished into 'agents' and 'patient', and thereby that the distinction between causes and effects *in terms of* 'actions of an agent' and 'changes in a patients', respectively, is ontologically inadequate. It involves a neglect of the reaction of the 'patient' and change produced in the 'agent'.[15] The causal production of a state of affairs involves the interaction of things, and this interaction is reciprocal.[16] That is, in explaining the causal relation between events, there is always a story to be told about the interaction between the things involved.

I do not deny that we often experience interactions as being asymmetrical, but I suggest that this experience of asymmetry is purely subjective. It does appear to be more 'fatal' for a window to be smashed to smithereens than for a brick to lose momentum. But, surely, the sense in which the breaking, or destruction of objects in general, is 'fatal', is a subjective evaluation. Is it perhaps because a smashed window is inconvenient to a house-owner in a way that the loss of momentum by a brick is not, that we attend to the breaking of the window as an 'important' effect of the interaction, while the loss of momentum

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[15] Someone may find my talk of causes and effects in terms of the action of 'agents' and changes in 'patients' ill fitted to contemporary discussions about causality, where causes are usually formulated in terms of conditions of various sorts. I chose this terminology to avoid confusion with accounts of causality where production has no place. But, I take it that the basic idea behind the polarisation of interacting entities into 'agents' and 'patients', has affinity with the idea behind distinguishing between conditions that are merely necessary, and conditions that are both necessary and sufficient. The idea is that there is some special part of a given state of affairs, whether that part is an object or event, which has an especially important function in the production (or determination) of a subsequent state of affairs. I argue that this idea is mistaken. It may anyhow be pointed out that in terms of conditions, my account comes closest to being compatible with Mackie's analysis of causes in terms of insufficient but necessary parts of a condition which is unnecessary but uniquely sufficient for the effect (INUS condition) (1965). Except, because I think of effects in terms of tokens, not types, and of the genetic link between cause and effect as grounding the necessity of the connection, then I think the 'action' and 'reaction' are each an insufficient but necessary part of an interaction which is *necessary* and uniquely sufficient for the effect (let me call that an INNS-condition).

[16] I am here using 'state of affairs' as the unity of a substance with properties, whether or not the substance is a compound or a simple, and whether or not the compound is an aggregate or unity of substances. For reference, see I. Johansson (1989, Ch. 3). For a recent discussion of the ontology of states of affairs, see E. Runggaldier & C. Kanzian (1998, pp. 198-218).

by the brick is a negligible 'side-effect'? If this is the reason, and I think it is, then the experienced asymmetry of the interaction is purely subjective, i.e. dependent on our explanatory interests.

To be sure, different things change in different ways when entering into interactions, and these differences can be quite dramatic, but does not justify giving one of the interacting things, e.g. 'the flying brick', the privilege of being the sole producer of the subsequent change, e.g. that the window breaks and that the brick loses momentum and velocity. The objective character of the subsequent state of affairs as a whole is determined jointly, and reciprocally, by all the things involved. I suggest the difference in how things change in interactions is due to differences in the intrinsic properties of the things themselves, not to an asymmetry between the influences they are subject to. Different things change differently when they interact, because they are different, not because of an asymmetry between their respective actions.

If it is correct that causal production always involves interaction between coexisting things, then it follows that interaction is ontologically prior to the cause-effect relation believed to hold between temporally distinct events. I think this is something we can observe in our everyday practices, when we reflect upon it. We know we cannot accomplish anything without acting upon things in some way or another, and we always feel their resistance (reaction) when we do. We always suffer a change ourselves when accomplishing a change in something else, but as long as this change is negligible to our purposes, then it will go by unnoticed. It is indeed because we feel the resistance of the things we interact with, that we can adjust the effort we make to their resistance. Our effort is always proportional to their resistance. We also know we value different consequences of interactions in various ways, indeed, different people value the same consequences differently, and we know that the mechanical forces involved have little or nothing to do with their value. A tiny little push on the edge of a cliff can have dramatic consequences, while a full body tackle in the ice-hockey rink does not matter a jot. We even disagree on what is to be considered as the 'agent', i.e. the efficient cause, e.g. in deciding questions of responsibility. That interactions are thoroughly reciprocal, is maybe not intuitively given at first glance, especially when it comes to intentional acts, but I think it is convincing on second reflection in light of everything that has been said.[17]

[17] Perhaps intentional beings could in some sense be examples of 'extrinsic motive agents', in accordance with the standard picture. That is, I am prepared to leave it open whether individuals with the capacity to a) perceive themselves in relation to other objects, b)

P 4: Interaction between coexisting objects is ontologically prior to the one-sided existential dependence relation between two temporally distinct events.

Now, in what sense can a state of affairs produced by an interaction be *necessarily* connected to the interaction that produced it? Perhaps it is possible to argue that if the character of the interaction is entirely determined by the properties of the interacting things, then the outcome of that interaction is entirely determined by the interaction. On the assumption that properties are universals, then whenever two objects of a certain kind interact in a certain way, the very same kind of effect is always produced. We would then have, in principle, constant and invariable type-type relations, i.e. a necessary connection. I will however argue that there is another kind of necessary connection to be found, a genetic token-token link.

Assuming, as I do, what appears to be an empirical fact, that nothing can be produced *ex nihilo,* then we must consider *out of what* a new state of affairs is produced. A potter cannot produce pots without clay, factories need raw material out of which they can produce ready products. Without raw material that can be altered into a new shape, nothing can be produced. What is the raw material out of which a new state of affairs is produced, and where does it come from? I propose that a new state of affairs is produced by the interaction of things, out of the very substance those interacting things are made of, i.e. the state which is produced is made of the same substances as were involved in the interaction. It is the same substance that constitutes a window and then a pile of broken glass. It is the same brick that comes flying through the air and then lies in that very pile of broken glass.

Since interaction requires at least two things, then the production of a new state of affairs requires an aggregate of things or substances, and we can speak of that aggregate as a *compound substance*. If the state of affairs produced by

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have preferences and desires, c) predict various consequences of various actions before they are performed, d) choose the action that is perceived to lead to a desired effect, e) adjust the effort and direction of the action to the reaction of other objects, may perhaps be capable of *initiating* actions, and not just interact with the environment in the sense described above. This list of capacities is not complete, nor do the distinctions aim to represent logically, or otherwise, independent capacities, but rather interdependent capacities. I just want to make a sharp distinction between how *we* calculate, and perhaps initiate, our actions in the world, and how physical objects in general actually interact in the course of real events. To what extent intentional actions differ from interactions is beyond the scope of this paper, but I do think our cognitive abilities biases our understanding of the nature of causal production in the world of inanimate material objects. For a recent overview on the topic of mental causation, see Loewer (1998).

the interaction is produced out of the substance of the interacting things, then the state of affairs produced by an interaction consist in the very same compound substance as were engaged in the interaction. On this account, the relationship between two different but in this sense causally related states of affairs is necessary in the sense that they are necessarily constituted by the very same compound substance. Causally produced change is then an alteration in the state of a compound substance, brought about by that very substance itself, through the interaction of its aggregate parts. This brings another feature of change into focus, namely that every production of a state of affairs is always at the same time a destruction of an existent state of affairs. The coming into existence of a state of affairs, that does not come into existence out of a state that is destroyed, must be creation *ex nihilo*.

> P 5: Two causally related states of affairs are necessarily constituted by the very same compound substance.

It might be objected that I am here assuming without argument an *endurance* view of the persistence of things, as opposed to a perduring view of persistence, but this would be mistaken. That things persist by enduring, as opposed to perduring, is a conclusion of my argument, from the initial premise that causality does in fact involve production. It seems to me that this premise is only compatible with endurance.[18] If it were assumed that things persist by having temporal parts, each part being a distinct and independent substantial entity, i.e. by perduring, then I fail to see what could be produced, by what, and out of what.[19] If one temporal part of a thing is broken and an earlier part is whole, without the part being whole having changed into being broken, then out of what was the broken part produced? The broken part must either (i) always have existed, in which case it was not produced, (ii) be produced by being brought into reality from outside reality, (iii) be produced out of the substance of the 'agent', in which case a brick would have to be able to change into a pile of glass and the problem would shift to the production of the brick lying in the pile of glass, or (iv) be produced *ex nihilo*. Indeed most perdurantist would agree and say that since things perdure, there is no production, everything simply exists, albeit at different times. I want to make as good sense as I can of the idea that causality involves production, but reject the possibility of creation *ex nihilo*, and

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[18] I have elsewhere argued in greater detail that the notion of causal production requires endurance (2001).

