



Time in Experience and Science

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Ph.D – Dissertation

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*Science is a dialogue between mankind and nature....
But what makes this dialogue possible?
A time-reversible world would also be an unknowable world.
Knowledge presupposes that the world affects us and our instruments,
that there is an interaction between the knower and the known,
and that this interaction creates a difference between past and future.
Becoming is the sine qua non of science, and indeed, of knowledge itself.*

Ilya Prigogine

Preface

This work will be submitted as a Ph.D. dissertation within the “Science Studies” program at Section of Philosophy and Science Studies, University of Roskilde, Denmark, September 2002. This dissertation has been under supervision of Prof. Stig Andur Pedersen.

I would like to extend my gratitude to some very important people that has made this dissertation possible. First of all, I would like to thank the Section of Philosophy and Science Studies, the Science Studies Program, and Prof. Stig Andur Pedersen for granting me the fellowship thus enabling me to write this dissertation. I am indebted beyond gratitude to Prof. Pedersen for his kind and wise support and supervision.

I would furthermore like to thank John Earman at the Department for Philosophy and History of Science, University of Pittsburgh for inviting me spring term 2001, to be a visiting scholar at the Department. During my stay there I met with several people who indeed influenced my investigation considerably, among them I would like to thank Prof. Nicholas Rescher, Center for Philosophy of Science, and Prof. Richard Gale, Department of Philosophy, both University of Pittsburgh, for reading through and commenting on large parts of an early draft of this manuscript. Likewise I would like to thank Prof. Kevin Kelly at Carnegie Mellon University for a thorough and scrutinizing critique of the same version of the manuscript.

Back here in Scandinavia I would like to thank Prof. of Physics Peder Voetmann Christiansen, University of Roskilde, for his encouragement and kind words. I am indebted to Prof. Ragnar Fjelland, Center for Philosophy of Science, University of Bergen, for good advice and constructive critique, for his invaluable encouragement. Likewise I would like to thank Prof. Peter Øhrstrøm, Department of Communication, Aalborg University, for sharing of his extensive knowledge about time, for his insightful critique and advice. Furthermore I am indebted to Prof. Vincent F. Hendricks and Prof. Arne Thing Mortensen, University of Roskilde, Section of Philosophy and Science Studies, for advice, critique and for using their valuable time to go through and discuss this dissertation with me. I will like to

extend my gratitude to my good friends Richard Røgeberg, Aage Wallin and Dr. Tom Stiris for insightful discussions on the nature of man. Last but not least I would like to thank my wife Teresa Ruch Olsen and my children for their love.

I dedicate this study of time to the memory of my very dear parents Åsta and Rudolf Berg Olsen.

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Abstract

This Ph.D. dissertation treats various interrelated issues of subjectivity, especially the experience of time, which is contrasted up against the nature of time as it is seen from the “objective” perspectives of physics.

I apply phenomenology, metaphysics, physics, and evolutionary epistemology as theoretical contexts in which the notions of time are analyzed. The argument in this dissertation is being used to evaluate the relationship between *asymmetrical* temporal experiences; the *asymmetrical* as well as the *symmetrical* time concept of physics, and the *asymmetrical* real-world time. This dissertation is structured with an Introduction and 9 Chapters.

The Introduction motivates the research and argument of this dissertation. The “introduction” also explains the “method”, together with an outline of the organization of the argument. The “introduction” is concluded with a review of previous and related work to be found in literature, which addresses the main topics of this work.

Chapter 1 discusses the general issue of metaphysical doctrines as the ideational background for concrete versus theoretical thinking.

Chapter 2 discusses the opposition between realism and anti-realism.

Chapter 3 categorizes different attitudes towards the question of time and subjectivity within physics and the philosophy of time.

Chapter 4 treats the central issues of the subjective-objective polarity.

Chapter 5 deals with Albert Einstein’s metaphysics.

Chapter 6 discusses the issue of becoming and subjectivity in relation to contemporary thinking in philosophy of physics and in the philosophy of time.

Chapter 7 treats in more detail the “determinist metaphysics”.

Chapter 8 is about the natural or organic foundation of temporal experience.

Chapter 9 recapitulates the essence of the previous discussions.

Norsk resumé

Denne Ph.D. avhandlingen behandler følgende problemkompleks: tidserfaringen, tidens natur sett fra fysikkens, fenomenologiens, metafysikkens og den evolusjonære erkjennelsesteoris perspektiver, samt sammenhengen mellom tidserfaringen og den virkelige verdens tidslighet. Denne avhandlingen er organisert i en Innledning og 9 kapitler.

Innledningen motiverer forskningen og argumentet i avhandlingen. Dessuten er metode såvel som organiseringen av avhandlingen forklart. Tilslutt presenteres en gjennomgang av tidligere og lignende arbeider som er å finne i litteraturen.

Kapittel 1 diskuterer tanken om at metafysiske idéer inngår som autoritative konstruksjoner i en individualisert erfarings-bakgrunn for tenkningen.

Kapittel 2 behandler debatten mellom realismen og anti-realismen.

Kapittel 3 kategoriserer forskjellige holdninger til spørsmålet om tid og subjektivitet innenfor fysikken og tidsfilosofien.

Kapittel 4 omhandler polariteten mellom subjektiviteten og objektiviteten.

Kapittel 5 er om Albert Einstein og hans metafysiske tilhørighet.

Kapittel 6 drøfter tilblivelsesproblematikken og dens relasjon til subjektiviteten sett ut fra både fysikkens filosofi og tidsfilosofien.

Kapittel 7 omhandler mere inngående determinismens metafysikk.

Kapittel 8 er om det virkelige, organiske fundamentet til den temporale erfaring.

Kapittel 9 er en gjennomgang av den forutgående diskusjon, samt en konklusjon.

Introduction

1. The Problem

This is a study of time. The underlying assumption of this study is that time cannot be understood isolated from other aspects concerning human existence and activities. This may seem trivial. Nevertheless, different tendencies to isolate the problem of time will be present in traditional as well as in actual considerations.

A classical example is Albert Einstein's 1905 paper on Special Relativity. The Special Theory of Relativity (STR) has inspired philosophers and physicists to overemphasize the importance of physics in the study of time. The notion that only physics is able to answer the question about the real nature of time has become almost a household opinion. Philosophical interpretations of STR have resulted in a division between *temporal experience*, on the one hand, and, on the other, *time* as a property of the physical and objective world. The "scientistical" *isolation* of experienceable temporality as "mind-dependent temporality" comes from a *rejection* of all things "mind-endowed". Human cognition, that is, thinking understood in its intimate relationship with experience, has thus become scientifically incredible. The metaphysical rejection of experienceable temporality is therefore a denial of the possibility that temporal experience could be a cognitive *source* of time. In other words, the rejection is of the human *awareness* of time as an insight that also concerns reality, internal and external, as such.

Secondly, to isolate human temporality is easy, given of course that there is a context of authoritative theories making the rejection of certain types of experiences legitimate. Human temporality has become easy to reject as real since it is so obvious to several influential theorists that it "merely" exists in the *mind* of people. Temporality is as a mind-dependent *phenomenon* isolated from the on-goings of the world and is as such only located in the *subjectivity* of man. "Temporal experience is the nest of illusions" it has been claimed. However, the task will be to open up and discuss the categorical rejection of subjective time as it has been claimed to be something *unreal* and instead try to see it as *real*! And by "real" we shall not only see time as subjectively real; experienced time, or temporality, is pure and simply *real*.

