

Introduction

This thesis is a serious attempt to proceed towards a fuller and wiser understanding of time, developing and arguing a specific and unconventional view of time's nature, and seeking to grasp the way time is related to matters such as emergence, development, change and endurance. Hence this thesis belongs to the type of philosophical enterprise called metaphysics, pursuing once more a deep eternal question in the footsteps of speculative geniuses such as Plato, Leibniz and Whitehead — a question as internal to philosophy as any question could be, and a question in an important sense aiming beyond concerns dominant in the spirit of our time, maybe even somewhat beyond such concerns which have led us to distrust claims of wisdom and questions of the nature of things.

The pretention and character of the project

Having indicated that the present enterprise has something in common with those of the giants of speculative philosophy, it is necessary to indicate also that the present enterprise cannot and will not pretend to be gigantic. The greater part of what will be proposed here is unconventional only in the limited sense that it takes up a stream of metaphysical thought which has been in the process of emerging and finding expressions for centuries, particularly in the work of Hegel, Whitehead and Deleuze — with deep striking early resonances as remote as the 2nd C Buddhist saint-philosopher Nagarjuna — and that this is a side stream, not the main stream of metaphysical thought in our culture. I will follow Whitehead in using the term *process* to characterize the central issue of this stream of thought, and accordingly, the term *process thought* to characterize the stream itself. Process thought exists and has its great classical expressions already. However, it is still not generally discussed very much, let alone well understood. Contributing to the discussion and understanding of process thought is ambition enough for this thesis. If it also contains an original contribution or two, they are applications, to a large degree they are mere consequences of taking process thought seriously.

As another initial disclaimer, this thesis does not pretend to adequately implement a particular family of classical scholarly approaches to such an enterprise. Just as it is not a complete original system of process thought to claim a place beside, e.g., Whitehead's, neither is it adequate as a piece of exegetic or critical study of Whitehead's works, let alone an overview of previous Whitehead studies. Another classical approach would be the comparative study arguing a major significance for Whitehead and Deleuze of a process philosophical core originating in Hegel's

work — an important project which ought perhaps be implemented in a book of its own, but it is not the project of this thesis. I do give an exposition of the main structures in Whitehead's great systematic formulation of process thought (Chp. 3), with some discussions of resonances and contrasts with the closely related philosophical projects of Hegel, Deleuze, Bergson and others. And I do argue that there is such a thing as a common stream of process thought which is dominant in these thinkers, and which has received a particularly complete expression in Whitehead's somewhat neglected work, but which is also very present in many other utterances in philosophy and elsewhere. However, this exposition is only made as a first preparatory move in what is the real project here: the application of process thought to various fields of experience and problems, particularly fields related with science, and the simultaneous use of such applications "backwards" to achieve a further explicitation and clarification of the sense of the basic concepts.

For several reasons to be further unfolded in the following, I take this line of work to be important to pursue, and perhaps particularly in a study of process thought. Firstly, inasmuch as a non-standard scheme of metaphysical concepts and interpretations is seriously being proposed, the play with the possibilities and expressions of such a metaphysical shift would hardly be interesting unless one could point out some *relevance* of the scheme in terms of a capacity to contribute to the understanding, handling or expression of something in real life. Secondly, the scheme of process thought implies, as we shall see, that speculative metaphysics is on the one hand a legitimate and even inescapable intellectual enterprise, but also on the other hand that it can only proceed in a meaningful and productive way if it is in an *open-ended exchange* with applications. For better or worse, the present thesis is shaped by this line of work — entering the philosophical discussion of process thought in a mode of participation (with however small contributions) in a constructive process rather than representation of one or several collections of stable results.

I just said *science* is the primary working field of experiences and problems in which I attempt to apply and develop the metaphysics of process. Scientific and technological developments have become a major source of experience forms, problems and expressive possibilities — and have been associated, first with a sequence of bold speculative attempts at constructing new coherent frameworks of understanding, and later with a sequence of epistemological attempts at explaining the limited possibilities of coherent understanding. These are gross generalizations of course, but centuries of philosophical thought can be thus grossly characterized as the ongoing intellectual attempt at appropriating the transformations brought about by science and technology, and the major expressions of process thought have very much been made as attempts to

contribute something which may overcome difficulties encountered in other attempts at thinking under the pressures of science. But why not *art*, you may ask. I agree: art is extremely productive of problematic objects and experience forms too. As is *religion*. As you will see, problems and possibilities produced in these other fields are discussed along with those of science in the following. I shall not seek to determine here whether or not Hegel is right in his famous claim that science has irrevocably superseded religion and art as the major productive power, but I shall return to the discussion of the way their productivity is connected to each other and to the venture of speculative metaphysics.

The main part of this thesis is a number of published and unpublished papers applying and developing a process metaphysical framework to suggest a reconstruction of the way *time* is applied and understood in several particular problematics the neighbourhood of physical science. Although the problems in question are on quite different levels and contexts — the nature of the arrow of time in the context of thermodynamics, the notion of simultaneity in the context of special relativity, and the notion of construction in science and technology studies — they share a problematic relationship with *time*. Furthermore, it is my main claim that process thought is making it possible to begin to grasp a common root of these problems and to make use of them as expressive possibilities in a new, emergent, more coherent metaphysical construction of time. In short, I suggest a connection between what is represented by the temporal parameters usually labelled “t” in the equations of physics, and what is referred to in discussions of developments of science, whether seen as revolutionary or cumulative — a connection more complex and interesting than the reduction of human history to physics or vice versa.

Hence, my last disclaimer: I do not pretend to give an encyclopedic philosophical treatment of all major fields of physics or natural science, or each of the many instances of their representations, measurements and installations of time. Even less do I pretend to cover the history of physics. Instead I attempt to work in depth in a few hotspots of metaphysical problems with time — some of them classical and already covered in a rich literature, some of them more recent and special. The problematic points are sought out, not really in order to criticize something or somebody of being on the wrong track, but rather in order to affirm their truth in the sense of chances of a richer grasp of something. A richer grasp of processuality, already emerging.

The hypotheses

Although the metaphysical mode of thought that this thesis attempts to discuss and develop is somewhat untimely in the above mentioned sense — claiming a chance, a power and even a right for metaphysical speculation to follow its own flight of reason beyond dominant patterns of the time — process thought pursues the flight in a direction which gives the greatest significance to becoming, to creativity, to emergence, to historicity and to the concrete historical situation, in short, to exactly those things which are traditionally thought of as paradigmatic of what is *in time*, what exists in a way which is strongly *temporal*.

There is a widespread desire of defending the reality of such temporal characteristics against the reduction — whether in the form of implicit tendencies or explicit philosophical argument — to mere appearances, due to epistemological constraints, of an underlying reality taken to be basically atemporal. Such a desire is what motivates many philosophical attempts at “taking time seriously”. But what is proposed here implies that these strongly temporal, or dynamic, aspects of reality are not really in time. They do not completely fit in there. They are too wild, too concrete, too dynamic, too complex.

Complexity has already infected this introduction. Obviously these initial remarks already open two classical philosophical discussions which stand in a problematic relation to each other: the nature of *time* (with some kind of strong emphasis on the inescapability of concrete local conditions subject to change and development) and the *untimely* nature of metaphysical thought. An integrated aspect of the hypothesis to be expressed and defended here is an account of an intimate connection between these two natures. This will be outlined at several points in the following, but in order to make things reasonably simple to begin with, let us think of time and processes in the “innocent” state, that is, as entities which are not themselves thinking, at least not yet. Also by way of simplicity, I shall now outline the understanding to be developed and argued further on, in the classical shape of a few closely connected programmatic hypotheses — well knowing that the full sense can emerge only later when the terms in the programmatic hypotheses are fleshed out.