[19] Like Haslanger (1989), I have argued that the perdurantist position commits to a Humean interpretation of causality, i.e. to a correlation view of causality, in which production has no place (2001).

will then have to conclude that if causality involves production then substances persist by enduring.[20]

If one is forced to assume that substances persist by enduring, one is arguably also forced to assume that time is tensed. The idea that substances endure through a succession of incompatible states, requires that substances may exists in just one state at a time, and, objectively speaking, cease to exist in the state they change from, when they change into another state. That is, in order for an entity to cease to be in a state and begin to be in another, objectively speaking, that entity must be 'wholly present' at many times in succession, i.e. be at present in one state but in another state in the future. This is a possibility that is denied by the so-called tenseless view of time, which claims that all moments of time are equally existent and real. On the tenseless view, things just appear to exist at different times in succession, when in fact they are at all times equally existent and real at all the times they exist. This view, it is argued, is only compatible with the view that things perdure, i.e. exist at various times by having different temporal parts located at those various times.[21]

Two states of affairs that are causally related, in the sense given above, will be different states of the very same compound substance, which has changed from one state to the other due to the interaction of its parts. The production of changes cannot then really be construed as involving an external influence on the changing entity (although the parts of that entity act mutually and externally on each other), but to influences *internal* to a changing compound, or aggregate of substances. That is, on this account, causally produced change is always a change within a system.

P 6: Causally produced change is always internal to a compound substance.

If causation is the production of a change in an aggregate by the interaction between the coexistent parts of that aggregate, that interaction being considered as the cause to the change, it follows trivially that causes are existentially prior to their effects. The causal production of a new state of affairs, presupposes the existence of an aggregate whose parts interact. On the further assumption that

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[20] It is widely argued that change *per se*, not just causally produced change, necessarily requires endurance of the substances involved. For reference see, Aristotle's *Metaphysics* (Bk. XII, Ch. 2), Haslanger (1989), and Lowe (1998).

[21] In (2001), I argue that endurance, tensed time and causal production are essentially linked to one another in what I call the *dynamic view* of reality, while perdurance, tenseless time and the correlation view of causality essentially belong together in what I call the *static view* of reality. In that paper I also argue that what has hitherto been considered the most serious objection to the dynamic view, the charge that tensed change in enduring entities is contradictory, is invalid because circular.

time is tensed, it follows trivially that interactions always precede their effects in time.

P 7: Interactions always precede their effects in time.

I must stress that this is an account of causal change that is completely independent of the particular qualitative character of the states of the compound substance before and after the interaction. Surely, what happens in an interaction is determined by the properties of the substances involved, and the way they interact, but my account does not depend on it being the case that any two interactions are exactly alike; my account is compatible with the possibility that every single interaction in the history of the universe is unique. It is also compatible with the possibility that there are general laws, it just does not give a criterion that can be used to identify types of effects that are always and invariably produced by certain types of interactions; that, I think, is a task for empirical science.

I have said that I will not defend the reality of causal production against those who deny its reality, and I will not. But, I will point out what I think is an interesting contrast between Hume's account of causality and mine. According to Hume, the objective components of the causal nexus are three: contiguity, succession, and constant conjunction. I have argued that there is also reciprocity between the contiguous objects. I have no qualms with Hume's view that there is no logical necessity in the conjunction of the motion of a billiard ball *A* and subsequent motion of a billiard ball *B*, when *A* and *B* collide. We are free to *think* of the collision of *A* and *B* as being succeeded by anything whatsoever. We can *conceive* of *A* approaching *B*, and their contact resulting in a third ball *C* (or whatever object you like) emerging from *B*. We can even think of ball *A* simply passing through ball *B*, without anything happening to *B* or to *A*. What we cannot do, or *will* not do, I submit, is to think of the passing by *A* through *B* as being a case of causation, *however many times this type of event recurs.* Rather, we would think of it as the absence of causality, because, I suggest, it completely lacks any sign of reciprocity. The appearance of reciprocity is present in every instance of causation in the realm of ordinary middle-sized objects. Whether this appearance of reciprocity is explained in terms of production or not, any adequate account of causation will have to be able to account for it.

Now there remains to describe the relation between the state destroyed in an interaction and the state produced by that very same interaction. Strictly speaking it is the interaction between the parts of the compound substance that produces a change in the compound from one state to another, the states

themselves are always products. That is, the interaction is the process in which the effect is produced. But, I suggest that the relation between any state *from* which the compound substance changes and the state *to* which it changes, due to the interaction, nevertheless be characterised as being one of producer to product. Any given state of a substance, although merely a temporary form of the substance, cannot be separated from the substance itself. The state cannot exist without the substance. If, as I have argued, the state to which the compound substance changes, is necessarily constituted by the very same substance as the state from which it changes, then the state to which the compound changes is for its existence dependent on the state from which the compound changes, because the state to which it changes 'inherits' both the substance, and the character, from the state the compound changes from.

The temporally distinct states of any such compound, related as producer to product through the interactions of the parts of the compound, will then hold a relation of one-sided existential dependence; the state to which a compound substance changes is for its existence dependent upon the state from which the compound changes, but the state from which it changes is not for its existence dependent upon the state to which it changes.

> P 8: The state produced by an interaction stands in a relation of one-sided existential dependence to the state destroyed by that very same interaction.

That is, on my account, the so-called causal asymmetry between a cause and an effect, i.e. why it does not follow from '*x* caused *y*', that '*y* caused *x*', can be given in the following terms: *if x* produced *y*, *y* could not have produced *x*, because that would have required *y* to produce *x* prior to its own production, which is impossible.[22]

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[22] I think this is a good time to point out a significant difference between my view and the *perspectival view* advocated by Huw Price (1996), who also argues that the standard picture of causality is biased by agency. I argue that the relation between interacting entities should be considered to be symmetrical, but the relation between the interaction and the state it produces as asymmetrical. Price argues that the relation between earlier and later stages of a process hold a symmetrical relation, i.e. he argues that the state which a system appears to have changed from, and the state which it appears to have changed to, when its parts interact, really hold a symmetrical relation. Price's argument is based on the fact that the mathematical formulations of the laws of nature in physics are time invariant. That is, because it makes no difference to exchange the time variable *t*, with its contrary *-t*, in the fundamental laws of physics, any process can be *described* as going either backwards or forwards in time, without violating those laws. Perhaps accounts of causality that rely *only* on the aspects of lawful connections between types of events in accordance with the laws of physics, will have to accept Price's conclusion, but then, I think, those accounts are incompatible with the conception of causality as involving production. If the relation between two states of one and the same system is symmetrical, neither could have produced the other. Admittedly, the

4. Conclusion

When the asymmetric relation between 'agent' and 'patient' is abandoned, and causal production of change is taken to be the result of reciprocal action between parts of an aggregate (or system), a relation of one-sided existential dependence can be found to hold between the state produced in the aggregate by the interaction of its own parts, and the state destroyed by that same interaction. In other words, the interaction between the parts of a compound substances, destroys a state of affairs at the same time as it produces a new state of affairs, the produced state of affairs being for its existence one-sidedly dependent upon the state that was destroyed.

Thus conceived, the two states of affairs may be *logically* independent, in terms of being of a certain type each, but they cannot be thought to be made of distinct and independent substances. If it is assumed that they are distinct compound substances, then the question out of what they are produced is left unanswered, or it is answered that they were not at all produced, or it is answered that this effect was at least not produced by this cause. I suggest that in order to explain production of changes, and the existential dependence relation between the change and what produced the change, it is necessary to assume that things, or the substance they are made of, persist by enduring. Conversely it means that if endurance is abandoned, production must be abandoned too. Also, if endurance requires time to be tensed, and production requires endurance, then production requires tensed time.