One conclusion that can be drawn from the above "compartmentalization" of "things in the world" on the one hand, and "phenomena in the mind" on the other, is that time must have both an

“internal” as well as an “external” aspect. I shall attempt to explain along the way that the understanding of the “external” time is conditioned by our comprehension of the internal, experienced temporality – and *vice versa*. That is to say, our internal temporality cannot be isolated from external time, that is, from the temporality of the world. But even if these two “areas” of time illuminate each other, it is clear that we can view them from complete different phenomenal perspectives. In my discussion of experienced and experienceable temporality I will be concerned with an epistemological-metaphysical and phenomenological justification for the reality of time in human awareness and experience. In connection with this I will furthermore deal with a few problems concerning the nature of time that exist within epistemology, metaphysics and phenomenology.

On the other hand, in my discussion of the “external” aspect of time it will be within physics¹ and biology that I will look for answers. To me, physics is a complex and extremely difficult field. But since most psycho-physics-related theory about time concludes with “real time has no relationship with human experienced temporality”, I will not accept this as “proper physics” or “proper science” but as metaphysics, as *meta-theory*. However, even with those few cases within physics that see a relationship between human temporality and physical reality, it is difficult to create a “real” foundation for human temporality in the physicists’ sense of the term. It is difficult to establish a physical-organic ontological basis for experienced temporality, which would *merge* temporal experience and the reality in science. However, biology may serve as a link. It is as a source for knowledge about time located between physics-related time-theory and psychological-related time-theory. Thus, it may enhance our scientific and philosophical understanding of how human experienceable temporality has a factual correspondence with external and “mind-independent” temporality through cognitive coordination with temporally structured processes in the external world. This coordination is with those physical-organic processes that are external as well as internally innate within the organism; together they constitute a temporality which is very characteristic of the world. The

¹ Obviously, I will have to mention different things that are not going to be elaborated any further as such. For instance it will be impossible to deal with the time of physics without mentioning the problem of “substantial versus relational space-time”, or it may seem that I am going to discuss “category theory” – a theory that avoids all talk of space-time points and values. I will not discuss these aspects, as it is not my intention to create an “ugly theory” about this or that kind of times within this or that branch of *physics*. My aim is purely philosophical, thus I will be referring to aspects of a “physical nature” which I consider being metaphysical in character.

external rhythm seen in physical and organic processes is therefore a temporality not only of the external but also something which is innate in human beings as an organism. This is to say, as a temporality *expressed* in body and mind through, for instance, our metabolic system. Adaptation is a key term to understand how this kind of temporality becomes a manifest experienceable phenomenon.

We have to deal with the problem of time from different contexts. Thus, we have the “phenomenological” perspective, the “metaphysical”, the “realist” and “anti-realist”, the “temporal realist” and “temporal anti-realist”, as well as the perspectives of “subjectivity” and “objectivity”. But we also have to view time from the “naturalistic” and “scientistical” point of view, together with other “physicalistic” perspectives. Finally, we will have to deal with real time from a “biological” perspective. It is our task to express at least an outline of a relationship between our cognitions in general, our awareness of time in particular and of that *time* which is present in all natural and organic development.

2. Method

As it may be understood from the above I shall attempt to go into certain themes in the philosophy of time which concerns our temporal awareness and experience of time as an expression of real time epistemologically/phenomenologically as well as ontologically. In the course of this I will discuss several central issues in philosophy bordering up to the problem of fitting temporal awareness and reality together. This does not, however, mean that I will solely deal with the issue theoretically. All the time, we will be confronted with temporal experience as an access-way to the contents of reality. Experience is therefore in its essence more than the definition that holds it to be nothing but an “empirical method”. “Experience” is a much wider phenomenon than being merely an “empirical method” since its sources to the real content of the world goes beyond that of perception, observation and measurement. Therefore, the question of the *origin* of our awareness of time will be important to us.

My use of the term “experience” has much in common with phenomenology, hermeneutics, and the transcendental-philosophical method. With reference to transcendental method this dissertation also, in a certain sense, discusses and tries to identify a fundamental and basic condition for human existence and cognition. Yet I dissociate myself from this transcendental method since I view my own emphasis on experience differently. I believe we have *experiences* of *real* things

and phenomenon's. We experience real or actual time when we have temporal experiences; therefore, we are not merely "reconstructing" the formal conditions for cognition and thought. My "method" will be further explained in the following Chapter 1.

3. Structure of the Dissertation

This dissertation is organized with an Introduction and chapters 1-9.

Chapter 1 Metaphysical doctrines functions as background-elements for human reflective awareness, in other words, metaphysical elements constitute an ideational framework for thinking. Examples of metaphysical background doctrines are "determinism", "scientism", "causalism", and the positions of "realism" and "anti-realism". Temporal realism, for instance, tends to determine temporal experiences as illusions. I argue that idealizations and abstractions that rest upon the postulates of realism in fact are results of metaphysical commitment rather than rational thinking. Metaphysical commitments may very well be an obstruction to rationality. This Chapter 1 leads to Chapter 2, which elaborates in more detail the issues of realism and the Cartesian-type dualism of mind and nature inherent in realism.

Chapter 2 focuses on important philosophical topics which have come to light in the debate between realists and idealists. I discuss the realist claim that experience and synthetic thinking cannot access reality "as it is in-itself". The rejection of experience and subjectivity can be followed as an Ariadne-Thread through all the positions of realism, including temporal realism.

I also discuss the usual philosophical misunderstandings concerning idealism, that is, the overall tendency to identify idealism with solipsism. Then I attempt a synthesis, accepting that realism is correct in claiming the world to exist independently of the mind. However, mind penetrates deep into every level of the human endeavor to understand both itself and the world. The intimacy between mind, experience, knowledge and the world is so complex that we cannot fully accept that the objectivity of science means that science is absolutely free of subjective elements, or should be free of subjective elements.

Chapter 3 deals with the way realism has influenced physics to the point where physicists and philosophers alike find it necessary to reject, omit and attempt to eliminate temporality. This is a consequence of the exaggerations of rationalism which claims objectivity to be knowledge about the external world and which is

detached from the detaching agent. I also discuss recent works of the philosophy of time, works that has attempted to merge two opposing positions of A-time and B-time but that in doing so rejects the notion of “becoming” and take for granted the primacy and truth of the B-series’ position. This is also a preliminary critique of the “static” or “B-series” view of time here and in the reminder of this dissertation referred to as temporal realism². Chapter 3 connects Chapter 2 to the next Chapter 4, which elaborates on the issues of realism and idealism, and on my synthesis of the two positions through analysis of the concepts of subjectivity and objectivity.

Chapter 4 discusses the deeper issues of the subjective-objective concept-polarity in more detail. Subjectivity and objectivity are concepts themselves. Objectivity is viewed as a perspective, as an objectified individual viewpoint. It is nonsense to talk about objectivity “in-itself”. Objectivity comes in a variety of forms. The most important distinction goes between ontological objectivity and theoretical/epistemological objectivity. It is the object at hand that determines the kind of approach mind takes towards it. Time has a peculiar position since its mind-bound character complicates the ontological objective approach, that is, to view time independently of the mind.