The central hypothesis, then, is that *process is metaphysically prior to time*. This implies taking time as a construction, not as an unconstructed ground of things going on in the world. It is a relaxation, so to speak, of the absoluteness of the claim of a system of time to be already lying or running below or within every process and history, as a sequence of separate stages, existing as a precondition of the very fact of change or development of things. A process or history may or may not be well divisible or quantizable within a constructed system of time,

depending on local conditions, and there may be not one but many constructed times.

The full unfoldment of the first hypothesis is the reconstruction of the metaphysics of time pointed to in the subtitle of this thesis — in this sense the list of five further hypotheses below are merely footnotes indicating some major implications of the first one. But the unfoldment of the first hypothesis in relative separation from those implications and applications is the careful explication of the metaphysical use of a concept of processuality, including its involvement in closely related concepts such as change, becoming, development and time. Such an explication will be directly aimed at in the chapter on *PROCESS*, chp. 3, mainly in the form of a loyal exegesis of Whitehead's scheme of process thought, which is found to be a particularly strong and useful contribution to the reconstruction of the metaphysics of time, even if perhaps this usefulness requires an insistence upon reading the Whiteheadian metaphysical structure in its full original radicality rather than in certain more moderate renderings given by some Whitehead scholars.

A second hypothesis or claim to be explained and defended is that *we must affirm the constructed*. The idea of construction and constructedness to be presented is so closely connected to the idea of process that a process metaphysics undermines the classical criticism of phenomena, claims or traditions as resting on "mere constructions". If we understand ourselves as constructed constructors living in a world of constructs which are themselves actively involved in further constructions, this criticism makes much less sense. But it opens a host of interesting questions of the how's and why's of various construction processes, not least those constructing times. This second hypothesis, affirmative constructivism, is directly addressed in the chapter on *CONSTRUCTION*, chp. 8, in the context of a discussion of resonances and contrasts between Hegel's and Deleuze's analyses of science. It is also pointed to as an integral moment in Whitehead's scheme, and argued in many of the discussions of metaphysical problems opened by scientific and other constructions — wherever the point is made that such a problem may be gently turned to produce rather than conceal truth.

Thirdly, although there may be nothing wrong with construction and although time may even be a particularly powerful and fertile construction in important respects, *the use of "time" in broad metaphysical generalizations, as a key to understand life and existence in totality, tends to lead to systematic distortions* — distortions that the metaphysics of process is an attempt to overcome. More generally this third point can be expressed with Whitehead's warning of a widespread tendency of a *fallacy of misplaced concreteness*, that is, a tendency of taking abstractions framed in the context of a particular kind of project, often one of the sciences, to immediately be useful as a general way of understanding

matters far beyond this context. Again, in this general formulation of the warning of misplaced concreteness, the point is not at all that scientific or other abstractions should be kept away from attempts at building general metaphysical understandings. The point is just the reverse, that they can be openings of metaphysical understanding which might not have been possible otherwise, but that this requires special care in seeking out those abstract structures which are well suited to respect rather than suppress features of concrete life beyond the original confines of the particular kind of project. By the same token, the overcoming of "misplaced concreteness" requires a great deal of creativity and sensibility in the way the abstract structures are interpreted in order to gain relevance beyond the original contexts.

A fourth hypothesis which must be stated here in order to make this initial circumscription reasonably complete is the characterization of the process, of that which is proposed to receive some of the metaphysical weight traditionally given to the notions of time and substance. As a first characterization we could simply notice that 1) time and 2) substance function as a pair of intimately connected abstract purifications conceptually dividing the concrete world of life and other happenings into 1) pure change without content and 2) pure content (being, existence) without change. Thinking in terms of process, then, is regaining understandings of the *inseparability of change and content*. However, even though this characterization goes rather directly to the heart of the matter, it has the double disadvantage of being negative, and of suggesting an innocent world of processuality as the unconstructed basis of our conceptual constructions. More positively, "process" shares with "time" the notion of a stream of history or situated becoming, while it shares with "substance" the notion of oneness in the sense of being an integral source of development, and of multiplicity in the sense of being merely one out of a manifold of ones. Similarly, the notion of processuality shares essential characteristics from both sides of a number of traditional dualities, such as one and many, subject and object, finality and causality, creativity and environmental dependence — a sharing which is not in terms of compromise but rather in terms of a dynamic co-production of polarities. In order to express this fourth hypothesis, as we just did the third, in the form of a short characterization of a very general mode of thought, an essential aspect of process thought is the conceptual *attempt to pass from duality to dialectics*, where dialectics is understood not only epistemologically as a mode of argument or discourse but also metaphysically as a way things are. Or better, perhaps, what the attempt is about is to loosen the grip of a deep rooted and often implicit tendency of thinking existence in terms of dualities, and thence to widen the scope of what can be thought to be. By the way, this very general aim at developing the ability of non-dual thought is what makes process thought deeply congenial with the most radical and philosophical expressions of Buddhist thought.

The fifth hypothesis is the explicit statement of the idea, implied several times in the statements of the previous hypotheses, that *thought is itself a process* and hence not fundamentally distinct from other constituents of the world. This has important implications, and I shall mention two of them here. Firstly, thought is bound to be immanent in a particular historical life world. Secondly, this radical constraint coincides with the radical freedom of thought as a never-ending project of building syntheses of that world by creatively utilizing elements in it as general models of understanding.

A sixth and final hypothesis is that *conceptual constructions are part of a mode of living in the world*, and that they have an important dynamic and immanent role in shaping it, even if sometimes they seem to point far beyond practical everyday matters. A very important case of this is the concept of time, for which I will suggest an important role as the formulation and management of a particular form of *politics*, that is, a way of assigning roles and legitimacies in a collective. Similarly, the suggestion of a metaphysics of process is meant to be not only a proposed solution or problematization confined to a sphere of thought but also to imply a modification of this politics of time. Taking up the thread of affirmative constructivism, what will be suggested is not that we denounce and resist all attempts at organizing things according to constructions of time, but that these are gently shifted in a way that allows their participation in something greater and wilder.

Other discussions of time

The presentation of the project in terms of this list of hypotheses makes it look extremely ambitious of course, perhaps even so much that it is proper to point once again to the disclaimers made initially. These hypotheses do not represent a new metaphysical system of my own but express some main features of a stream of thought which has already been given sharp and strong formulations by several well known philosophers. The full and radical form of process thought circumscribed by this list of hypotheses may only be common with a limited circle of explicitly and radically processual philosophies; however, most of these philosophical points can be read as tendencies shared by many, even most, schools of contemporary and even classical thought. For example, process thought is frequently presented as the philosophical alternative to a school of dogmatic substantialism, but the attempt to pinpoint philosophical representatives of such a tradition of thought invariably leads to failure: every great philosopher has in fact been thinking in much richer and more dynamic concepts. Aristotle, who shaped the forefather of modern concepts of substance in his notion of *ousia*, is a good example of this — *ousia* is exemplified by active living organisms rather than inert matter. Whitehead takes the full consequence of this absence of an antithesis to process thought when he abstains from presenting his system of radical process

thought in the traditional rhetoric, common to just about every other modern philosopher, of a *breach* from a tradition — and rather insists on taking his own philosophy to continue and complete what was almost completely done by “mainstream” philosophers such as Descartes, Hume and Kant. However, Whitehead can show this familiarity with the tradition only after having established a process philosophical framework which opens a set of problems completely different from those that the tradition seems to treat.