When cause and effect are seen to be made of the same substance, it is impossible to think that any particular effect could just as well have been produced by some other cause than it in fact was. Any attempt to think of the effect as having been produced by some other cause, will necessarily involve thinking of it as having been produced out of some altogether different substance, and therefore as being a totally different effect. It is of course possible to think that a certain *type* of effect could have been produced by a number of different *types* of causes, or by different *token* causes of the same *type*, but not that a particular *token* effect could have been produced by any other *token* cause than it in fact was.

I hope I have made a good case for the claims that interaction, as I have described it (i) *can* be conceived to involve production, (ii) involves a necessary connection between an interaction and its product, and (iii) should be taken seriously as a possible hypothesis of the factual nature of causality. It is an

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genetic principle imposes no special direction to certain *types* of processes, but it excludes that the relation between two *token* stages of one and the same causal process is symmetric.

hypothesis that fits the components of the common notion of causality, i.e. that causality involves *production* due to *causal influence* such that the producer and product hold a relation of *one-sided existential dependence*, although it combines these components in a somewhat different way than is usual. It also fits certain widely accepted metaphysical principles, i.e. the genetic principle and the principle of lawfulness, but requires that the principle of action be substituted for what may be called the principle of reciprocity. This, I believe is however only a minor modification, and which serves to correct the agency bias of the standard picture. My final suggestion is thus:

P 9: Interaction and necessary causal production is the same process

In short, my suggestion is that causally produced change is properly described in terms of changes in the state of a compound substance, produced by the interaction between the parts of that substance itself, i.e. that causally produced change is always due to influences internal to the changing entity. Causally related states of affairs are thus different states of the very same substance, one coming to exist out of the other, and that is, I suggest, the kernel of truth behind all talk of a necessary connection between causally related events.[23]

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Appendix A

CAUSAL ASPECTS OF PERSISTENCE

In 'Causal Production as Interaction' the focal point is on the causal aspects of *change* in persistent entities. I think there is an important point to be made about the causal aspects of the *persistence* of those changing entities as well. It is sometimes acknowledged that persistence does have causal aspects, but these aspects are not often discussed in any detail. Thus for instance, Jonathan Lowe distinguishes between *explaining* persistence and saying what persistence *consists in*, taking the first to be giving a causal explanation of the phenomena, and the latter to say in some revealing way what that phenomena is, to state its 'essence', so to speak (1998, p. 108). Lowe says that perhaps a causal explanation of the persistence of ordinary middle-sized objects may be forthcoming (although not, he suspects, of the persistence of the most fundamental entities in the world), but that he will focus on a discussion about the essential features of persistence, i.e. on what persistence consists in. I will however discuss the possibility of giving a causal explanation of the persistence of middle-sized objects, in light of the interaction account of causality presented in 'Causal Production as Interaction'. I think that the idea that causality is basically a matter of interaction between coexistent entities, allows us to give a causal explanation of the persistence of middles-sized objects, in a way that is not offered by standard accounts of causality.

1. Persistence as existence at many times

In the debate between the proponents of the endurance and perdurance views of persistence, the characterisation 'to exist at different times', is often presented as a *theory-neutral description* of persistence, i.e. as a description that everybody can accept as a point of departure for the debate. Thus David Lewis writes:

> […]something persists iff, somehow or other, it exists at various times; this is the neutral word. Something perdures iff it persists by having different temporal[…]stages at different times[…]it endures iff it persists by being wholly present at more than one time. (1986, p. 202)

But, a point of departure does not just determine where the debate starts from, it also indicates where the debate ends. A theory-neutral description of a phenomena, like the one proposed by Lewis, sets conditions of adequacy for any answer that might be given, i.e. it does not just state the problem, it also indicates what will count as an adequate answer. The conditions set by Lewis'

description says that any answer explaining what the existence of things at different times consists in, will be adequate explanations of persistence, unless shown to be contradictory, or otherwise faulty.

Now, I take it to be generally accepted that the perdurance view is an intelligible account of how things can be conceived to exist at different times, and of how things can be conceived to have different properties at those different times, namely by being composed of temporal parts that exist at different times and that have different properties. It is nevertheless disputed whether this sense of existing at different times and having different properties at those different times really captures the true nature of persistence and change. The objection is that it lacks the component of *strict identity* of some entity *x*, existing at the different times, and of objective *gain/loss of properties* by that entity. It seems then that perdurance theories satisfies the conditions of adequacy set by the allegedly theory-neutral description of persistence and change, and yet endurantists find reasons to deny that perdurance captures the essence of persistence and change. This indicates that endurantists have other conditions of adequacy, not contained in Lewis' presumed theory-neutral formulation, and consequently an altogether different point of departure for the debate. I think endurantist must deny that persistence is simply a matter of existence at various times.

The proponents of endurance and perdurance do not just disagree about the solution to the problem, but also about what the problem is. The perdurance view is a solution to what Lewis calls the problem of temporary intrinsics (1986, pp. 202ff), i.e. what he thinks is a contradiction inherent in the endurance view of persistence, and which then requires a new account of what persistence consists in. That is, he thinks this contradiction requires us to reconsider what the essence of persistence really is. The problem facing endurantists is not to solve the problem of temporary intrinsics by giving a new account of persistence, but to show that the problem of temporary intrinsics is a pseudo-problem. In 'Temporal Parity and the Problem of Change', I discuss why I think the problem of temporary intrinsics is a pseudo-problem. Here I want to suggest a more complex endurance view of persistence.

I will suggest that one important aspect is very much neglected in the discussion about the objective nature of persistence, namely that the persistence of compound entities, as opposed to the persistence of simple substances, is a product of causal interactions, in much the same way as changes are the product of interactions.

2. The causal component of persistence

Is persistence really just a relation between things and the positions they exist 'at' in a temporal dimension, as Lewis' suggestion seems to imply? Is the problem of persistence *merely* a question of whether things are temporal simples that hold a one-to-many relation to times as endurantists suggest, or whether things are temporal compounds whose parts hold a one-to-one relation to times? I think not. In the following I will present some common sense reasons for the claim that the persistence of ordinary middle-sized objects is thoroughly causal, and discuss how the causal aspects of their persistence can be accounted for in terms of interaction.

Let us examine paradigmatic examples of persistent entities, i.e. of material middle-sized things and persons. Some things, and some persons, persist longer than others. The pyramids have persisted for over 5000 years, without maintenance, while an automobile may last for 20 years, with good maintenance. Some persons live to a ripe old age while others die 'before their time'. The difference between 'long-lived' and 'short-lived' entities does not appear to be just a matter of their factual existence for long or short periods of time, or whether their existence during that period consists in a one-to-many relation between the thing and the times it exist at, or a one-to-one relation between the parts of the thing to the times those parts exist at. Their persistence appears to be determined by the causal interactions they participate in and by their ability to survive (persist through) those interactions. The question is, can we make sense of their persistence in causal terms?

Bohemian crystal is fragile, but if handled carefully it may last for centuries. A glass of Bohemian crystal may even persist longer than a bronze statue, which is of a much more sturdy nature. The fact that a particular crystal glass happens to 'outlive' a particular bronze statue does not make the crystal 'more persistent' than the statue. A bronze statue normally lasts for centuries, even when handled roughly, while crystal glasses need careful handling to last that long. However, a newly cast bronze statue may be destroyed in any number of ways, e.g. during war times. In fact, neither the existence of pieces of crystal, or of bronze, come to an end unless being causally influenced to do so. The persistence of these things is partly due to their ability to resist causal influences that work towards their destruction, i.e. their ability to persist through changes, and partly in the absence of such causal influence. Normally, a crystal glass will not last as long as a bronze statue because it is fragile and often handled carelessly. But, when handled carefully it may nevertheless last longer than a less fortunate bronze statue. In that case, the particular piece of crystal lasts longer *despite* its fragile

nature because of the absence of causal influence that might have resulted in its breaking.