Chapter 5 is about Albert Einstein’s metaphysical beliefs. Experienced temporality, as a consequence from the apparently “closed” (the asymmetric and heterogeneous) nature of the individual temporal perspective, is determined as relative. Einstein’s metaphysics are discussed from several perspectives, as for instance, his relationship to Mach and Hume’s thinking, his Kantian characteristics, his early positivistic feelings towards metaphysics and the Newtonian Absolute. I also take into consideration his affiliation with the non-temporalism of the Eleatics and his conviction about the universe being deterministically governed by the fundamental laws of physics. Ideas that are all dependent upon the belief that true time of the world is to be found within the closed systems of microphysics displaying

² I will apply the term “temporal realism” the same way philosophers that claim McTaggart’s B-series to be the sole true and objective representation of the time of an event or a series of connectable events. However, I do this by knowing and agreeing with Prior that the best term for the above view on time is “the tapestry view on time” and not “temporal realism”. Prior called himself a temporal realist because he did not reject the objectivity of tenses or the epistemological importance of temporal experience. However, as I have said already, I will use temporal realism the usual way we find it defined in literature about time. For Prior, see Peter Øhrstrøm’s “Prior’s Ideas of Temporal Realism”, and Prior’s paper, “A Statement of Temporal Realism”. See Prior, A.N., *Papers on Time and Tense*, 2nd Edition, edited by Per Hasle, Peter Øhrstrøm, Torben Braüner, and Jack Copeland, OxfordUniversityPress2002.

time in the way the fundamental laws operate unrestricted in time, that is, universally. This view is supported by my argument in Chapter 7. Chapter 5 is intimately connected to Chapter 7, which deepens the understanding of the Eleatic ideas contained in Einstein's thought. I also attempt an evaluation of the objectivity status of STR, based on my views based on Chapters 2, 3 and 4.

Chapter 6 is a further discussion of the topics of Chapter 3. But now, I will pay a lot more attention to *alternative* views on the time concept in physics than the one view which is represented by Einstein's conception. Time is a problematic affair for physicists since it is difficult to let go of conventional habits of thought like the inclination to reduce everything to the assumed fundamental levels of reality; that only physics can come up with the correct answers to what is real, and so on. This is a critique of the way physicists have attempted to reduce temporality to some kind of physical concept, whether it is becoming in Stapp's sense, entropy, or something entirely different. Here is also my critique of the B-series position taken further. Chapter 6 concludes with an attempt to view time in mind and in physics from a non-reductionism point of view, to join the two spheres of temporal thinking, from an epistemological standpoint. Chapter 6 leads to Chapter 8, which treats the natural or organic foundation of temporal experience.

Chapter 7 treats in more detail the "determinist metaphysics". It evaluates the validity of rejecting experience and temporality on the basis of pure and abstract theory. This is the metaphysics that Einstein assumed to be true about the world and which underlies the realism that today tries to prove experienced temporality to be nothing but solipsism and illusion. Chapter 7 is therefore connected to Chapter 5 (Einstein) and to Chapters 3 and 6 (about the B-series position). The Eleatic ideal of non-created being, eternalism and non-temporalism is found to be inherent in a line of thinking leading from classical physics to Einstein and static interpretations of his STR and then on to temporal realism. This is also a critique of the temporal realist claim for ontological objectivity for symmetric laws of physics. The objectivity of these laws is not identical to the going-on of the real world but is instead based on idealizations and pure theoretical abstractions triggered by metaphysical commitment.

Chapter 8 connects with the other strand of argument in this dissertation, namely the one that attempts to see a real relationship and an intelligible conceptual connection between the time of mind and the real time in nature and that this is the objective basis for conceptual development of the symbolic dimension of temporality and time. This Chapter is in other words about the real and organic foundation of the temporal experience, which is an accomplishment of

the human capability to adapt to its environmental (and cultural) situations. Chapter 8 therefore elaborates thoughts suggested in Chapters 2, 4, in sub-chapter 5.4.3., and in Chapter 6.

Chapter 9 is a recapitulation of the previous discussions where the essentials are extracted and a conclusion drawn.

4. Previous Work and Related Literature

Initially it was my studies of Albert Einstein's work that prompted me to begin my investigations into the nature of time. I was dazzled by the obvious genius of Einstein. However, my disappointment grew as my reading went on. I could no longer see how it was possible for Einstein to argue that pure thinking and intuition could access reality while other mental accomplishments could not, for instance, experience, especially temporal experience, which, in Einstein's opinion, presented us with the grandest illusion of them all. How could we access nature if our way of ordering thought and experiences were flawed and even illusory?

My amazement grew even larger when I discovered that modern theories about time, to a large extent, argue from very similar contexts, producing similar views to those of Einstein's. The consequence, if these views are found to be true, is that man is not part of the reality we access through our best scientific theories; man is not part of the nature which is described and explained by the sciences. The need to find a valid true and real basis for our only way of accessing the world, that is, through thought and experience in tandem, brought me into the difficult and vast literature of philosophy of time, realism and anti-realism, subjectivity, objectivity, phenomenology, philosophy of physics, and biology.

To apply different perspectives in order to view time from more than one angle became necessary since I was not able to find even one book that could explain to me how the time of mind, the time of science and the time of nature is interrelated as an inner phenomenon, in external processes, and as construed concept. I did, however, find many books that presupposed that there was no such relation at all. Representative literature from the above mentioned sciences and philosophical approaches gives only partial explanations and are for the most part only suggestive.

Very few scientists and philosophers want to make the crossover between the various relevant sciences and the various philosophical approaches in pursuit of different but connecting conceptual properties of time. Analytical philosophers cannot stomach phenomenologists and

vice versa, although the positions of A-time and B-time run through both the analytical as well as the phenomenological camps, meaning that analytical philosophers are divided between the positions of A-time (temporal anti-realists) and B-time (temporal realists). However, some literature does display attempts to build bridges between the different sciences and the philosophical approaches, although these works differ from my emphasis on the analysis of subjectivity and the subject-object polarity and the epistemic primacy of temporal experience as the foundation for conceptual development of time.

Modern thinkers as Fraser (1990) and Whitrow (1988) has written pioneering works that try to establish both a broader and a deeper context for our understanding of time. In my opinion, this is literature that cannot be avoided in the study of time. Both of these works emphasize the interdisciplinary approach which is needed in order to grasp the real importance of time study. In Fraser's case it is the broad interdisciplinary context and the variety of topics that can be related to time which have been of interest. Whitrow, on the other hand, has had a more subtle influence since he has been able to bring temporal experience into the debate about physical and organic time without attempting any form of elimination or reduction. Typical for Whitrow's classical work *The Natural Philosophy of Time* (1980) is his broadened scope of the disciplinary context.

The main problem in the study of time has not consisted in the lack of any philosophy-physics connection. It is quite the opposite. This dual philosophy-physics approach seems to be the method of investigation that has been most applied. We find that phenomenology seldom or never attempts to approach physics, or any other sciences for that matter. We also see that the temporal realism approaches looks to relativity physics for support and validation of its claims. But we never see that temporal realism brings the phenomenological approach of experience into the context with the purpose of perhaps learning something. It is precisely this lack of connection between different fields of investigation that has to be overcome in the study of time. This indicates that there are metaphysical differences to be overcome as well as other scientific- and methodological biases. It is this lack of understanding of how these different approaches to time can meet, or why they cannot relate, that I find to be the most characteristic of the philosophy of time and other fields of time study. The intention of this dissertation is to put temporal experience, theories on subjectivity, metaphysical theories, realism, idealism, theories about objectivity in the sciences and in thought, relativity physics, thermo-dynamics, biology, some psychology, metaphysical context theory, into one and the same study of time. This was necessary in order to question the rational basis behind theories that rejects the epistemological as well

as the ontological reality of temporal experience. This does not bring irrationality onto the stage. On the contrary, it put lights on the importance of subjectivity as the ultimate basis for any rational approach, which is an aspect of rationality that has become blurred by the traditional mind-body dualism, a metaphysical belief which is still thriving within the various academic cultures of the Western world.