By the same token, we could say that treating questions of time is a well established and richly ramified activity in Western philosophy. And the process philosophical attempt at analyzing and reconstructing time we are about to enter will clearly share much with other attempts. Furthermore we should acknowledge the tradition's answers to its own sequence of questions as containing much wisdom. In a sense we are often repeating some of these well known answers. Still, if process thought contributes anything whatsoever to the metaphysics of time, it is what we might call, with a Deleuzian characterization I shall unfold a bit further below, a *true problem*. Therefore, the philosophical work of this thesis begins with bringing forth this problem, the question of the relationship between process and time, and not with fixing the issue with reference to the traditional sequence of problems. [So, readers eager to get on with real philosophical work should jump from this point to the beginning of chp.2] However, before we directly address this heart of the matter, we could pay homage to the tradition by giving an overview of its fascinating sequence of questions of time. This may have the double advantage of providing a background upon which we can point out that we are indeed opening a problem different from those of the tradition, and of making it easier to show later how our own proposals are continuations of many branches of the tradition — read in the light of the new problem.

A list of traditional questions of time can be organized in many ways. Here I will organize it (after the Hegelian fashion of building agendas in philosophy) as a sequence of increasing degrees of processuality, so that the questions which are posed in terms of the most abstract and static categories go first. In short, the list of headings that I take to encompass pretty well our traditional discussions of time are: objectivity, reality, structure, anisotropy, absoluteness, dynamism and creativity.

The first question then, which would thus be the most misleading one for us to answer immediately, given the character of our project, is whether time is subjective or objective — or whether our treatment deals with one or the other of two sets of temporal entities thus separated. What is at issue in this question is whether time, or perhaps some aspects of it, is a feature of a world existing in independence of the contribution or perception by subjects. The time whose

objectivity is affirmed or denied will often be something like a physical magnitude available for measurement, itself unaffected whether or not some suitably interested observer happens to be around with a suitable measuring device; but it could also be the referent of temporal terms in broader, non-technical contexts: the chronology of history, or the inescapability of aging and death. A wide spectrum of positions have been argued in respect to this question, ranging from a straightforward realism for which time is a thing-like fact, a structure of things that subjective experiences and expressions are somehow a picture or representation of, to a straightforward subjective idealism for which time is grounded exclusively in these. There are good reasons for holding both of the extremes: the objectivity of time can be held in order to acknowledge the stubborn and characteristic rhythms and developments of nature beyond human making and the legitimacy of systematic technical and scientific work in dealing with them; and the subjectivity of time can be held in order to acknowledge the concrete ever-changing immediacy of the real world of experience, so closely associated with the temporal character of human existence, and perhaps the legitimacy of an aesthetic, phenomenological or therapeutic cultivation of awareness of concrete human life.

Also there is a large number of versions of a compromise answer within the framework of the question of objectivity of time, a quite widespread understanding of a division between two completely separate pools of matters to do with time: the extended time system of physics to go on the objective side, and the fleeting present of consciousness in a separate pile of subjective temporal items. As I shall discuss in several of the following chapters, such a division is very problematic in the framework of process metaphysics, no matter whether one or the other pool is more or less explicitly associated with an ontologically primary temporality. What is problematic is not that one distinguishes between temporal facts and structures on different levels of locality or immediacy or abstractness, but the idea that the distinction is a stable limit which exists, so to speak, before time — that the difference between what is inside and outside the subject does not have to be made and remade all the time in order for there to be experienced time and nonexperienced time in the first place. Another compromise answer which is already much more interesting from a process philosophical perspective is the Kantian redefinition of objectivity in terms of a transcendental structure forming a condition of the very possibility of subjective experience. We may then say that temporal characteristics of the world are objective, not before or outside of subjective handling but by virtue of it. It may well be warranted to criticize Kant, as many have done, for repeating on another level the kind of assumption I just called problematic: in the Kantian image it is the transcendental structure of the subject which seems to be held beyond change and productive work. Still, Deleuze makes a good point when he credits Kant for making much more acute

the problem of the processual character of subjectivity. Obviously we cannot enter any adequate treatment of Kant's philosophy of subjectivity at this point, but it is important to note that there, at the onset of German Idealism, a shift is initiated in the sense of subjectivity and objectivity which will lead to an increasingly radical requirement that these spheres be themselves actively produced, so that an expectation that temporal characteristics could fall neatly within them will seem more and more questionable.

The second question is that of the reality of time. It is sometimes taken to coincide with the first question, but this is so only given a particular sort of answer to one of them — for instance, *if* time is essentially objective, in the sense of subject-independence, *then* the suggestion of its subject-dependence amounts to a suggestion of its irreality — a kind of dependent overlapping which exists between many pairs of questions of time. What is at issue here is whether temporal entities like timespans, moments, or the present, really exist, regardless if they do or do not stand in some special relation to a subject. Also like the first question, this one comes in many versions with different more or less explicit assumptions regarding the sense of the key terms, temporal entities and existence. And again there are philosophers who have contributed what amounts to a sea change to this question by showing the terms to stand in a close and problematic relation to each other, notably Heidegger. The project of “clearing of the ground” for the question of being leads Heidegger to the need of a fundamental reconsideration of our entire culture's ontology revealing once again an essential coupling with temporality whose understanding has been increasingly frozen out, concealed and forgotten by the tradition. I will have several things to say in the following chapters, in applause as well as criticism of Heidegger's important reproblematicization of being and temporality. But however important, it should not make us so prejudiced about “naive” questions like the reality of time that we fail to see its great philosophical interest. When time is proposed to be unreal, it means that something which is perceived or assumed has no place in the world of facts. But since time is quite lively and exigent despite of its alleged nonexistence, it will have to be accounted for by some process capable of bringing about the merely apparent, the myth or the construction. Thus, the question is opened of the construction and legitimation of time — a question which is, I will propose, of larger scope than those of its reality or objectivity. Also, of course, the question of the reality of time, even more than that of objectivity, makes ever more acute the need of stating explicitly what exactly is meant by time in toto or by the particular aspects of it which are held to be unreal. McTaggart made a very important contribution to the philosophical formulation of the most minimal and basic furniture common to a large family of discussions of time, with the famous definitions of an A-series (basically the sequence of events and/or dates, those temporal references which can enter propositions without making their truth value

time dependent) and a B-series (basically the expressions of temporal modality, temporal assignments implying a reference to the fleeting “now”). It is significant that these definitions, later taken over by a range of discussions of other issues in the philosophy of time, were developed by McTaggart as part of the attempt at systematically arguing the speculative and commonsense-defying thesis of time’s irreality.

The third question is the more detailed and technical explicitation of the structure implied by references to “time” in one or several contexts. In contrast to the first two questions, most of the answers to this one have been formulated under explicit and well-informed consideration of the applications of notions of time in the sciences. Therefore, this mode of discussing time has the advantage, seen from the perspective of process philosophy, that it cannot convincingly pretend its matter to be a “pure” philosophical problem over and above technical and historical developments. Several issues are involved, grouped under main headings such as topology and metrics, including circularity vs. linearity, the beginning, end or infinity of time, the possibility of branching or parallel lines of time, and the internal characteristics of a more or less line-like ordered set of points (moments): continuity, denseness or discreteness, etc. Sometimes, these structural elements in a mathematical-physical representation of time are discussed by philosophers who insist on tracing their connections to structurally similar elements of non-technical discourse, as when Nietzsche discusses the religious-cosmological significance of ideas of circular time in non-Christian cultures and attempts to support the reinvigoration of such a spirit of “repetition” with arguments that mathematical-physical time must also in some sense have the form of a cycle rather than a line. More frequently, however, the style of discussion here is focused rather exclusively on the mathematical-physical structures. A fine representative of the discussions of this question is W.H. Newton-Smith’s *The Structure of Time* which is organized as a systematic overview of such issues, and also contains, for each of these issues, a thorough discussion of the degree to which the matter can be determinable *rationally* — i.e., by requirements of consistency or deductions from unquestionable first principles — or determinable *empirically* — i.e. depend on real or possible observations of sequences of events — or perhaps be not determinable in any of these ways, and hence be underdetermined in principle.