In the case of inanimate material objects, like crystal and bronze statues, their persistence is usually explained by the absence of *external* causal influence. They last as long as nothing external to them causes their destruction. Biological creatures, on the other hand, naturally cease to exist because of the inevitable failure to maintain their own organic structure due to *internal* degenerative processes, i.e. what we call dying of sickness or old age. Obviously, biological creatures also cease to exist because of external influence, e.g. when killed by being hit by a foreign object, but we do tend to treat such ends as 'unnatural'. It is considered natural for pyramids to be worn down by wind, water, and earthquakes, i.e. by influences external to the pyramid, while it is natural for animals to die because of old age and/or sickness, i.e. influences internal to the animal. I think both kinds of destruction are causal, and both kinds are really at work in all compound objects.

Inanimate objects, like statues of bronze and pieces of crystal, do not cease to exist only due to external influence. They are also subject to internal degenerative processes, i.e. interactions between their component parts. Such intrinsic degenerative processes are just more outspoken in biological creatures than in 'dead' matter, although even here there are large variations between different kinds of material substances. Gold is an extremely stable element while iron is less so, it rusts. Given enough time, even 'dead' matter falls apart almost by itself, in due course, because of the interaction between its component parts. The spontaneous decay of radioactive matter is the clearest example of that. The persistence of a compound object thus depends upon its ability to maintain its structure despite influences, *external* and *internal*, working to destroy that structure. On this account, for a compound object to persist is for that object to continue to exist despite influences working to the contrary. I suggest that some such influence is always at work in every compound object.

I believe that it is relevant to distinguish here between persistence of unities, of aggregates, and of simples. Of these three, I think it is only the first that can be given a causal explanation in terms of interaction, but then again it is the persistence of unities like chairs, tables, and persons that are the paradigmatic examples of persistent entities. The persistence of aggregates is not due to an interaction between parts, mainly because aggregates amount to no more than what is called the mereological sum of its parts, i.e. aggregates are a collection of parts that exist independently of one another. The existence of the collection is dependent upon the existence of each and every part, but the existence of the

part is not dependent upon the collection. Aggregates are often objects merely by fiat and may cease to exist just because one of its parts ceases to be a part of the whole because failing to live up to some *subjective* identity condition. The aggregate of all the cars now being parked on the parking-lot outside my office, exists as long as all those cars persist and stay in the parking-lot. Those cars form an object only because of my decision to bundle them up with reference to some arbitrarily chosen geographical boundary; the parking-lot. They do not form an object because being united to each other by any kind of bond. When anyone removes a car from the parking-lot, that car leaves those arbitrary boundaries and there is a different aggregate within the boundaries. It is not the same aggregate that has lost one part. We can also imagine a situation where none of the cars is ever removed, in which case the aggregate does not cease to exist until some car rusts apart. In that case the aggregate persists until some of its parts is destroyed. In short, the persistence of aggregates is entirely dependent upon the persistence of the parts, but the persistence of the parts is not dependent upon the persistence of the aggregate.

There is, as far as I can tell, no explanation forthcoming to the persistence of aggregates in terms of interaction, other than the explanation of the persistence of the parts of the aggregates, in so far as these parts are compounds. If the parts of an aggregate are simple substances, the persistence of the aggregate cannot at all be explained in terms of interactions, because simples can of course not be explained in terms of the interaction of their parts; they have no parts. The persistence of aggregates and simples cannot then be given a causal explanation. If there are simples, then there are entities that merely have a one-to-many relation to times. As suggested by Lowe (1998, p. 107), such simples may then perhaps be described, by analogy, as persisting because of a kind of 'existential inertia'. I could then add that an aggregate consisting entirely of simple parts could be described in the same way as persisting because of the inertia it lends from the permanent nature of its constituent parts. However, more needs to be said about the way unities persist. Of course, the persistence of a unity partly consists in the fact that its fundamental parts have 'existential inertia', but this 'existential inertia' does not explain why the parts continue to be parts of the unity.

It is the survival of unities, like tables and persons, which I think can be given a causal explanation when one conceives of causality in terms of interaction. Ordinary middle-sized objects are compound substances whose structure is upheld through the interaction of their parts. A brick is a unity of parts and it can in turn be a part of an aggregate whose parts interact, e.g. when

the brick collides with a window. In this example, the unity of the brick is preserved but the unity of the window is destroyed. In 'Causal Production as Interaction' I maintain that the aggregate whole of brick and window also persist through an interaction, but this is not something it does because of the interaction, rather in spite of the interaction. The aggregate whole persists because of the 'existential inertia' it lends from the simple substances that are its fundamental parts. Whether any unity contained in that aggregate survives as well, is decided by how well the unity succeeds in preserving its structure.

It should be noted, to avoid confusion, that I am now discussing under the assumption that to persist is to endure. It is mostly middle-sized objects that we think of as enduring entities, but I think it is fitting to use the term also for the persistence of aggregate wholes, when, as here, the term 'endurance' is used in contrast to the notion of perdurance. The endurance vs. perdurance dispute is not primarily a question about what kind of things endure and what kind of things perdure. It is a dispute about whether persistent objects have to have temporal parts or not. Once that issue is settled, if it ever will, the terms endurance and perdurance could be dropped. But, until the dispute about whether persistence involves endurance or perdurance is settled, one may speak of aggregate wholes as enduring just as one speaks about unities as enduring things.

The idea that there are causal aspects to persistence is not new, but discussions about the those causal aspects are rare. I think they may have been neglected because standard accounts of causality do not offer a natural way of thinking of persistence in causal terms. Causes are typically conceived in terms of 'extrinsic motive agents' acting on a given thing. A causal explanation of persistence in those terms would require an external cause to the persistence of things, and normally we find no such external factors. The external factors we do find are not factors contributing to the persistence of the thing, but to the destruction of it.

On another popular account, causality is taken to be a relation between two events without explicit mention of an 'extrinsic motive agent'. A causal explanation of persistence in those terms require that we conceive of the persisting thing as consisting in a series of events, each event being the cause to the next. As I will discuss further in *Appendix B*, this is the view of Peter Simons (2000*a*). He points out that the persistence of things seems to be dependent on the processes taking place in the thing, but he takes this to show that we should think of enduring things as dependent on a base of events, whose temporal parts have a causal relation. In other words, Simons thinks that persistence is causal, but because he presupposes the view that causation is basically a two place

relation between distinct events then he thinks that persistent objects must really be constituted by a series of events. I will not add anything further at this point to why I reject these accounts of causality.

A less easily categorised view can be found in the works of Wesley Salmon. Salmon does not himself explicitly discuss persistence, but he suggests that causality really involves two different but interrelated components: (i) the production of changes through the interaction of processes, and (ii) the propagation of causal influence by causal processes in the absence of interactions (1984, Ch. 5). The latter component should, I think, be considered to correspond to what substance ontologists call persistence.

Salmon's account is thoroughly embedded in a process ontology, which may invite misunderstanding by those substance ontologists who assume that talk of processes commits to an event ontology, i.e. the view that the world is fundamentally constituted by a series of very briefly existing events related as cause and effect. Salmon makes no serious attempt to define what a process is, fundamentally, but offers some examples and points to some essential characteristics. And, he denies that to think of the world as being constituted by processes commits to an event ontology (1984, p. 140).[1] By a causal process, Salmon means whatever *conserves* its structure in the absence of causal interactions, like baseballs and windows remain the same unless caused to change, i.e. the term 'causal process' refers to what substance ontologists call 'things'. But, it could also be applied to simple substances, provided we think of them as entities that conserve their structure. To say that they conserve their structure may appear to be a contradiction in terms, since they are supposedly simple. However, to say that they are simple does not mean that they have no complexity, it just says that they have no parts. A simple can both have extension and colour, which gives it a complexity in aspect. I for one think that if there exist simples, they must in any case have the capacity to interact with other simples in order to be able to constitute compounds. This is a capacity they can preserve.