To dissect the above complex of theories into explicit groups of literature, I will begin with the opposing views that were born as a result of the tremendous impact McTaggart's 1908 paper "On the Unreality of Time" had on the philosophy of time. Here, he distinguishes analytically between different series of time, namely the A-series and the B-series. McTaggart himself, as well as many others, did not consider the distinction to be merely "analytical" but representational of something partly independent of mind. McTaggart came to deny reality to time, meaning that time, understood as A-series and B-series, did not exist on the outside of the mind. However, time, as C-series were real. The C-series have had little importance on later thinking. All subsequent philosophy has focused on the distinction between A-series and B-series, typical for the analytical tradition, while continental phenomenologists have dealt with various aspects of temporal experience as phenomenal experience. From the second group we have Husserl's *On the Phenomenology of the Consciousness of Internal Time* (1991), Bergson's *Tiden og den frie vilje* (1990) (Time and Free Will), and Heidegger's *History of the Concept of Time: Prolegomena* (1992). Recent phenomenology also applies McTaggart's temporal distinctions. And the status given to the distinctions are not always obvious, that is, if these distinctions are to be understood either epistemologically or as representational of differences consisting of internal and external realities.

As already mentioned, analytical philosophers who study time can be divided between the temporal realism position and the temporal anti-realism position. The first position claims that it is the B-series that represent objectively the temporal sequence in which the event occur. The anti-realists say that it is the A-series of present, past and future which constitute the correct representation of time. Of the various B-theories, I have focused on the famous *Real Time* by Mellor (1981) and Faye's *The Reality of the Future* (1989). The most notable and common feature of both these works is the fierce attack on human temporal experience and the concept of "becoming". Their claims rest on the assumption that both A- and B-series can be treated as if they really are independent of each other.

I spent a considerable amount of time searching for theories which could present me with a synthesis of the two temporal series. I found that in Sellars paper (1962), but also in Broad's (in Gale, 1968)

there were interesting aspects which could highlight the strange procedure of hypostatization of “temporal facts into the mold of non-temporal facts about abstract objects” (Broad, in Gale, 1968:137).

One recent theorist who is trying to overcome the incompleteness of B-theoretical time representation is Richard Gale. In a series of papers he has shown his turn away from his earlier position of dynamic time and “becoming” (1967, 1968). I had the opportunity to visit Gale at the University of Pittsburgh where he took great pains in explaining to me his new approach. His new theory is called “The co-reporting thesis”, and deals with the necessity of identity between the A- and B-series since we cannot operate with only one of the series. The only aspect that can create an intelligible identity between the series is the “now” of a real agent. Strangely enough, Gale gives the B-series more epistemological importance. However, in the end it seems that Sellars’ theory turns out to be the more constructive one since the temporal picture of the world (tensed or detensed) is one in which we have to *use* and not only mention the term “now”. The framework is always someone’s *now*. Only the now makes clear the non-fictional character of statements, that this is rooted in real-life activities of observation and inference (Sellars, 1962:592).

Not accepting to treat time either as A-series or as B-series I turned to Bergson’s *Duration & Simultaneity* (1999), Eddington (1939, 1946), C. S. Peirce (1990), Lestienne (1995, 1998), E. E. Harris (1988, 1993), D. R. Griffin (1986), Capek (1975, 1965, 1976), Cassirer (1953, 1965), Cleugh (1937), Whitrow (1980), and Dewey (1948). These thinkers represent various approaches to the question of the nature of time. Still they all agree about the essential nature of time to be dynamic and that “becoming” is characteristic of time. Even subjectivity and temporal experience are given importance in the sense that a relation between the mind of man and real time is suggested in a variety of ways.

These thinkers and their work bring this project over to the field of physics and the importance of time in the physical world as well as in its description. From the above it is clear that there exist confusions about the distinctions between real world properties and theoretical entities hypothesized as real world properties. This confusion rests upon dubious metaphysics. This is the reason why time in physics becomes a problem located between the real world and theoretical fiction. The literature that motivated me most in the investigation of physical time was primarily Einstein’s own work, (1954a, 1954b, 1956, 1966, 1976, 1988, 1999), which at first seemed to present me with a connection between temporal experience and the development of the physical time-concept. I then confronted several thinkers claiming to build from Einstein’s fundament, philosophically as well as

scientifically. Most notably of these was Grünbaum's work (1967, 1976), which rejected any mention of dynamic time and claimed that "becoming" is mind-dependent. Of Einstein's contemporaries should be mentioned Gödel (1976, 1997) since he was among the first to interpret Einstein's work as "static time" (1976). A contribution which Einstein found valuable.

On the other side of the trenches I read with interest the work of Prigogine (1986, 1980, 1997), where a new vision about the interrelationship between man, the world and scientific thinking was introduced. Prigogine's claims were that physical time conforms to our fundamental experience, the laws of physics need to be rewritten, the physics claiming that nature in its minutest parts behave reversible in time have gone astray. This indicates a total change of physics, as we know it of today. But Prigogine is not alone. Along with him in the new project of turning the tide in favor of "becoming", for the "irreversible time" of experience, he has other prominent thinkers as Stapp (1986), Sachs (2000), a reformed Paul Davies (1997), Bohm (1957, 1974, and 1995), and Pauri (1997). These thinkers differ considerably but their similarity rests on the fundamental transitive character of the temporal world itself. Stapp tries to develop a fifth temporal dimension of "becoming" within physics, using the S-matrix of quantum theory as his starting point. This leads to strange applications of the time series. Sachs criticizes the ontological sense of objectivity attached to metaphysical aspects within Einstein's relativity theory. Bohm's early work is very informative and straight to the point. These sources has led me to claim that physical theory must restrict its use of time concepts that cannot be empirically confirmed. At least theoretical concepts that are context-dependent should be restricted to theory and not be given any ontological importance. Paul Davies is now criticizing modern psychophysics. The Italian physicist Pauri tries to show the importance of human temporality and experience for physical inquiry, and so Pauri has also been very important for my own orientation.

One of the greatest obstacles was to decide what kind of *object* time is. This meant that I had to go into the realism-idealism debate. I had to secure a fundament for subjectivity and I had to determine the "nature" of "objectivity".

A further obstacle was the dualistic ontology that not only separates mankind from nature. This is a dualism that also establishes a disjunction between mind and nature within each and every human being as well. Everything material, including the brain, is *nature* and is therefore an object of science. Mind is of a different nature and falls outside the scope of science, at least of the "hard sciences". It was the old dualism of quantities versus qualities that popped up of the hat. If the time of mind shall have any relevance at all it is necessary to show

how flawed the dualistic metaphysics are, at least to show how bad a fundament it is for science wishing to be rational. The realism and anti-realism debate had to be cleared away first in order to balance the weights, that is, to find the right balance between metaphysics, method and subjectivity. Essential reading to be done in order to manage this task was of course Putnam's books (1983, 1987, 1990). Aggerbeck (1994). Peirce (1996). Polanyi (1998). Popper (1975, 1983). Rescher (2000).

Putnam is the anti-realist. Aggerbeck gives an insightful study of Berkeley, balancing the weights for Berkeley so to speak. Peirce is the moderate realist. Polanyi argues for personal knowledge, while Popper advocates realism, although a metaphysical kind of realism that cannot find the temporal realism valid as a realistically founded approach to the study of time. Rescher tries to find a synthesis between realism and idealism thus appealing to the reason of realists and idealists alike.