It may be of interest to make a brief note here that this classical tripartite epistemological scheme — rational determination, empirical determination, underdetermination — so very central to Newton-Smith’s discussions, is less than an unproblematic framework in the light of process thought. It is not clear to process thought that all relevant experience must come in the form of observation sequences, nor is it clear that there is a sharp division between the rational and

the empirical in the sense that it is fixed once and for all what is rational — independent of the development of experience forms. Therefore I will have reasons to differ from some of Newton-Smith’s conclusions regarding the structure of time. Newton-Smith’s realist emphasis on scientistic experience as pivotal to the philosophical understanding of the structure of time and its implications for the nature of things happening in time can be wholeheartedly shared by process thought, but the emphasis is gently shifted from what an idealized science might in principle do in a range of ideally possible worlds towards what real science is achieving in this one.

There is a separate discussion aiming at the explicitation of the temporal structure implied in common, non-technical language of time, or the temporality implied in language when time is not even explicitly mentioned, or even in human practice, life or existence altogether. Often, this form of explicitation is entered in order to resist or counteract an alleged tendency of technical/scientific models to invade and dominate our involvement in all kinds of relations. Therefore, this mode of discussing the structure of time can also be presented as the explicitation of the temporality of the arts or humanist sciences, viewed as distinct from that of the natural and technical sciences, a human and social framework of time often termed *historicity*. Heidegger plays a key role again here, the most important and systematic contribution to this line of discussion is his (paradoxically technical) exposition of *Zeitlichkeit*. In fact, as we shall see, Heidegger’s way of asking and answering the question of the structure of temporality accomplishes to a very large extent what process thought aspires to do: constructing a metaphysics of processuality beyond the “misplaced concreteness” of time (cf. the first and third hypothesis above). Still, there are respects in which we will need to try to push beyond limitations that are held on to even in Heidegger’s very radical way of asking. In short, the limitations concern the denial of the sciences as contributions to metaphysical truth, and the ahistorical postulate of human subjectivity as having a temporal structure which is beyond and before technical and scientific history, a structure that it is the task of philosophy to unearth from beneath the structures thus erected above them. It is also interesting to note that although Hegel is often credited along with Heidegger for explicating the structure of historicity, Hegel develops it without respecting these two limitations. This is an important part of the reason Hegel should be seen, for better or worse, as a process thinker.

The fourth question is that of the famous “arrow of time”. This question assumes that there is time in some form which can be represented as a sequence of pointlike moments or interval-like durations, and that every real event is associated with a position in this sequence. That is, it assumes that there is some kind of answer to the previous question of time’s structure, in its first mathematical-physical sense, although that answer does not need to be fully

specified. The question, now, is how this structure of time is related to the anisotropic character of sequences of events in the real world — that is, the existence of asymmetric patterns of events which often or always occur in one temporal direction and rarely or not at all in the reverse. There is, of course, a very general agreement that in our experienced reality, temporal anisotropy is dominant and consistent. Ripples expand from the point where a stone fell down, they do not contract towards a point from where it will jump up, etc. But given the installation of some version of the abstract structure of time, it becomes possible to imagine a number of formal modifications upon it, including time reversal, and hence to ask such questions as whether this anisotropy is typical or atypical of the entire universe, whether it is universal or local, whether it is necessary or contingent. As far as the purely mathematical structure is concerned, it may perhaps be claimed to be indifferent to what happens to be thought or known about such a question. However, the question can also be asked, and most frequently is asked, in a mode that includes a physical interest in the causes of the way things happen and refers to the fact that the laws of physics on the most basic level of mechanics are temporally symmetric (as argued in Chp. 2 the small qualification of this symmetry which probably holds for the weak nuclear force is irrelevant in this context). The question why the symmetry is broken in the world of experience can then be seen either as the dealing of yet another blow to our “pre-copernican” belief that categories and models adequate in the scope of our human businesses are applicable to the entire universe, or conversely it can be seen as a challenge to the mechanist claim that fundamental elementary physics has universal explanatory power, that it underlies and causes all reality on more complex levels.

This discussion is heavily loaded with metaphysics of the speculative and cosmological orientation which has been seen as particularly suspect in high modern philosophy. Yet it is a very lively discussion pursued with vigour and visionary creativity by physicists and physical cosmologists at least as much as by philosophers. The process view of the philosophical process to be unfolded will imply that such discussions cannot really be escaped by philosophers or anyone else, except in the sense of becoming implicit for a while, and hence that they are not so much to be debunked for transgressing boundaries as they are to be welcomed as openings to be carefully made explicit by philosophy. I shall try to make use of some of the technicalities of contemporary discussions of the arrow of time as one of the main entries, in this thesis, to the discussion and development of process metaphysics. It is a particularly interesting point of entry because directed change, development or striving is internal to the notion of processuality while it is external to the notion of time.

The fifth question is whether time is absolute or relational. As in the previous question, it arises once the axis of time is formulated as the abstract structure of moments and distances which can be distinguished from events and courses of events. It is now possible to imagine not just the reversal but also the displacement, the stretching or the shrinking of the axis of time, relative to the “real world” courses of events, producing the famous type of questions Leibniz corresponded with Clarke about: Could God have chosen to create the Cosmos five minutes earlier, etc. Or more generally: how time is connected with those events which mark its passage — astronomical cycles or clocks — or streams of consciousness or aging processes according to some — and perhaps how these events relate to the rest of the real world. There is a general agreement that the core of this complex of questions is the ontological status of the system of time (and space): do they have some form of independent existence as something which functions as “container” of the real world (absolute time and space), or do they exist only with the things and events of the world, as a web of relations (relational time and space)?

When I said that process thought holds processes to be ontologically prior to time (first hypothesis in the list above) this obviously implies that process thought takes the side of Leibniz and the relational view of time. However, the question of absoluteness vs. relationality is often discussed in a sense which is too moderate to express much of the issue of process thought. For example, if it is assumed firstly that temporal relations form a class of properties shared by all processes, secondly that the separation of this class from all other kinds of relation and involvement is a given and unambiguous matter, and thirdly that all the relations in this class always already form a coherent system which maps perfectly on to the imaginary structure of absolute time, then the relational view is hardly more than a play of words (a structure *called* time, and more or less isomorphic with time, is real if not time “itself”) or perhaps a statement of a general reluctance to grant reality to any of the abstract constructions of physics and mathematics. The process view to be developed, on the other hand, has no such reluctance, but it does see the process of separating and ordering an adequate class of time-like relations as an important dynamic prerequisite of such reality, and as anything but universally and unambiguously given. Even though procedures and instruments of time have become extended to a much larger part of the sphere of human life, and much more accurately aligned, process thought can still take quite seriously Aristotle’s question¹ whether all or just some kinds of event patterns have time-like structures at all.

¹Aristotle: *Physics*, IV, 11

Furthermore, there is something about the notion of “time as a system of relations” which makes it difficult to conceive in connection with the commonsense notion of the “passage” of time — a difficulty which will be much less once we have reformulated the system of relations as well as the passage in terms of processes.

Passage, or becoming, is our sixth question. Again, this question points to something of central significance for process thought, even more so than the question of relationism vs. absolutism. Usually it is posed in terms of a system of time: is there, or is there not, such a thing as an ontologically privileged point of time, the *now*, containing the present, cosmos-wide state of affairs, separating all of the other points on the axis of time into the regions of past (all instants earlier than now) and future (all instants later). Accordingly, the traditional answers given to this question are grouped in the two main camps of *temporalism*, claiming that the fleeting present is as real as anything, perhaps that it is even *the* reality, and *atemporalism*, claiming that the very special character of this particular instant is merely an illusion, a perspective effect, a neuro-psychological phenomenon, or objective at best in the sense that subjects must impose this structure in order for any experience to be possible.