Processes, on Salmons account, are causal. Not by consisting of a series of events related as cause and effect, but by having causal powers in very much the same way as things have inertial mass and velocity, and in the way simples may be thought to have the capacity to interact. These processes are able to conserve their structure and thereby of course their causal powers, if they do not interact with any other processes. In the same way, things continue to exist and preserve their inertial mass as long as nothing causes their destruction or loss of inertial

[1] For a recent overview on the issue of processes, see Griffin (1998)

mass. This is the essence of the analogy between 'existential inertia' and 'inertia' mentioned earlier. By being able to conserve their structure, processes *propagate* causal influence from one interaction to another, like a baseball propagates the causal influence it is subject to when hit by a batsman, to when it breaks the window it encounters.

To sum up. I take Salmon to be saying that things persist unchanged between interactions, and that persistence has a causal aspect in that it is by persisting, i.e. conserving their structure, that things transfer causal influence between interactions. Because a baseball can conserve the change in its causal powers produced in it by its interaction with a baseball-bat, the ball can later break a window it encounters. On Salmon's account, even the continuing to exist in the absence of interactions is causal, even though in a somewhat different sense than I am proposing, namely by grounding the causal relation between temporally distinct interactions.

As I have said, processes need not be a series of very short-lived entities. Simples can be thought of as processes, and compounds can be thought of as a structure of simples which conserves this structure by some kind of activity. This, I think, is the main difference between what could be called process-talk and traditional substance-talk, namely that 'process' and 'propagation of causal influence' have associations to some kind of activity, while 'substance' and 'possession of different properties at different times' depict persistent things as something passive.

I think Salmon is right to think of persistence as a process, but I think his account leaves the question unanswered in what way things are processes. The conception of a process implies some kind of activity. Therefore to think of persistence as a kind of process that preserves a structure, implies that it is by way of some kind of activity that this structure is preserved. But Salmon makes no attempt to clarify further the nature of this activity that conserves its own structure. I think it is possible to give a substance-ontological account of processes, i.e. as consisting in an interaction of substantial parts, and I think Salmon is wrong to think that the distinction between change and persistence is a matter of interaction vs. absence of interactions.

Salmon's account describes the lifetime of a process as consisting in a series of interactions divided by periods where interactions are absent. That is, first a ball interacts with a bat, then it 'propagates causal influence' between its interaction with the bat until it interacts with a window. The period in which the ball propagates causal influence is, on Salmon's account, devoid of interactions. But, the lifetime of the ball can only be so divided into distinct phases of

interaction vs. absence of interactions by neglecting the interaction between the ball and the air it flies through on its way from bat to window. Even if we would think of the ball as being hit by an astronaut out in empty space, we would have to disregard the gravitational interaction between the ball and surrounding objects in order to divide its lifetime into distinct phases of interaction vs. propagation, i.e. of interactions vs. absence of interactions. And, even if we could construe an example where the thing was, in theory, unaffected by anything external to it, then we could only divide its lifetime into distinct phases of interaction vs. propagation by neglecting the interaction that takes place between the component parts of the ball itself. It is only if we would think of a 'free' simple substance, i.e. a simple that is not a part of any unity, that we would get an entity whose lifetime could be characterised as one in which interactions were absent. I will leave the task of establishing the factual existence of such 'free' simples to the empirical sciences.

In any case, both changes in things due to their interaction with other things, and the non-changes in the structure of a thing in the absence of interactions with other things, are essentially causal. It is only when the causal influence internal to a thing is neglected that persistence, or the propagation of causal influence, can be described in terms of the continuing to exist in the absence of causal influence. Unless there actually exist 'free' simple substances, i.e. substances that are not composed of parts and which are themselves not influenced by other substances, there is never an absence of causal influence. The conservation of structure of anything compound is in itself a causal product, due to the interaction between the component parts. The interaction between component parts is of the conserving kind, just as long as it does not result in the destruction of the structure of which the interacting entities are parts.

I think, then, that there is something that makes things persist, namely the interaction between their parts. But, I think the persistence of any compound unity, e.g. ordinary middle sized things, depends as well upon the existential inertia of the substances which are its parts. Like Aristotle (*Metaphysics*, Bk. 12, Ch. 2), I think that in order to provide an explanation of change we must assume that the world fundamentally consists in a permanent matter substratum.

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Appendix B

CAN THINGS ENDURE IN TENSELESS TIME?

In ‘Temporal Parity and the Problem of Change’, I argue that the tenseless view is committed to a perdurance view of persistence, but I do not discuss in any detail the arguments of those who deny this linkage thesis, and why I think they fail. Most notably, there are Hugh Mellor’s and Peter Simons’ attempts to combine an endurance view of persistence with a tenseless view of time. In this appendix I will discuss Mellor’s and Simons’ attempts, in light of what I argue in ‘Temporal Parity and the Problem of Change’.

Mellor (1998, p. 90) and Simons (2000*a* & 2000*b*) both think that change requires strict identity just as much as it requires differences in properties, and they therefore reject the idea that persistent objects have temporal parts, i.e. that things perdure. But, since Mellor and Simons favour the tenseless view of time they face the problem of showing that the linkage theses between tenseless time and perdurance, and/or between endurance and tensed time, are invalid. They need to argue either, (i) negatively, that the linkage theses do not show conclusively that the combination of endurance and tenseless time is impossible (in which case the combination can be given the benefit of the doubt), or (ii) positively, by presenting an account of how things can endure in tenseless time. It seems to me that Mellor argues mainly negatively in the fashion presented in (i), while Simons argues more in the positive fashion presented in (ii).

Mellor argues that it is obvious that things do not have temporal parts, that they endure, but claims that they must endure in tenseless time because he thinks McTaggart proved that the tensed view of time is contradictory. In other words, Mellor presents us with three alternatives, (a) endurance in tensed time, (b) perdurance in tenseless time, and (c) endurance in tenseless time, and argues that the first is contradictory, the second does not allow change, and that therefore we must choose the third, i.e. if we want to allow change at all in our philosophy. He thinks we must accept endurance in tenseless time despite its difficulties, because otherwise we will have to give up change, and claims that, anyway, the arguments outlining the difficulties are inconclusive. Mellor emphasises his tenseless theory of time, and does not provide more than the outlines of an account of how things actually can endure in such a time. His argument mainly strives to show that there are no good arguments against the

assumption that things endure in tenseless time. Simons, on the other hand, assumes the tenseless theory of time to be true, and proceeds to construe a positive theory of the way things can be conceived to endure in tenseless time. Briefly, according to Simons, an enduring thing is "an abstractum over occurrents under a suitable equivalence relation" (Simons 2000*b*). I will return later to the exact meaning of this claim, but for the time being point out that Simons presents enduring entities as existentially dependent on a base of events.

Mellor's and Simons' idea is that a combination of the tenseless view of time and the endurance view of persistence would be the perfect match, since it would avoid the contradictions of the tensed view of time and the lack of intuitive appeal of the perdurance view of persistence.

1. The temporal parity thesis of the tenseless view of time

In 'Temporal Parity and the Problem of Change', I argue that the thesis that all moments of time are equally existent and real, whose essence is expressed by the *principle of temporal parity*, is not just an important corollary to the tenseless view of time, as is usually suggested, but in fact equivalent to it. It cannot be understood as merely a positive claim about the objective nature of temporal reality, but must also be understood as a denial of the view that temporal reality is the way it appears to be, i.e. tensed. Consequently, the principle of temporal parity is equivalent to the claim that time is not tensed, but tenseless.

Admittedly, the claim that all moments of time are equally existent and real, can be given a tensed interpretation: if time consists in the coming into existence of new states of affairs, and all moments of time come into existence in the present, then all moments of time are existent and real in the same (tensed) way. But, this is not what is usually meant by 'temporal parity'. The principle of temporal parity is always formulated as a denial of the objective reality of tense. It states that contrary to the *prima facie* appearance of time, the future and past exist just as well as the present:

> *Temporal Parity*: For any times t_i and t_j, neither t_i or t_j exemplifies the monadic properties of pastness, presentness, or futureness. It is not true that the state of the world at t_i or t_j uniquely reflects "the way things really are." Rather, the way things *really* are includes both the way things are at t_i and the way things are at t_j (Carter & Hestevold 1994).