The subjectivity and objectivity concepts had to be seen as concepts, that is, as *symbols* created by the mind interacting with its surroundings. The essential need for different detached perspectives is clearly pragmatic. Dworkin (1996) argues against theories which see time and science entirely as social constructs. However, the concept of objectivity seems to have dawned on us from nowhere, to paraphrase Thomas Nagel's *The View from Nowhere* (1986). Other interesting works by Nagel are (1979,1998). N. Rescher took a slightly different approach to the question of objectivity (1997). I take Rescher's approach further in the sense that I place the traditional understanding of physical time within his context of epistemological objectivity and ontological objectivity, and furthermore by broadening the scope by applying Mandik's categories of objectivity (1998). In conversation with Rescher at Center for Philosophy of Science, University of Pittsburgh, Rescher expressed agreement with this application of his theory. Another great thinker is E. Cassirer (1965). He discusses the relationship between mankind and its symbolic universe. He analyses how mankind has been able to develop symbolic tools in order to understand and to create, resulting in the invention of science. Here is no dualism, no "*Ding an Sich*", denying man his access to true experiential information about reality.

Determinism and the fundamental laws of physics present us furthermore with something of a conundrum. The conundrum is, of course, that time is reversible, systems are closed and symmetrical, and the laws governing all this are claimed to be universal. These components added together yield a microscopic reality, that is, we are offered a *fundamental reality* that is *deterministic*. Bas van Fraassen (1989) represents the anti-realist view where laws do not represent

reality in any true sense. Husserl (1970) gives groundbreaking analysis of the context on which the laws of nature rest, a work where he attempts to answer the question why we have *universal* laws. But the most inspiring of the classical literature must have been Peirce's *Values in a Universe of Chance: Selected Writings* (1839-1914). Today there is still a tendency to implement the "doctrine of necessity" to everything, a tendency that Peirce criticized already for more than one hundred years ago. Peirce's arguments are taken further. They are related to contemporary discussions within physics and philosophy involving the concept of time. On contemporary participant in this discussion is the Danish physicist P. V. Christensen, (1987, 1988, 1993). John Earman (1986) represents contemporary determinism. He presents a determinism which includes the elements of time reversibility and symmetry of the laws. Cartwright (1983, 1999) is a must for anyone who shall investigate what laws are. She can be placed somewhere in between van Fraassen and Putnam. Like both van Fraassen and Putnam she thinks that laws are not descriptive of nature. Other literature on the matter of laws and determinism are by Martel (1999) who discusses indeterminism and by Reichenbach's view on "becoming". Also von Wright (1974) has been most informative about different views on causality and determinism. Bunge (1979) puts causality and causalism in connection with the issue of determinism. Lewis (1974) and Bohm (1957) reject determinism altogether. Gurwitsch (1965) and Marcuse (1965) discuss the historical context for metaphysical determinism. Fernandez (1993) sets up a line of argument against determinism in physics from Peirce to Bohr. Lastly I have to mention Denbigh & Denbigh (1985). They differentiate between meanings of determinism thus pointing at an important problem if indeterminism was to be true, namely that of determination.

In discussing evolutionary epistemology in connection with temporal experience I have had to criticize the notion of "filling in". "Filling in" has usually been taken as proof of the illusionary character of temporal experiences. The notion of "filling in" has been covered by applying and criticizing the arguments of Libet, Wright, Feinstein and Pearl (1979) as well as of Dennet (1991). Davies (1997) has opposed the view of Dennet and Libet.

Essential literature about the possibility of a relationship between mind and nature through temporal adaptation is illuminated by Whitrow (1980), Fraser (1990), Harris (1988, 1993), Jerison (1973, 1976), and Saunders (1976). All these various philosophers and scientists have all attempted to show how mankind has developed its cognitive capacities including the sense of time.

This leads us to the contexts of scientific explanations. One of my main inspirations is the classical work by Burt (1936). Other

classics, of what may be termed “metaphysical context theory”, are of course by Husserl (1970) with his concept of “Life-world”, and by Kuhn (1996) with his theory about paradigms within scientific thinking. Others who have contributed with interesting perspectives are i.e. Polanyi (1998), who also stresses the importance of tacit knowledge, here applied in the sense that commitment comes in the form of tacit acceptance and application of contexts produced by authorities within the field we work. In the debate that came in the wake of Husserl we find both Marcuse (1965) and Gurwitsch (1965). Another contributor to the irrationality of science is Feyerabend (1987, 1993). Addelson’s (1983) contribution focuses on the academic authority and the specialization of professional thinking. More recent we have Jones (1986) who discusses the relationship between physics and metaphysics, and Rapp (1993) who compares metaphysical systems and scientific theories. This dissertation is, as a whole, part of this larger philosophical debate.

1

Epistemological Metaphysics and Time

Metaphysics and epistemology presuppose each other. Both of these areas are involved in the investigation of reality. Being involved also implicates both in the problems concerning the conceptual determination of what kind of status we are to label the various different properties and aspects we find intrinsic to reality, that is, to existence and ontology.

Another important aspect of metaphysics is that metaphysics are involved at some level in every epistemological doctrine. The perhaps most important aspects of metaphysical involvement in the epistemological doctrine are all those various and different metaphysical ideas and assumptions that *commit* investigators in their roles as researchers and scientists. Every epistemological doctrine assumes certain specific “world-views”, “cosmologies”, and a stance either towards “realism or idealism”, “positivism or rationalism”, naturalism, objectivism or subjectivism. In short, every thinker is somewhat “biased” by ideas and notions, theories and paradigms that help shape and form what may be termed his or her “background of conscious acts”. And this is the case for the large variety of ontologies concerning my issue, namely how to determine the “*nature*” of time.

1.1. About Epistemological Metaphysics and the Foundation of Time in Mind and Theory

The self-understanding of any epoch, including our present conceptions of science, is determined by metaphysical presuppositions.³ The reaction each and every one of us may have to this statement should give us a hint about our own *personal* commitments. The answer one gives depends on how one view the role of metaphysics in relationship

³ See Friedrich Rapp, “Metaphysical Systems and Scientific Theories: A Structural Comparison”, in P. A. Bogaard & G. Treash (eds.), 1993, *Metaphysics as Foundation*, SUNY, p. 240.

to science and to human spirituality, and how human spirituality and science are related. That is, of how rational science and the spiritual yet temperamental human being can become *united* in the effort to disclose *reality*.

Metaphysics have often been criticized for being a *dogmatic* way of arguing for certain definitions of what “reality” is supposed to signify. Traditionally metaphysics are identified with ontology, with the type of theory that defines “being” and as such is constitutive for ideas concerning *reality*. The critiques of metaphysics claim that instead of constructing theories about what reality *is*, we should investigate in a critical manner what *possibilities there are for knowledge* in the first place, that is, we should be concerned with epistemology. It is only relatively recently that metaphysics again have been looked upon as an approach which has importance to our understanding of how we construct knowledge. Now, it has become evident to most investigators in the field of knowledge that metaphysics presuppose epistemology as well as epistemology must presuppose metaphysics. Epistemology has to presuppose metaphysics as *ontology* because all awareness and experience, that is, human cognition, are directed towards “that which is”, or “being in itself” or “as it is perceived to be”. Ontology is precisely concerned with “being” as well as with “becoming” and “passing away”, or “not-being”.