As long as the question is stated this way, we will not have much of an answer to it from the viewpoint of process thought. We will probably have to accept, if reluctantly, much of the atemporalist argument that the addition of a structure of presence to the structure of extended time makes no sense as a representation of additional reality. But the question can also be stated in another way which is often taken to be merely derivative: is there a real ontological difference between that which has already happened and that which has not happened yet? With this version of the question, process thought can give an emphatically positive answer, and thus reveal its true face as a close ally to most of the motivations for defending temporalist views. What is at issue, in this version of the question and this way of answering it, is that real processes in the world can make a difference by happening, in the sense that something can be produced and added to the world. St. Augustine² argues, for example, that we must speak of temporal matters in a respectful manner which allows us to understand and express the irrevocable and important addition brought into the world by acts of love. However, in the light of process thought it is unfortunate that Augustine very quickly turns this deep truth into a question of associating the exchange between the world and a monotheistic God with one type of singular and universal time system (linear) rather than another (cyclic). Many arguments for temporalism share with Augustine’s the

²Augustine: *De Civitate Dei*

explicit attempt at vindicating the ontological significance of agency, in more recent versions typically by attacking the kind of mechanical determinism which implies that our actions are completely determined by physical causation. Even when temporalist arguments are shaped in a way that explicitly revolves around other issues — the logical implications of temporal features of ordinary language, the indeterminacy associated with quantum measurement — it is often obvious that the real interest is agency.

With agency and the idea that the events of the world can produce something new and unforeseeable, we have already been slipping over into the seventh and last question, that of creativity. It is an extension of the sixth question, a question of the strength or radicalness of the notion of passage or becoming. If there is passage of time, or real change, this can be understood either as simply a “now” pointer traversing a sequence of states of affairs deterministic or indeterministic as the case may be, or it could further be specified that a state of affairs sometimes or always emerges from its predecessors in a non-deterministic way, or finally it could be claimed, as Augustine and many others would probably like to do about our own actions, that the event is — or can be — productive in a sense which is at least as different from stochastic or random indeterminacy as it is from mechanical determination. One way to state the deficiency of the stochastic variation as a model of creativity, agency, or freedom, is that the range of possible outcomes is already given. Hence, it differs from mechanical determination only by replacing a singular, already given trail of future events by a branching but equally given system of trails, the “supermarket theory of freedom” with an apt phrase of Andy Pickering’s. Conversely, one of the ways that some authors have attempted to express the strong version of the thesis of becoming is the openness or nonexistence of the future — which can be further strengthened by specifying that the openness transcends any supermarket of readymade options.

What it means for processes to be productive or creative — or how to speak of them in a way which respects that they are, or can be, so — is a central issue for process thought. There are several aspects of this issue, including the explicitation of the notion of creativity and the question where it exists — say, in intentional human actions, or some larger or smaller subset of the events in the universe (much larger, I shall argue). You may object that this issue is out of the range of questions of the nature of time and pertains, instead, to the nature of the kind of things that can or do exist in the world, in time. This is true I think, but it is complicated by a strong coupling between the questions of time and creativity. However abundant creativity may be everywhere else, it has difficulty existing in time. One way to state this difficulty is within the vocabulary of the theistic agenda common to Augustine and Newton: time ticks out the created world, while the act of creation is divine and concentrated outside of the temporal

created world, on the edge of it, at its beginning and perhaps at a few points of interaction along the way. Another way of stating it is that the construction of a system of time involves a selection of certain events as relevant and paradigmatic, and that if the construction is to be efficient they must be carefully tamed ones, with minimal and practically negligible creativity.

Therefore, according to many understandings of time in respect to the other questions in our list, the seventh and last question, whether time is dynamic and open enough to allow for the existence of acts of strong creativity, is a non-issue. And maybe they are right, perhaps creativity cannot exist — in time.

This completes the list of questions of time discussed in the tradition. Obviously the enumeration of seven separate questions is negotiable (as it seems to be always the case in philosophy whenever there is more than two of anything — even Aristotle did not keep the number of categories constant...) As I have mentioned, sometimes the separateness of two questions depends on the way you answer one of them, or the meaningfulness of one question depends on the answer to the other. Furthermore, sometimes one question mentioned above, such as the structure of time, might well be argued to be several separate questions. Still, I would like to stress that there are more than two or three traditional questions of time, but also that it is possible to give a reasonably complete list of the traditional issues under a limited number of headlines — and that the problem we shall be discussing is neither to be placed under any particular point on that list, nor is it absent from any of them.

The different problem

The different problem of process metaphysics is to understand things in a way that takes in centres of activity in the world as its focus, to think within rather than around processes, or, with Deleuze's formulation, to think difference itself.

To put the matter in a simple form, perhaps dangerously simple, the problem is shifted to a consideration of nodes rather than lines in an "event diagram" like fig. 1, where we could let thick lines represent enduring objects and thin lines causal influences, so that the circles at the nodes represent all sorts of interactions, changes, becomings, perishings, mergings and developments, in short processes. The time axis at the left side is there only in order to give a homely feel to the diagram: as indicated in the list of theses above the process view to be unfolded will imply that "t" is not so much of a necessary background as a possible extension of a system of processes.

Saying that our interest in processuality is metaphysical means that we are looking for the most general characteristics common to the widest possible family of processes. And saying that process is the concept in the focal point of a metaphysical line of work already contains, in some form, an assumption that processuality has universal significance and, further, an expectation that this significance is not a trivial restatement of what other metaphysical approaches have taught us.

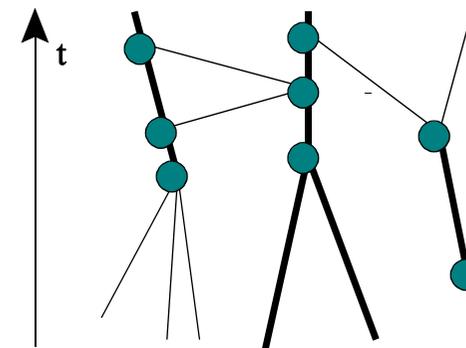


Fig. 1

To think of something mainly or completely in terms of processes is not really a new and alien kind of exercise. We are quite used to dealing with market transactions, metabolic flows and forest fires without worrying about fixing a steady substrate, centre or limit, or a momentary state of affairs: the whole point of taking something for a process is, of course, that even though there may be focal points and distinctions between

what is in and out, they are in flux — and that one can act and think along with that rather than holding on to particular bits of stuff which will be out of the flow in question next moment. Entire scientific fields are already built as systematic approaches to particular kinds of process: a good example is thermodynamics where interactions of heat flows and physical work (mechanic, electromagnetic, chemical, etc.) are dealt with and analyzed in ways which systematically cancel out the details of the substrate of micro-particles which is thought to underlie the

flow. Hence it is unnecessary in thermodynamics to know or deal with any such particularities of the substrate — fortunately, since the task of representing and handling the fate of all the constituent elementary particles or molecules, the famous accomplishment of Maxwell's demon, is far beyond all imaginable feasibility. Also, we are already quite competent in handling flows of experience and/or performance, such as a piece of music, without usually fixing attention on a particular note or a particular guitar string. However, this last example also serves very well to indicate how such fixation — which is immediately at odds with the music — is sometimes desirable as means of repair, tuning, learning, correction, analysis, coordination and control.