Taken in this sense, to hold temporal parity to be true, is to believe that everything in the history of the universe coexists, albeit located at different positions in time.

In ‘Temporal Parity and the Problem of Change’, I further argue that any theory that is supposed to be compatible with the temporal parity thesis, e.g. Mellor’s and Simons’ theories of endurance and change, is committed to the view that everything coexist in this sense, and that this is the root to the so-called problem of change, both with regards to tensed change of events and changes in the intrinsic properties of things. In this appendix I focus on the difficulties with giving an account of change in terms of variation in the properties of an enduring thing, i.e. of a thing that exists exclusively at many times in succession, when one presupposes that all moments of time are equally existent and real. It should be noted that I identify endurance with the view that things can exist *exclusively* at each of the many times it exists at in succession, i.e. that at any given time the thing exists objectively speaking only at that time and ‘no-when’ else. This is the particular sense of being ‘wholly present’ that I think is relevant to the debate. Often the endurance view is formulated merely as a negation of the view that things have temporal parts, which may seem to make it an open question whether things can be ‘wholly present’ at many times without existing exclusively at each and every time. However, this would be to blatantly neglect crucial aspects of the metaphysics to which endurance theories are usually wedded, e.g. the belief that only the present exists and that new states of affairs are causally produced. It also invites confusion with other kinds of entities that do not have temporal parts, but do not endure through changes, e.g. universals. In a sense a universal is ‘wholly present’ in each particular instantiation of it, but this is not what it means for an enduring entity to be ‘wholly present’. I assume therefore that to be ‘wholly present’ does not just involve a rejection of temporal parts, but implies exclusive existence at a time.

To my mind, then, the problem of accounting for change in tenseless time, is to show that the view that things can exist exclusively at many times in succession, is compatible with the view that everything coexists in time.

2. Mellor's solution

Mellor does indeed seem to agree with my understanding of the problem, i.e. that it consists in showing how the coexistence of everything can be made compatible with change in time:

> If a poker is hot at 2.15 and cold at 3.15, then those always were and always will be its temperatures at those times. These *B*-facts no more change over time than spatial *B*-facts change across space. But what stops a poker's being hot at one end and cold at the other being a case of change is precisely that its hot and cold ends coexist in a single world, albeit in different *B*-places. But then, as we saw in chapter 2, on a *B*-theory the hot poker and the cold also coexist in a single world, albeit at different *B*-times. So if, as everyone agrees, coexistence rules out change in the spatial case, how can it be compatible with change in time? (1998, p. 71)

Mellor argues that coexistence is compatible with change in time, by arguing that there is no good reason to think they are incompatible. According to him, there are mainly two objections to the tenseless conception of change: "These are that the theory has no way of distinguishing properties varying over time from properties varying across space, and that it reduces changes to changeless facts". (1998, p. 84) His answer to the first objection is that causality distinguishes temporal variation from spatial variation. As an answer to the latter he claims that it really is no objection at all because "why […] must facts change in order to *be* changes"(1998, p. 84).

As an answer to the first objection, Mellor argues that the analogy between the two kinds of variation disappears when one realises that variation in the properties of a thing over time is due to a causal factor, while variation between the spatial parts of a thing is not. We could take this as a suggestion that what I take to be a standard account of change, namely that change is the possession by a numerically identical entity of different and incompatible properties at different times, should be augmented so as to include a reference to causality, perhaps in the following way:

> Change is the possession by a numerically identical entity *a* of different and incompatible properties *F* and *G* at different times *t* and *t'*, provided the difference between *a* having the property *F* at *t,* and lacking *F* at *t'* (or vice versa) is due to a causal factor.

I do not dispute that the difference in the properties of a thing between times is due to a causal factor, nor that the difference between spatial parts of a thing is not causal. I just do not think that Mellor has explained why variation in the properties of a thing persisting in tenseless time need not be a variation between

parts, by showing that variation in time is different from variation in space with respect to causality.

To say that two things are in some way analogous, presupposes that the two can be distinguished, but that they resemble one another *in some particular respect*. The tenseless view of time is charged for being committed to the view that things have temporal parts, because it holds that an object existing at many times must be equally existent and real at all those times, and this, it is argued, excludes the possibility that the thing can exist exclusively at each particular time. A thing cannot be spatially extended and be 'wholly' contained in each and every part of that spatial extension, and, by analogy, it cannot be temporally extended and be 'wholly' contained in every part of that temporal extension. If it cannot exist exclusively at each particular time, but is nevertheless equally existent and real at every one of those times, then it must be different parts of it that exists at each particular time. This depicts the variation in the properties of a thing between times as being a variation between its parts, and therefore analogous to the variation between the spatial parts of the thing. The problem now under consideration is therefore not simply a matter of distinguishing the two kinds of variation in any old way, but in a way that shows that variation in the properties of an object persisting in tenseless time need not be a variation between its parts. To say that variation in time is due to a causal factor, while variation in space is not, does not make the analogy go away, unless this explains how a thing can exist exclusively at many times in succession, but nevertheless be equally existent and real in all of those times.

As pointed out in 'Temporal Parity and the Problem of Change', and further elaborated in 'Causal Production as Interaction', there are two very different accounts of causality: (i) the view that causes bring their effects into existence, i.e. the *production view*, and (ii) the view that causes are only correlated to their effects but do not produce them, i.e. the *correlation view*. In these papers I further argue that the production view is wedded to a tensed view of time, and to an endurance view of persistence, but the correlation view to a tenseless view of time and a perdurance view of persistence. Mellor does not explicitly discuss the difference between the production view and the correlation view of causality, nor the difficulties associated with fitting each view to the metaphysics implied by his theory of time. Consequently, I have not been able to discern beyond doubt which view of causality he endorses. Either way, he faces serious problems. If he endorses a production view, he must show that a production view is compatible with temporal parity, in which case he has to show how the thesis that causes produce effects, i.e. bring effects into existence, can be made

compatible with the claim that everything at all moments of time is equally existent and real. *Prima facie*, the idea of something being brought into existence which did not exist before is completely contrary to the view that everything coexists. On the other hand, if Mellor endorses a correlation view, he must show that it is compatible with endurance, i.e. he must show how the view that causality is a correlation between temporally distinct but coexistent entities, can be made compatible with the view that things are not coexistent at all the times of their existence. This he does not do. He completely overlooks the different consequences a production view, or correlation view would have for the overall coherence of his theory.[1]

To my mind, Mellor's appeal to causality does not explain how variation in tenseless time is different from variation in space in *respects relevant to change*. Distinguishing variation in time from variation in space by appeal to causation does not automatically establish that variation in time amounts to change, it merely establishes that they are different in this respect: a temporal part implies something about another temporal part of the whole they are parts, in a way that a spatial part does not imply something about other spatial parts of the whole they are parts. The appeal to causality merely snares Mellor into a further problem, namely to show that the linkage thesis between the correlation view of causality and perdurance is invalid. By appealing to causality, he has not given an answer to how persistent things can exist exclusively at each of the many times they exist at and need not have temporal parts.