Epistemology must also presuppose metaphysics in the sense that we all have metaphysical “commitments” in which we seek guidance in our labor to decide upon whatever topic. These are “commitments” that we have to take with us everywhere we go; “commitments” that constitute our general outlook on the world. Thus, background elements are hard to get rid of since the very character that makes them such important aspects of our personal symbolic universe are precisely their “likeliness”; their claim to “truth”; their cultural “actuality” – whether it be scientific or otherwise. We could also call this concept of “background” for “life-world”, “horizon”, and “transcendental categories” – although these elements are not, in my opinion, innate but *cultural*. I prefer to term this “background”; since we are here talking of individual or *personal* “backgrounds” which influence one’s choice of certain things. Others may share elements of this “background”, but it is rather unlikely that someone else can share *all* the elements of an individual’s “background”. We need only to consider the complex nature of anyone’s personal beliefs to agree upon this claim. *This “background” may therefore be an obstacle to rationality.* Background elements may be an intrusion of ideal, or rather “theoretical” elements that are part of the subject’s personal belief-system; elements that seldom are questioned themselves.

Husserl already emphasized this aspect with the term “life-world” in his *The Crisis of European Sciences...*⁴ However, some of the commitments, perhaps most of them, are in many cases only influential in a *tacit* sense, as tacit knowledge, upon what we think and how we represent the world we have perceived.⁵ Furthermore, it is a “background” which also has a practical means in that it serves as our personal source of information – information concerning the world *we* live in. In this sense, our “background” is understood as i.e. our memory, of utmost pragmatic importance to our comprehension of the world. However, we can easily distinguish between such elements of memory which origin in the practical perception and experience of the world, and those ideal elements which have become influential of quite other reasons.

I have already mentioned that this “background”, as far as it is “metaphysical”, is “cultural” rather than “innate”. It is simply a product of learning. Thus, there are in relation to the characteristic complexity of the human mind *cognitive elements* of knowledge like those of religious, political, and philosophical foundations, which together with other various beliefs, ideas and concepts *constitute* this “background”. Thus, the background that we possess will tint our judgments and other types of reflective work we might be doing.

Now, it happens to be the case that it is most probably the elements that are *products of learning* that are authoritative, and as such they are the dominating elements in the construction of experience. These learning-elements are authoritative because we believe them to be just that, because they are emphasized as *true*, *necessary* and *fundamental* for instance by the academic authority. As Kathryn Pyne Addelson has pointed out, we tend to believe that the methods of science are the most rational ones, and that when these are practiced properly they yield objective knowledge. There can be only one truth and science is the instrument we apply in obtaining this truth.⁶ Scientists are specialists and specialists have therefore an epistemological or cognitive authority.⁷ Furthermore, their *understanding* of matters within their sphere of expertise is often regarded as *knowledge*. We believe that the methods applied to reach this understanding; that they are rational because we believe that they

⁴ E. Husserl, 1970, *The Crisis of European Sciences and Transcendental Phenomenology*, Northwestern University Press, Evanston.

⁵ See M. Polanyi, 1998, *Personal Knowledge*, Routledge.

⁶ Addelson, K.P., “The Man of Professional Wisdom” in Harding, S., and Hintikka, M., eds., 1983, *Discovering Reality*, Dordrecht, Boston and London, p. 165.

⁷ Ibid.

have been criticized and tested. Also Thomas Kuhn⁸ focused on academic authority and metaphysical commitment as an irrational aspect clinging to scientific procedure. Kuhn focuses on science as an activity but he also stresses that as an activity science includes not only theories and laws but also metaphysical commitments. Metaphysical commitments are therefore certain beliefs about “the nature of the living and the non-living things of our world and about their relations with us and with each other.”⁹

Metaphysical commitments are part of the “background” information we have as individuals. This background information is highly influential upon *theoretical* considerations, for instance upon *reflected* decisions, upon *idealizations* and *abstractions*, which are again elements which depart in a clear and distinct way from the immediacy of conscious presentness. The fact is that when we sense directly the sensible things of the physical world we may say that we *sense* the *same* things more or less the *same* way. When we *perceive* a thing, the acts of differentiation and identification will be present and thus be influential in the reconstruction. This will happen according to what we already know about the thing, that is, “know” or “believe” or “assume” the thing to *be* from the generality of the framework/background in which it falls into and by which we also identify it. Thus, among individuals, there have to be different opinions about concrete things, their functions, essences, natures, and so on, since these elements are already part of the individual’s “background” which is applied in the thing/object identification and conceptual reconstruction. Therefore, all these different views cannot be correct; they cannot all be products of *cognition* and *rational* method. They must somehow have been “put into the frame” constituting what we refer to as “rationality”, together with other relevant elements. In this sense, for instance, *ontological* “commitments” are *constitutive* in the construction of epistemological strategies to disclose what is assumed to be *real*.

This line of investigation carries within itself, for instance, the assumption that no man has a more favored position than any other human being in the world, which should, if possible, enable him or her to be completely unbiased in the pursuit of knowledge. Therefore, I believe that the notion that *all* theories and *all* epistemologies must have *metaphysical* elements, or a “*forcing schemata*”, is important. It is important because this hypothesis could help to clarify what aspect of the background material *aids* or *obstructs* the scientist or philosopher

⁸ Kuhn, T., 1996, *The Structure of Scientific Revolutions*, The University of Chicago Press.

⁹ Addelson, 1983:167.

in their activities. A greater rationality in science would require a critique of metaphysical commitments.¹⁰

But we should perhaps state that we do not claim that the scientific effort to gain knowledge is relative, that there is no objective knowledge, and so on. I believe there is. We just have to change the perspective a little. Personal knowledge is not necessarily always a hindrance to objective knowledge; it does not render knowledge *relatively*, it represents perspectives on the world, frameworks that may be useful instruments to gain verifiable knowledge. *It is the unverifiable knowledge; the hypothesized and idealized elements constituting the intelligible binding material of various theories that can be questioned.* And, as I will be arguing, the assumed *ideal* symmetric or reversible nature of time is precisely such an element.

Knowledge, on the other hand, is not relative if we stick to the structures of the concrete and empirical, that is, to those structures and features of the world we can intersubjectively agree about from an empirical (experience) point of view. These are the elements that are necessary for us in order to construct intelligible and intersubjective concepts of the real.

Thus, we can see that the aspect, which is mostly concerned about knowledge, is how we are able to define a borderline between what is genuinely human (“subjective”) and what is evidently and genuinely independent of human nature. The real problem of knowledge is to decide upon what separates human mind and nature from the theoretical “nature” science is interested in. This would be a “nature” that has no correspondence with human concepts. This is a “nature” that is independent of man and man has thus a reality which is “in itself” and therefore cannot be approached by man with his normal cognition capabilities. The distinction between which elements of our “background” that shall be allowed to dominate the scene has to do with a distinction between speculative elements, that is, between an abstracted “perspective” *and* the common and concrete perspective of experience. The relativity is avoided if one is able to maintain an experience of what connects the concrete with the abstract.

Hence, we cannot avoid that there is a presence of both rational as well as irrational elements in the production of theories, that is, of *theoretical* knowledge.¹¹ Scientific and philosophical theories must

¹⁰ Addelson, 1983:168.