Now, what if our patterns of systematic thought have been favouring a fixing, externalizing and sequencing mode, even while our competences still have the processual character? And perhaps, even while new, very processual competences emerge? Could understanding of the processual be cultivated and systematized in philosophy? Could we gain something from that? Might it even be possible to learn something about the controlling and sequencing mode of thought, to affirm it, even perhaps to amplify its efficiency?

Deleuze says, following Bergson, that the *invention of a problem* is the most important philosophical event. Once a problem is expressed in a distinct manner, the relevant elements and the desired kinds of order are close at hand, and answers and solutions almost organize themselves. Again, according to Deleuze and Bergson, philosophically interesting concepts are problems, in the sense that they do not only represent actual or potential states of affairs but open interests and possibilities of doing certain things. With a true problem, the orders in a situation are brought into meaningful contrasts, opening degrees of freedom for the job of organizing things coherently and interestingly, whereas less true problems or problems running out of truth makes this job an ever more hopeless struggle of mutually repressive orders so that answers tend towards the reductive, negative and fragmentary. Bergson uses this idea of creative philosophical problematization to criticize what he finds to be a host of false problems in the tradition of philosophy. For example, we have been asking why and how artistic creativity breaks free from every known rule and pattern, while we should much rather be asking how it commits itself to the expression of even more orders. Or we have been asking how passage can be added to a time line consisting of pointlike moments while we should rather be asking how ongoing living duration is sometimes channelled into short, sharply sliced events of explicit presence. Deleuze perhaps is less interested in criticizing false problems but at least as interested in unfolding the idea of philosophy as the necessary ongoing process of problematization, and its ability of *creating true problems*. In this sense of the word, it is the ambition of this thesis to show that the founders of process thought

have produced a truly great problem, the project of expressing process as a concept of universal relevance and applicability.

Some may object that this just amounts to arbitrarily *assuming* that events are the fundamental building blocks of the universe. This way it appears that we fix to our shoulders a burden of metaphysical assumption, and also that concepts lie ready at hand for whoever wishes to carry them around like that. But it is also possible — as maybe it always is with metaphysical problems — to give this point a negative expression: thinking in terms of process we *drop the assumption* of ultimate conserved entities and separate positive stages underlying every change. What warrants the holding or dropping of such assumptions is the question of metaphysical method and justification that we will need to address at the end of this introduction. However, there is another kind of metaphysical question which is at least as important as such a discussion of justification: the question of working out a vision, a possibility of imagining what it might even mean for some conceptual structure, such as that of processuality, to be universally applicable, that is, the question of finding and expressing traits of a conceptual structure which might make it a candidate for grasping things outside of the sphere of its ordinary use, the work of building philosophical metaphors. As we shall see, Whitehead ventures much further than that which is usually understood by the term “event ontology” by attempting to construct a strong and rich notion of process geared to meaningfully circumscribe happenings of all kinds of degrees of complexity or creativity — from the complexity of a piece of music to the simplicity (and suitability for sharp spatiotemporal delimitation) of paradigmatic “events” like strokes of lightning. I follow Whitehead in using the term *speculation* for this kind of creative philosophical work of constructing and trying out general concepts. Furthermore, in the organization of the chapters to follow I try to respect the importance Whitehead attributes to work of “speculation” and Deleuze to work of “problematization” by first seeing if we can imagine and speak of processuality in distinct ways and if we can throw a new and interesting light on interesting questions by doing so, and only later taking up the questions of legitimacy and grounding.

Let me indicate the shifting but by no means vanishing philosophical interest in *time* which flows from a speculative re-problematization in terms of process. To the founders of process philosophy it was of vital importance to think of processes directly, rather than indirectly through the metaphysical structures of substance and time. This became important because they found that thinking in terms of time-and-substance, while it is a main element in efficient models able to grasp, sort out, handle and mobilize many things, had been placing a systematic constraint on the kind of structures and relationships which can be envisaged and modelled. What is channelled and amplified by expression through the traditional

categories is stable matters, control and representation, and what is attenuated in the same process is instabilities, participation, creativity and construction. There is a strong and growing tendency of criticizing Western culture for being too centered on a utilitarian, externalizing, controlling approach to nature and even to human beings, and many have pointed out that this is somehow connected with our ways of dealing with time, particularly with the idea of time as a kind of extension or measurable resource. But rather than joining a kind of despairing self-criticism which continues speaking within the agenda of time if only in a reverse, critical, negative mode, process thought addresses the problem of reconnecting conceptual thought with the participation and processuality which has not, in its view, disappeared from Western civilization or anywhere else. Furthermore, perhaps processual reality need not be simply something we have forgotten and now need to be brought back to the old track of. A project of a great deal of modern process thought is to find, express and make metaphysically relevant new kinds of participation and process which are required and invented at an increasing rate in the sciences and technologies — the same sciences and technologies that have been seen by some critics as mere instruments of a deplorable drive for externalization and control, and by some defenders as a kind of transcendental demonstration that the fully external — that which is fully at hand for control and representation — is the form rock bottom metaphysical reality *must* have. Therefore, the project of a process philosophy is to proceed as far as possible towards an understanding that can bear to look into transitions, happenings, exchanges and developments in problem fields as points of departure and as units of their description rather than automatically fitting them into a scheme of basic stable matters and forms in the absence of serious alternatives. Even formulations like *points* of departure and *units* of description may be yielding too much to a habit of looking for fixpoints rather than flows for thought. In the study of problems and resources of process thought that we are about to enter, we shall see how such yielding has been systematically avoided. A reconsideration of time in the light of an emerging understanding of processuality will be one important aspect of such a project, because it is by way of a projection unto an axis of time — a single sequence of stages — that real world processes can come to appear as mere ripples on the surface of a cosmos of clean, stable things and orders. But time being such a strong component in our handling of many real world processes, and hence in many of the processes themselves, it is equally important that we do not deny or ignore it. Its metaphysics must be reconstructed.

How to proceed

The previous remarks lead up to the question which must be addressed before an introduction to a series of investigations can close, the question of method and beginning. How can philosophy even begin to try out such a processual

redescription of things without assuming a new set of fundamental entities, processes at elementary particle level for example, or social events in which an “external” world is constructed? And how can such assumptions be made without fixing once more a level of basic things which are assumed to be represented and not (co-)produced? Furthermore, how can one be justified at all in making any kind of assumptions about the ultimate nature of things, processual or otherwise?

Of course this last, very general, challenge can be met by pointing out that metaphysical assumptions are everywhere and that attempts at overcoming metaphysics have always turned out to be themselves resting on implicit metaphysical assumptions. This kind of defence, however, is about as useful as the corresponding general rejection of all metaphysics for being groundless, because it leaves us entirely in the dark about how it could be warranted to point our metaphysical interest and assumptions in the direction of one particular general concept to be further generalized, “processes” — rather than, say, machines, particles or cognitive states.

One way of thinking about metaphysics is the classical fundamentalism well illustrated by Descartes: either we have absolutely certain points of departure, or we have no warrant for metaphysical statements. The cartesian model of metaphysical grounding is probably a major reason for the modern tendency of associating metaphysics with a tall requirement of “privileged access” to something beyond reach of discourse and other interactions within the horizon of ordinary life. In a way this is a rather paradoxical effect of Descartes’ work, since his attempt was exactly to begin metaphysics in a new and more humble way than that of the tradition, namely, in a humble common fact immanent to ordinary life. His famous beginning, of course, was that in which we are already immersed if we are thinking, whether the thought is metaphysically sound or not: the mere fact of the activity of thought.