Let us now turn to Mellor's answer to the second objection, i.e. that Mellor's theory reduces change to changeless facts. Mellor claims that this objection rests on the absurd view that change requires that facts must change, but I am inclined to think that Mellor misunderstands the objection The objection does not concern the nature of the facts, but the reduction of changes to facts. It is generally agreed that facts, i.e. existing states of affairs, do not change. States of affairs either exist permanently, according to the tenseless view, or they come into and go out of existence, according to the tenseless view, but on neither view

[1] In fact I think Mellor does endorse a production view, e.g. in (1995), but I do not see that he really takes on the task of showing that the ontology of that view is compatible with the temporal parity thesis. In fact, if Mellor were to abandon the tenseless view and adopt a tensed view, I would think the overall consistency of his theory about change, persistence, and causality would greatly improve. He does seem to take seriously all the prima facie appearances accepted by the dynamic view, but since he is convinced that McTaggart's argument conclusively shows that the tensed view cannot be true, he is forced to make all these prima facie appearances fit into a tenseless conception of time.

do the facts change.[2] It is the *constituent parts* of those states of affairs that change, i.e. things. It is the window that changes from being whole to be broken, when it is hit by a brick, not the state of 'wholeness' that changes into a state of 'brokenness'. The objection that the tenseless theory of change depicts changes as a conjunction of changeless facts, is not an objection to the tenseless characterisation of the nature of facts, but to the reduction of change to such facts. That is, a change is commonly believed to consist in the possession of different properties *F* and *G* by one and the very same thing *a* at the different times *t* and *t'*, in which case we have two states of affairs which have *a* as a common constituent. This is possible if *a* can endure and change from being *F* to be *G*. However, if things perdure, it is different parts of *a* that have the different properties, and then the two states of affairs really do not have a common constituent; since it is different parts of the thing that are constitutive parts of the two states of affairs, there is nothing that changes from one state to the other. On this account, change is variation between two distinct states of affairs. It is entirely besides the point of Mellor to ask "why […] must facts change in order to *be* changes?" (1998, p. 84). Mellor's critics do not require him to explain how facts change, but how his tenseless view allows the constituents of those facts to change, because if the constituents do not change, change is merely a conjunction of facts.

Mellor misreads the objection as an objection to the tenseless characterisation of facts, i.e. that they are changeless, and points out that as such the objection is absurd because it is not facts that change but the things to which changes happen. Mellor presents the idea that things do not have temporal parts as an answer to the objection that the tenseless view reduces change to changeless facts, when the objection really is directed against the idea that tenseless time can contain things that persist without having temporal parts. Mellor makes certain logical, and semantical, distinctions between *facts* and the *things* those facts 'are about', and between *events* and the *things* that those events happen to, in order to justify our talking and thinking about them as independent entities,

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[2] Please note that in this dissertation I only discuss the presentist version of the tensed view. Other tensed views claim that facts do change, by passing from future to present, and from present to past (see discussion in the general introduction, p. 22). It should also be noted that Aristotle held that beginning and ceasing to exist (of facts) was a kind of change. But, Aristotle held that in order to conceive of beginning and ceasing to exist as a kind of change, one had to assume the existence of a permanent matter substratum in which the beginning and ceasing to exist of determinate states of affairs (facts) is a change. That is, creation/destruction of facts is not a change in the facts, but in the determinations of the matter substrate. In this sense, presentism can accept the coming into existence of facts (and going out of existence) as a kind of change, but not that it is a change in the facts.

some of which exist permanently at different times, while others are 'wholly present' at different times. But, he does not give any reasons for why things really can exist exclusively at every of the many times they exist at, as we think they do, when it is assumed that everything coexists in time.

To my mind, Mellor's definitions and distinctions between things, facts, events, and changes, merely serve to further establish their interdependence. The distinctions between things, changes and facts are of special relevance. Mellor understands changes as consisting in things having different properties at different times. Each having of a property by a thing is of course a fact. But, facts exist permanently at a certain time, according to the tenseless view, and since they have the thing as a constituent part, the thing must exist permanently at that time too, if the fact does. There can be no fact involving *a* being *F* at *t*, unless *a* exists at *t* being *F*. Now, changes in a thing involves at least two facts, and each fact consists in the thing having a certain property. If the facts exist permanently at two different times then the thing must exist permanently at the two different times, given that the thing is a constituent part of those facts, and yet the thing is supposed to exist exclusively at each particular time. This is an equation I find difficult to solve.

My conclusion is that Mellor does not adequately answer the objections he mentions. He fails to answer the first because he fails to appreciate the difference between a production and a correlation view of causality, and I think he misunderstands the latter objection, and therefore never comes round to addressing the problem that gave rise to that objection. The original problem was how a thing could constitute two different and incompatible states of affairs at two different times, and exist exclusively in each particular state of affair, if it was assumed that all moments of time are equally existent and real, i.e. if it was assumed that everything in time coexists. If two states of affairs, involving one and the same thing, coexist in time, it is argued, then that thing cannot exist exclusively in each state; it must be different parts of it that exist in each state. Mellor, I think correctly, does not accept the perdurance account of persistence, because he thinks change requires a difference in the properties of one and the very same thing, but he does not reject the thesis that everything coexists in time. He still faces the problem of showing how a thing can coexist without contradiction in incompatible states of affairs, and of explaining in what sense a thing coexisting in that way can at the same time be 'wholly present' in each particular state of affairs.

3. Simons' theory of invariants

Peter Simons does not himself provide a theory of time, but he prefers the tenseless view, and assumes it to be the correct one. He agrees with Mellor that perdurance is not a possible explanation of change. He thinks that there must be enduring things, or 'continuants' as he calls them, if there is to be any change at all, because change requires identity as well as difference in properties. Simons' suggestion is, in short, that an enduring entity is "an abstractum over occurrents under a suitable equivalence relation" (2000*b*). By saying that it is an abstractum, Simons does not mean to say that the enduring entity is an abstract object in the traditional sense, i.e. something outside space and time inaccessible to causal influence, but rather in the sense that it consists in the invariant features of an underlying base of *concretely* existing occurrents located in space and time. By 'occurrents', Simons means events, i.e. entities that do consist of temporal parts. An enduring entity is the invariant features reproduced in a set of temporal parts of a base of occurrents. In fact, Simons suggests to use the term 'invariants' for enduring entities (2000*b*).

Let me point out certain things about Simons' characterisation of enduring things as invariants: (a) Simons' views are different from traditional endurance views in that he thinks the occurrent base is ontologically prior to the enduring thing, and (b) Simons' must hold that the occurrents of the base, and all their temporal parts, must objectively speaking be equally real and existent, in accordance to the tenseless view of time that he presupposes. Like Mellor, Simons also faces the problem of explaining in what sense the invariant exists exclusively in each and every temporal part of the occurrent base existing at different times, without violating temporal parity.

I will not venture into the technical details of Simons' theoretical construct of invariants as 'abstracta over occurrents under a suitable equivalence relation', we can assume it to hold good as such, i.e. as an intelligible theoretical construction of how to conceive of the relationship between things and events. But, even so, it does not appear to me that he succeeds to avoid, or solve, the problem now under consideration, notably that of change. The problem of change was to provide an entity that is supposed to be numerically the same across time, but also could have different and incompatible properties at different times. As I see it, the requirement of numerical identity is satisfied by Simons' account, but not in the sense that the identical entity is 'wholly present' at every particular time at which it exists, in the relevant sense of existing exclusively at each time. As for the requirement of change, i.e. the variation in the *intrinsic* properties of the thing between times, which is not just a variation

between temporal parts, then I do not see that it is satisfied at all. How does an *invariant* change when it is something which essentially does not change? It cannot consist of, or contain, anything variant, because it is in fact an invariant. According to Simons' thesis, it is the occurrents in which the continuant is an invariant feature that provide the variation between times. This is indeed how they are distinguished. The continuant can be distinguished from the occurrent base, by abstraction, because it is what is invariant in the diverse occurrent base. It is the invariant nature of the invariant, that gives it its identity, and it is the diversity of the occurrents that provide the variation. Is there a sense in which this variation in the occurrent base can be said to be a variation in the invariant, as opposed to between the temporal parts of the occurrents? It appears as if not even Simons thinks there is:

> How would we expect a continuant to have properties? The answer is that with the exception of those properties it has unqualifiedly, they derive in some way from the properties of its underlying occurrents. […] For example a life-occurrent may swell in spatial extent along its temporal axis. In such a case we say the associated continuant grows. (2000*b*)

I assume that the properties it has unqualifiedly, it has at all times, and then the apparent difference in the properties of an invariant between times really is a matter of the invariant inhering in different temporal parts of the underlying occurrent base, and thereby being associated with the different properties of those temporal parts. Change, on Simons' account, is a difference in association to various properties of different temporal parts existing at different times, not a difference in the properties which a continuant has simpliciter. This, if anything, reduces change to a variation between temporal parts, although not to the temporal parts of the continuant.