¹¹ A theory – even if it is scientific, does not necessarily signify the same as knowledge. However, we can distinguish between several forms of knowledge; “concrete knowledge”, “practical knowledge” or “theoretical knowledge”. This is to say; *theoretical* knowledge is a kind of knowledge that is dependent upon its specified theoretical context framework, perhaps more than any other kind of knowledge. All these types of knowledge

therefore be defined as being either *realistic* or *idealistic/anti-realistic* theories. The theories will define and specify certain ways of conducting the “rational procedure” or “method”. These metaphysical positions both believe that they possess the *correct* and only method that will grant them access to the kind of reality of interest for their branch of science. Realism or idealism constitutes a preferred framework for the actual thinker. The positions, which are part of the metaphysical “background”, have to include assumptions about *human* nature. Especially the assumptions about cognition and estimations about the epistemological *value* of perception and experience are important factors of this “background”. Idealized elements constitutive of specific theoretical frameworks lurking in the “horizon” will be applied categorically when judgments and decisions are made.

I focus on the peculiar “gulf” between the concrete experienced reality and abstracted or idealized aspects which are elements in memory and experience. My own rather trivial opinion is that the more *abstract* our theories are the more they will differ in nature from the concretely experienced. In other words, abstract theory will suffer as a consequence of suspicions which again are caused by the theory’s obvious lack of a relationship to the concretely real. To be more specific: for *time* this means that when our opinions about the *nature of time* differ from each other it is because we try to explain time in terms of abstractions. This also indicates that we apply different explanatory models which force us to conform to a specific technical terminology already implying a certain specific style of “rational” procedure, that is to say, “forcing” us to accept certain inherent meanings that are hidden in the presuppositions of the theory. This perspective emphasizes the influences of theory on our “background”.

On the other hand, differences in opinions that appear both in the philosophy of time and in the philosophy of physics have to do with differences, not in *how* and *what* we factually experience when we experience *time*, but in “background” or metaphysics, mainly brought about from existing theories. This “background” must then be viewed as part of the personal knowledge which the individual carries with him/her into the overall explanation of things. In a sense we could perhaps say that the more abstractly metaphysical¹² a theory about

are typified by the area or object they represent. What typifies this knowledge as “theoretical” is that it is about *types* and not about things. On the other hand, we have the concrete “object” presence in “concrete knowledge”. Although this concrete kind of knowledge is *general*, it is “concrete” because it has contained the conceptual linkage to the concrete object that this kind of knowledge is said to represent.

¹² Which means that its idealized (abstracted) elements are far removed from the concrete elements of experience.

time gets, the more *personal* it probably is, that is, with respect to the specific background elements implemented into the theory by the theorist. This seem less rational from an empirical point of view, that is, when and where the empirical content, together with its structure and order is denied any relevance to the overall explanation. But it may still be rational in the sense that the abstract theory conforms to scientific norms, to a pre-given rational framework and to a set of specified rules. This also means that it is rational because it may apply a certain and accepted form of methodology, that is, that it conforms to certain forms of logical *discourse*. Since epistemology cannot omit or avoid talking about “being” or “reality” in some sense, it should deal with these metaphysical issues. The issue of how the nature of the relationship is between the concrete, lived time and the scientific, abstract time has not been thoroughly analyzed before.

It is this idea of an epistemological metaphysics that I intend to apply as a framework to understand a few different scientific and philosophical views, which are meant to give us an account about the real *nature* of time. In my treatment of the possible nature of time the investigation is concentrated around the contrast between experienced temporality and scientific, objective time. Thus, we have to explain the term “foundations”.

The term foundation in relation to the idea of time indicates an approach that deals with time as a most basic idea, which somehow is presupposed or should be presupposed in other parts of the culture. It treats time as an idea, which is fundamental because it is a pervasive idea.

To examine the foundations of time in this manner is simply metaphysics. As it has been pointed out, the method is to highlight presuppositions and assumptions, commitments and experiences in order to differentiate between the real properties of time and what can be termed “purposive” alterations of what we commonly know time to be. This means that we are either looking at ideas or concepts which have their origin in the experiencing and cognizing individual subject itself, or which have *become* part of this cognizing individual’s horizon and yet at the same time do not have their origin in the individual’s own cognitions of the real world. This last aspect is twofold, since one strand is about the “injection” of time from theoretical learning, while the other is about a time which is part of nature proper. The last matter may indicate a relationship between concepts about time, which have their origin in the individual’s experiencing and cognizing of the world. “Foundations”, therefore, mean that we shall discuss some of the arguments that are *connecting* or *disconnecting* to the “experience of time” and the “theoretically and idealized approaches to time” with science and reason. Thus, we cannot avoid investigating the

inextricable relation between time and the concepts of subjectivity and objectivity. And so we should take a stand in the debate between realism and idealism.

All experience can be characterized as made up of a subject on the one hand, which is confronted and aware of something, which on the other hand, is opposite to it as an object. In this sense, we must determine our awareness as a relation between subject and object. Where metaphysics and epistemology intersect we see that the problem of subject and object becomes extremely difficult. If, as realism claims, subject and object exist independently of each other and both are “in-themselves”, how can we then establish a relation between that of subject and objectivity, which discloses the objects, as they are “in-themselves” without tainting the essence disclosed with subjective aspects? Concerning time as an object for science we have, of course, the initial problem of deciding the issue of how to determine the nature of the object when the object is time. Which makes us ask how time becomes an “object” in the first place. It is the task of epistemological metaphysics, within the framework of general metaphysics, to analyze and discuss this problem.

Thus, there are basically two main types of approaches to the problems of science, and hence to time in particular, namely that of “realism” and that of “anti-realism/idealism”. Realism understands the object, the independent object, as the first and most important issue in the relation to the experiencing subject. Idealism, on the other hand, sees the subject as the most important and primary one since it is the subject, which establishes the relation to the object in the first place, irrespective of the fact that the “object” has to “be there” in order to be perceived by someone. The task of the idealist is to show how the subject can objectify the content of subjective awareness and experience. This appears to be contrary to realism, which endeavors to explain objects in terms of movement, energy, force and matter. Or time as symmetry of processes expressed by the fundamental laws of physics. This has left us with a confusingly large amount of time-concepts, concepts that originate together with the characteristic features of physical thinking. Thus we have absolute time that has two senses: a) *Newtonian time*, and b) *non-relativistic time*; we have furthermore *special relativistic time* and *general relativistic time*; but also *relational time* as well as *constitutive time*, being logical opposites. And there are more ideas about time, which we shall not go into here, restricting ourselves only to a couple of general but stubborn ideas that are of special interest, since they keep to the notion of having a “nature” of their own. That is, a nature which is absolutely independent of human cognition. One of the problems that realism is faced with is to explain how a world of objects, like “objective time”, in

one or the other meanings just mentioned, can produce *subjective, conscious awareness of time* when it is independent of human perception and thus unreachable by ordinary human experience.