There are several interesting lessons to be learned from this paradoxical turn, and I do not pretend to treat them with any kind of completeness, but let me point out one of them: in fixing this indubitable activity to a substance, Descartes could see the thinking substance as an original, uncontaminated level — a ground free from deceit, falsity and construction (construction is exactly what Descartes’ demon is up to, isn’t it) in which the new metaphysics could be safely anchored. Something that did not occur to Descartes was the possibility that thought could partake of a secret union with the demonic: the forms of the imaginable and conceivable conditioned by a contingent historical situation, the forms of interest brought about by a particular life form too, and the inventive activity of constructing all kinds of unoriginal stuff, more or less substance-like. At this point it is interesting to compare Descartes’ pure unconstructed beginning with the metaphysical

insight of the other meditative genius we have already encountered, Nagarjuna, according to whom wisdom is achieved not by escaping the demonic force of construction but by explicitly being one with it, so that we can quench the impossible craving for stable identity, being or substance.

Along the same lines, there is an alternative to that dualist idea of metaphysics common to many proponents and critics of metaphysics — the idea that either metaphysics is founded with absolute certainty in evidence transcending all history and perspective or there is no legitimate metaphysics. The alternative is legitimizing a metaphysics which is little more than the most systematic and reflected bits of the systematizing activities already unfolding in many fields of life, a metaphysics which accepts and admits to be incarnated in a particular universe of patterns of life, objects, experiences and thoughts, and to be seeking to find, express and refine what is suited for further construction of general patterns for understanding and self-understanding. This idea of metaphysics as a never-ending process of rationalization, a kind of ongoing digestion of a common but local universe, is very explicitly Whitehead's: his main work *Process and Reality* opens with a clear declaration of such a humility regarding absolute beginnings paired with a very high thought of the power of thought — and particularly speculative thought — to conceptually penetrate and synthesize life and its universe. The idea of metaphysics as such an immanent, historical process with great pretensions of universality and relevance to be ever developed in synthesis of new patterns and experiences is, I shall argue, a central aspect of the philosophical project not only for Whitehead but also for other explicitly processual thinkers such as Hegel and Deleuze. And maybe not only them, maybe such a processual approach to metaphysics is not very different from a common pragmatic idea of metaphysics taking shape in many schools of philosophy now that the strong 20th C trend of antimetaphysics is waning without many signs of a return to classical fundamentalist approaches. Furthermore, a non-fundamentalist approach to metaphysics should not be seen as something entirely new. Beginning metaphysical discussion in the thick of things, with descriptions and analyses of well known forms of life and ordinary language, and trying out their relevance and consistency if taken as elements in universal frameworks, is a major feature of Aristotle's founding work.

No matter how common or special the processual idea of an ongoing constructive metaphysical activity "from below" the sphere of the moon — or "from within" the form of life — may be, we may still need to say a bit more about the way to look for the concrete, local, historical, always already ongoing life from where we should now be explicitly thinking. For example, the cartesian *cogito* and the classical empiricist *simple ideas* of perception must both be recognized as sharing to some extent the project of working "from within" a horizon closely related to concrete life form: the horizon of the human subject; but it is important to add to

this acknowledgement the further interest in problematizing the particular fields of conscious thought or events of perception — rather than taking them for simply original or completely given fields of evidence. Process thought assumes a strong commitment of looking for "the overseen halves of the evidence" in the sense that a field of explicit evidence always enfolds another implicit half to do with its construction: such as the fainter and less sharply present bodily-emotional backgrounds of explicit momentary "perceptions", or the linguistic-historical preconditions of "a clear thought". Similar "overseen halves" of scientific measurements or stable physical objects may be traced. At this point I do not attempt to follow through such an analysis of all the particular fields of evidence relevant for a general project of metaphysics; rather the point is to outline a philosophical approach of working in the middle of things. Also it should be explicitly stated that the idea is not at all the "scepticist" suspicion of all kinds of evidence for being "merely constructions" — on the contrary, it is the affirmation of the constructed for being a strong witness of truth, particularly when we undertake the adventure of seizing chances of expressing previously implicit backgrounds which may arise, whether because of mental or economical crises, techno-scientific developments, cultural clashes, artistic and religious cultivation of sensibilities, or — in more or less rare cases perhaps — from philosophical creativity.

Indeed, if we are to take process thought seriously, the question *where to begin in philosophy* is really a first step to a deeper question of *how to proceed more philosophically* with what we are already doing, what we are already involved in, and with what is already happening where we are. In short, how to be more thinkingly in process.

If we accept such a processual idea of metaphysics, even tentatively — either because it makes sense to view metaphysics as a continuation, on the most general level, of other situated rational processes or because the alternatives (the rejection of metaphysics and the claim of absolutely certain foundations for it) seem more absurd — then we have a rationalization for the way the discussion proceeds in the following. We will be investigating some interesting problem fields where "overseen halves of the evidence" seem to become available for philosophical expression and synthesis — new chances and new challenges emerging from science and elsewhere, as previously discussed. What is not warranted by the adoption of a processual approach to metaphysics of course, is the choice of the notion of process as a particularly interesting general concept to try to express, refine and universalize. The relevance of doing so can only be foreshadowed in trends of subjects and objects arising here, in the middle of things — and it can only be justified by trying out: formulating it as thoroughly as possible as a metaphysical structure, and then seeing whether interesting

possibilities of understanding and analysis may emerge. If new relevant features of the well known can be expressed, and if wide-ranging generalizations can be constructed without increasing the stiffness and narrowness of “misplaced concreteness”, and if finally nothing significant is lost because the proposed metaphysical structures are able to affirm and situate “rivalling” systems of interpretation, then we will have made a good case for a processual reconstruction of time — the only and best kind of case possible according to the premises of process thought itself when these are applied to the metaphysical process.

The organization of the following

The organization of the following reflects this notion of metaphysical work beginning (or, rather, proceeding from) the middle of things — aiming at an expression of features of universal significance, in the form of concept development and problematization — and seeking to meaningfully integrate contrasts with other fields of inquiry and self-expression.

(1) IRREVERSIBILITY: First, we embark in the ongoing stream of discussions concerning the role of “time’s arrow” in relation to the description and handling of spontaneous physical processes in thermodynamics. I shall argue that traditional attempts to answer this metaphysical question are dissatisfactory on their own premises, or that they depend on more or less explicit metaphysical assumptions of a rather extreme and improbable character. This expresses, I shall argue, a general deficiency of metaphysical attempts at understanding strongly processual phenomena within a classical metaphysical framework of substance and time. But within the complex of thermodynamics and its metaphysical interpretations there is also an emerging line of work much more interested in processes as such, even when this clashes with received metaphysical frameworks. The possibility of systematically working out an alternative, processual metaphysics seems to propose itself here — it may even open possibilities of reconstructing the arguments made within the classical framework in such a way that their dissatisfactory metaphysical “gaps” of arbitrary assumptions can be closed.

(2) PROCESS: In preparation for the application to the discussions of time’s arrow and thermodynamics, we proceed to the project of developing the notion of processuality into a systematic and explicit metaphysics. Whitehead’s system, one of the most complete implementations of such a programme, is chosen as a useful structure for the following discussions, but some interesting resonances and contrasts with other systematic expressions of process thought are introduced as well.

(3) ORDER-PRODUCTION: Applying Whitehead’s systematic process metaphysics to the discussion of the interpretation of the second law of thermodynamics we find a promising possibility of a coherent metaphysical

interpretation of the second law. Not only can the general tendency of dispersion expressed by the law be reconciled with a strong notion of creative processuality, thus overcoming an apparent conflict. With a sufficiently radical reading of Whitehead’s notion of processuality, the second law is even found to follow as a consequence of the assumption of a universe of order-producing processes. Finally, this ‘derivation’ of the metaphysically problematic core of the second law of thermodynamics exemplifies the idea of metaphysics as an ongoing two-way interaction: one the one hand, we can further derive interesting implications from it, e.g. concerning ecological matters; on the other hand the application of process thought to thermodynamics echoes back on the assumptions of a process metaphysical framework enabling us to make them more clear and explicit.