One can at least say that change, on this account, does not involve change of intrinsic properties, but it may perhaps be said to involve changes in the associations that a continuant has to different properties of different temporal parts, and those associations is surely something the continuant has simpliciter; thus there is genuine change. But, the sense in which this could be construed as a case of change proper is not clear, mostly because Simons has not solved the problem imposed by the tenseless existence of the continuant at many times, notably that it coexists at all those many times. If the thing coexists at all the times it has different associations to different parts, it is not clear how it changes those associations, as opposed to just having them.

Let us be quite clear that the sense of being 'wholly present' relevant to this issue is not the sense in which a universal is 'wholly present' at a multitude of places and times, because a universal is something which does not change. An

invariant could easily be conceived of as a universal in this sense, and that it is 'wholly present' in the same sense that each instance of 'redness' is of course never lacking in its 'redness'. A universal, when considered as being real only through its instantiations in time and space (as opposed to being an ideal form outside of space and time), is at least in some sense a concretely existing entity. But, a universal is not exclusively present at any single time and place (except perhaps accidentally if it would be possible for a universal to be instantiated only once), even though it may be thought to be 'wholly present' in the sense that its essence as what kind of universal it is, is never lacking (or incomplete) in any instantiation of it. If the invariant is a universal, it is (if not by anything else, then at least by definition) not subject to change, and change was one of the most important motivations to develop the account in the first place.

4. Substance, process, or trope ontology?

I think there is a tension between substance, process, and trope ontological considerations in Simons' work, which I suspect relates to his claim that science should connect to, or be connectible with, one's metaphysics. According to Simons, substance ontology has played out its role as an explanatory concept within physics (1998). He claims that when ordinary middle-sized objects, like stones and drum-sticks, come under the scrutiny of science, their solidity dissolves into a myriad of processes. Stones turn out to be made of molecules, that are made of protons, neutrons and electrons, that are made of quarks, and what have you. This leads science to regard things, and their properties, in terms of processes. As I have already discussed in *Appendix A*, it is possible to think of things as being processes in the sense that they are unities whose structure is preserved by the interactions taking place between the parts of the things. Simons' however, continues his scrutiny of the inner structure of things down to the quantum level, where, he claims, science discovers entities that do not themselves appear as an activity of parts, and which science fails to individuate and distinguish from other entities during any interval of time. According to quantum mechanics, Simons claims, particles on the fundamental level are not identifiable individuals. At that level the substance-attribute duality appears to break down, and we have something that may perhaps best be described as bundles of once and for all occurrent states, or properties, i.e. bundles of tropes (distinguished from events, in that events are compounds of such bundles of once and for all occurrent properties).

Simons' account of endurance is not just meant to explain change, but also (or perhaps primarily) an attempt to incorporate a non-reductionist conception of

enduring objects within a fundamentally trope-based ontology, an ontology he believes to be best suited to connect metaphysics with what he thinks is "the best theory we have of what makes up everyday substances", i.e. quantum mechanics (1998). That is, because quantum mechanics imply that the world is constituted by very short-lived entities, Simons wants to say that occurrents are more basic than continuants, tropes more fundamental than occurrents, but in a way that does not totally extinguish continuants, nor occurrents, from his trope ontological framework.

It is true that I do not share Simons' positive attitude towards quantum mechanics, but that is not why I reject tropes. I reject tropes because I think it is impossible to think of things even as processes given a trope-based ontology. I do agree with Simons that substance ontologists often neglect the fact that ordinary middle-sized objects are always compounds, whose unity is upheld through the interaction of their constituent parts; i.e. that middle-sized objects are processes, although, as *unities*, they can for most practical purposes be treated as simples. Process ontologists, on the other hand, neglect the fact that on every level, the conception of a process invokes the idea of it as being an activity of parts, and that it is an empirical question whether or not the parts of any process themselves turn out to be processes, i.e. an activity of parts. I think the process ontologist cannot in the end avoid assuming that processes have certain attributes that cannot themselves be explained in terms of an activity of a compound. That is, at rock bottom the parts of the activity must be gifted with properties that they simply have, properties which are not expressions of their nature as processes, but rather as what makes them capable of constituting a process. For instance, things have mass, not because of the processes taking place in them due to the interaction of its constituent parts, but because its constituent parts just have mass. It is in fact due to the fact that the parts have mass that their gravitational force attracts one another, which is an important part of what makes them capable of interaction.

However, the idea that the fundamental entities in the world are tropes, is, I think, incompatible with the idea that ordinary middle-sized objects are properly described as processes. Tropes have the wrong kind of existential boundary conditions for being the parts of a process, they do not persist. In order for something to be a part of an activity, it must persist during that activity. A trope based 'process' ontology conceives of processes as a temporally ordered aggregate or unity of very short-lived entities. But, if a process consists of very short-lived entities that are not in any way involved in an activity, or are in themselves an activity, the process they are supposed to be parts of cannot be

properly described as an activity either. So, by assuming that the world is fundamentally constituted by tropes, does not just dispose of the reality of enduring things but also the reality of processes, at least if processes are assumed to be a kind of activity. Trope ontology leaves us with nothing but non-enduring simples which are correlated to each other in a law-like manner. Not just change, but persistence and activity as well, turn out to be far from well founded phenomena on the assumption of such an ontology.

Whitehead and Bergson apparently thought of processes as a series of very short-lived entities. But, realising that unless each part of the process contained some form of activity, or change, the process itself could not contain change, then they suggested that every part has a very brief duration in which it moves from potentiality to concreteness, an activity Whitehead called 'concrescence'. This view is called 'process philosophy', to distinguish it from other process views (Griffin 1998). It should be noted that even on this view there are enduring entities, although their duration is too brief to ground the endurance of the things they constitute.

Those process ontologists that I am more closely familiar with, have no explicit views about the nature of the fundamental entities in the world, they are content to state that physical science has showed us that the nature of the entities with which we are familiar, i.e. like bricks, balls and windows, are properly described as processes, e.g. Wesley Salmon (1984, p. 139ff). I think that this is a very healthy attitude towards the relationship between metaphysics and what science tells us about the nature of things. It is fairly uncontroversial that middle-sized objects are constituted by an activity of parts, but it is controversial whether quantum mechanics provides a metaphysically sound picture of the nature of the fundamental entities in the universe, as opposed to being a highly useful tool for prediction. Indeed, Salmons main concern is to explain the nature of causality, he is not particularly concerned with what reality ultimately consists in. I for one have no quarrel with the idea that things are in some sense processes, but then I think of processes in terms of an activity of enduring parts, and not as a series of very short-lived entities.

The problem of endurance goes much deeper than just to the endurance and changeability of middle-sized objects. The conception of things as being a kind of process is also dependent on the conception of enduring entities, i.e. of the parts of the process as enduring through interactions, at least if one wants the compound thing to be an enduring entity. To deny entirely the reality of enduring entities, i.e. substances, because one has found that ordinary middle-sized objects must be thought of as being processes, only gives rise to the

question whether processes can properly be thought of as being constituted by tropes.[3]

5. Conclusion

It is my conclusion that neither Mellor or Simons provide adequate explanations of how things can endure in tenseless time, at least for the purposes of grounding the reality of change. To my mind, this failure is an unavoidable consequence of the fact that endurance is incompatible with the principle of temporal parity. Nothing can exist exclusively at a single time in the sense required for endurance, and coexist at many times in the way required by temporal parity. I think neither thinker are adequately aware of just how strong the restrictions of the temporal parity thesis are for their metaphysical endeavour.

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[3] For an interesting discussion of the tension between substance and process ontologies, with respect to the endurance-perdurance debate, see (Seibt 1997).