(4) RELATIVITY: The special theory of relativity is another interesting spot in which modern physical theory has created serious difficulties for attempts at coherent metaphysical interpretation. Within traditional metaphysical frameworks, the theory’s departure from the idea of an unproblematic simultaneity relation has led to a dilemma of either abandoning the idea of dynamic time (“passage”) or denouncing physics as metaphysically insignificant. Again, we find that the application of the process metaphysical framework allows for a significant reorganization so that the problematic structure in the physical theory — the context-dependence of simultaneity — can be seen as expressing a metaphysical principle of dynamism rather than contradicting it. Furthermore, we find again that a fundamental feature of the physical theory that goes counter to traditional metaphysical expectations becomes so perfectly expectable in the light of the alternative metaphysics that one might be tempted to ‘derive’ the theory from the metaphysics. However, from a process metaphysical perspective, this is not the reduction of hard-working physics to the status of a mere derivative to a disembodied speculative metaphysics, but rather the contrary: a way of taking physics — and other fields of experience — very seriously as sources of metaphysical problems and insights.

(5) SCIENCE STUDIES. Relations between the processual structures science is *about* and the structures of the processes it is *itself in*, are studied by focusing on some ambiguities in the descriptions of the two layers, by Whitehead and Latour respectively. After comparing implications of two possible readings of some of Latour’s concepts, particularly *the collective* — one possibility more epistemological and the other more cosmological — a cosmological reading is favoured as the most consistent and interesting. This reading implies that theories of science can be sources of metaphysical and cosmological insight even while their structures are being interpreted as shaped by historical and sociological factors. Not *in spite* of this dependence on concrete life situations, but *because* of it. As a test of feasibility, a reading of the special theory of relativity as a contribution to a metaphysical theory of historicity is tried out.

(6) CONSTRUCTION: An important aspect of the reason we have traditionally avoided processuality and preferred substance and time, as conceptual building blocks in our explicit rationalization of things and projects, is the desire to ground things in something unconstructed because constructedness appeared to imply ungroundedness and hence falseness. Several of the arguments given so far have contained the structure of a process metaphysical shift towards an idea of ground and construction as one continuous world of dynamic relations. This idea is addressed directly in this chapter, in an exegesis of Hegel's and Deleuze's radical constructivist and strongly affirmative readings of science and scientific processes.

(7) SPECULATION: Finally, the previous moves point to the need of an explicit discussion of the general character of speculative metaphysics. When and how is it legitimate to derive something from intuitive or rational first principles, and when and how is it legitimate to conclude "upwards" — from particular scientific structures or phenomenologically described concreteness to globally relevant principles of metaphysics? Examples of famous insightful speculative moves by Bergson, Schelling, Goethe and others — successes as well as failures in terms of bringing about flexible, coherent understandings of the fields in question — are discussed, along with the speculative moves of the previous articles in this collection, in the attempt of expressing what it takes for speculation to be reasonable, sensitive and useful. A very important requirement is that the structures of science and life which are generalized as globally significant should not carry "dead weight" of unreflected metaphysical structure in our way of expressing them — Heidegger's characterization of *Gestell*, a world of mere resources, is discussed as a particularly clear statement of this problem. It is argued that the Bergsonian idea of truthful creativity and the Whiteheadian idea of a processual speculative scheme are able to meet this requirement, but not without systematic, creative work. This is exemplified by metaphysically significant generalizations over the field of science and technology studies, by Latour, Pickering, Haraway and others, showing that the being of science and technology is much more than *Gestell* when described in a participatory perspective, just as Goethe *participated* in the world of nature, and Turner in the hybrid landscapes of early industrialism.

(8) CONCLUSION: T

(9) REINTRODUCTION: This does not close the circle but rather points to strong coupling between the metaphysics of time and process on one hand, and the issues of ecology and economy on the other. One way to utilize the resources of philosophy in this problematic is outlined in a discussion of Hegelian and Marxian concepts of alienation and the extension of systems of measuring and exchanging quantities of work and value. The hope of an emerging new politics of time is expressed, as well as the submission that speculative metaphysics and cosmology are involved in the politics of time, implicitly or explicitly. This will be an important project for further metaphysical research, requiring a reading of some

well chosen structures of these sciences with as thoroughly affirmative and constructivist as that which has at least been attempted in the present work, with regard to physics.

An additional note on modes of metaphysical approach

This thesis assumes the responsibility of unfolding and treating some metaphysical problems made possible and sometimes perhaps unavoidable by developments in science, technology and other great enterprises. This could seem a risky project because metaphysics was apparently “overcome” in philosophy so many times during the last few hundred years that we may seem to place upon ourselves a huge burden of proof to carry even in order to seriously open such questions within philosophy, let alone attempt to answer them. However, if we were to begin with arguing the legitimacy of speculative metaphysics on a general level, this would not only be unnecessarily perilous in the sense of an all-out contradiction of the great schools of philosophy, but it would also be a very empty and infertile discussion as long as it is not clear that there is interesting and relevant speculative work that can be done anywhere particular. Instead, I propose to join in where the serious metaphysical problems are already felt, and where a lively activity of creative speculation is already going on, even if perhaps the schools of philosophy have achieved, at least partially and temporarily, to discredit philosophy’s own tradition of great creations of speculative structures. It will be in this spirit of joining that I enter discussions of metaphysical implications and interpretations of scientific theories and practice. In particular, I would like to explicitly characterize two kinds of metaphysical approach to science which are *not* what is attempted here. They are, I think, two inadequate — in important respects insufficiently speculative — kinds of approach which deserve the kind of suspicion which has been developing towards metaphysical treatments of science. I hope and think it is very clear that the metaphysical suggestions which are actually made in the following chapters perform a third kind of movement quite different from these two, but I have learnt from experience that traditional expectations and suspicions tend to lead the reading of anything carrying the title of metaphysics into these two tracks anyway. The first of these tracks is the derivation, from the results of science, of an authoritative support for particular traditional metaphysical assurances — as when recent developments in physics have been invoked as support or even final proof of a “Taoist” notion of omnipresent mind by some authors, and for a “Judeo-Christian” notion of immortal individual souls by others. The second track is the reverse attempt at deriving from a traditional metaphysical platform certain constraints that should be imposed upon science and the interpretation of scientific results — as when a certain notion of theism is taken to ground a claim of the existence of a cosmic “now” for God to think and act in. I would like to emphasise that what I find inadequate about such approaches is not that an initially incommensurable pair of notions — from, e.g., religion and physics — get involved in a project of conceiving overarching universal structures of a world in which they can both operate. This project is the general project of metaphysics, and it is healthy and inevitable I shall argue. What is inadequate in the two tracks I characterized,

however, is a peculiar fixedness that reduces speculative metaphysics to a channelling of legitimacy between fixed poles of security. The more fully speculative style of work that I propose to take up is the one that seeks in science a dynamic possibility of continuing the development of a common understanding of the world — stepping back from what used to seem unquestionable authority rather than fixing authority at any side of the matter, it is a participation in the ongoing development of a coherent cosmology. In particular I would like to point to my own use of the term “derivation” to characterize a sort of metaphysical move made at some points in the following. The derivation, here, does not proceed from any previously established point of legitimacy, but from the speculative ideas developed. What this kind of derivation can do, then, is testing the universality of the ideas. It cannot transmit any authority or legitimacy. At best, it can produce an expanded perspective on the commodities of legitimacy and authority. In fact, it is by virtue of this kind of non-authoritarian approach that the present small contribution to the discussion of process thought hopes to have something in common with the great speculative systems in the history of philosophy, as mentioned in the initial remark of the introduction.