The above situation can be described by asking how do we conceive of the nature that we ascribe to the “objectivity” of time? When we say that time is real we are stating some kind of reality for time that is dependent upon some specific kind of nature. When we say that “time is real”, everything hinges on what is meant by “real”, on how *we* relate to this “reality” and to this kind of “time”, and ultimately, how we relate “real” and “time” so that its objective nature becomes evident and unambiguous for everyone to understand.¹³

1.2. Reality and Time

The relationship between *time* and *reality*, and how time and reality are related to human temporal *experience*, and furthermore, how human temporal experience is related to temporal abstractions, here termed *physical* or *scientific* time, is the theme of this dissertation. It is a complex of ideas related to the interpretation and understanding of reality through the understanding of the reality of time that only can be analyzed by understanding the relationship, or lack of such a relationship, between human temporal experience and abstract scientific time. Time is “becoming” and “being”, it cannot be reduced to a definition that sees in time the characteristics of only one of the concepts. The reason for this claim is very simple, too simple perhaps, but it rests on the fact that we deal with reality, which can be characterized as both changing, as flux, but also as “permanence”. We deal with these factors in our everyday life, we deal with the reality of time, a reality that is contradictory from a logical point of view, in an unproblematic and simple way everyday of our lives. It is simple in the sense that we do not pay any attention to the logical contradictions by the way we normally go about in the concrete world; by solving concrete and practical problems. It is, on the other hand, not as simple as experienced reality since the experience of time involves us on a personal level and makes us very aware of our own mortality. On the abstract level it is difficult to unify the differences implicit in the concepts of “becoming” and “being”. However, attempts to reconcile

¹³ See my paper “Some Neglected Aspects in Connection with the Objectification of Time”, in V. F. Hendricks & J. Ryberg (eds.), 2001, *Readings in Philosophy & Science Studies*, Vol. I, Roskilde University.

important aspects of temporal reality as it is found empirically in the world have begun to take shape as “temporal logic” in recent years.¹⁴ Although the abstractness of theoretical time is our business temporal logic is not. Our everyday or simple non-logical adaptation to both the transitiveness and permanens of the world is found in experience. But it is also found in the logical way we apply language to describe, in communicable terms, our experiences to others, by using both tenses and references to tenseless “facts”. We can move around easily with both categories, placing the event within the scope of experienceable reality as something which becomes or changes and as something which *is* in relation to something else and which makes sense to others as an intersubjective reference point both in time and place. In this sense time is a fundamental reality.

Another fundamental concept we cannot avoid to use, whether it is as a common-sense concept or as a scientific term, is the concept and/or intuition of “reality”. Most people assume that the world we live in is real. We have a fundamental certainty about what is real and what is not and why these things are real and why they are not. However, the more theoretical our reality gets it seems less simple. Everyone regardless of metaphysical position must presuppose some sense of “reality”. Since we all share the notion of something that is real, and since we have differences of metaphysical positions, we have irreconcilable and ultimate differences of ideas about what reality is. We can see the divergence in the different views about time. Time and reality are inextricably (in every sense of the word) linked together; they eliminate time from reality and we cannot imagine what reality would be like. If we removed reality from time we would be left with appearances that we would have to know were mere beliefs or fantasies about reality. What we sense and experience would only appear to be properties of reality.

No one denies that time is “real” phenomenally speaking. When it is stated that time is *not* real it may be the same as stating that time is an illusion, or it does not have to mean that at all. We could still have grounds for believing that we perceive and experience things as if they were in time. The serious consequence of denying the *reality* of time, of time *experience*, is that the way of experiencing things is denied to have any *ultimate* significance. To many theorists, it is self-evident that we exist in a reality where time is appearance. Others again see reality as part of the texture of wholeness, that is, which

¹⁴ I am thinking of the studies within the field called “temporal logic”, begun by A. N. Prior and taken further by Peter Øhrstrøm. For an excellent introduction see: Peter Øhrstrøm & Per F. V. Hasle, 1995, *Temporal Logic: From Ancient Ideas to Artificial Intelligence*, Kluwer Academic Publishers.

includes appearance among the reality-defined phenomena of the world, and hence includes time, although in a rather inferior position. Still others reject the reality of time altogether because time, that is, a time conforming to the characteristics of experience, does not conform to the premises put down by pure thinking, premises which are beyond questioning. The answer to the question of what the ultimate significance is of time, which is beyond the reach of experience, is by this very fact beyond the reach of human cognition. Perhaps, the answers we actually come up with are only provisional; perhaps they cannot be anything else since these answers would then depend upon our partiality to certain commitments.

There are, however, ways to *understand* the issue of the *real nature of time*. It is quite often held that time is inexplicable. Time is thought to be inexplicable *because we cannot separate* it from our experience. Furthermore, it is believed that time cannot be explained because there are certain problems or difficulties that are peculiar to time. First, we see that time is seen as something that we necessarily have to deal with because we experience it and cannot part with the experience. Thus, time seems fundamental, although we cannot be sure how it *is* independently of our experience. One assumes that our view on time is necessary but partial and subjective. All experience is temporally structured. The other sense mentioned assumes that there is something irrational about time. That time can be divided between human temporal experience and that it is independently in-itself of human participation. It is a division between human beings and time. This is, in my opinion, an undesirable claim since, evidently, *we are in time*.

The time of mind that constitutes our awareness of presence *now* is fundamental to our experience. It is so fundamental that it cannot be separated from any kind of experience. This must put some restrictions on what we can claim to be part and property of the nature of time. That is, our analysis must, at least from the perspective of the realist, remain incomplete. The incompleteness of the description of nature of time tends, however, to be more on the side of the temporal realistically inclined theorist, who tends to exclude temporal experience altogether, than on the side where the temporal experience is found to be fundamental. This is so, since we may project our private cognitive limitations on time when we perceive of time in the way we do. On the other hand, we have to keep in mind the opposite danger of separating time in an absolute sense from experience so that we give “real” time an independent and thus an alien mode than the one we perceive. Metaphysical theories about the nature of time, and this should include epistemological and physical treatments of time that claim something about the nature of time, must, however, risk this

danger. We have to admit that it is not illegitimate to consider the nature of time as something “abstract”. The abstraction enters every level no matter how one chooses to describe or explain the nature of time. Even in our everyday talk, which must refer to primitive, experienceable temporality, we have to apply idealizations and abstractions to a certain degree. When we refer to “now” or “yesterday” or “tomorrow” or “before” or “after”, we are abstracting and applying the abstractions in our description of things and situations by creating a comprehensible, i.e. intersubjective, order in our communication. This shows us how we objectify or abstract and when and how we actually go too far with our abstractions claiming a “nature” for time that never can be verified empirically. In my opinion, it is important to avoid going too far.

It is the exaggerated philosophical valuation of abstractions that motivates me to focus on temporality as an integral property of reality, that is, of *nature*. Perhaps it is more correct to say that it is the time of nature, which is integrated in the minds of men. The confusion is precisely that the ontological, i.e. the actual, real-world issues and the epistemological issues, i.e. assumptions and hypotheses, are hard to distinguish.

Even if temporal realism rejects the ultimate significance of time from the perspective of temporal experience it nevertheless should, and this I believe to be one of the great weaknesses of realism, accept that *time is experienced* and as such time is *empirically* real. The consequence of all realist accounts about the nature of *scientific* time, hypothesized to play the role of the *real* nature of time, is that it consequently refuses to take experienced time as something *given* in experience. Instead of beginning with the simple everyday experience of temporal ordering it is usually completely ignored. The theorist pulls it out of the hat when it is necessary to legitimize his abstractions by referring to the experience of time as inadequate and/or illusory, that time is contradictory if we compare experience and abstraction. Only a very simple view on time can be satisfactory. To begin with abstract consistency and then to bring this abstract consistency to bear upon the issue of the nature of time is doomed to fail because it is to begin with the wrong end. We must accept the fact of experienced temporality.

It is, however, true that we can freely explain away temporal aspects and characteristics as being nothing but “mere” appearances, definitely not *real*, not properties of reality. As I see it, the problem seems to be the question about the ultimate significance of time; that it is difficult to determine from attempts which are focused on the characterization of experienced temporality as *not* real. Or by reducing the experience since it cannot be believed to be nothing else but a

flickering of a time that is much more fundamental. This is problematic because we cannot escape the temporal perspective and claims are made for properties of real time in its *independent* “state of existence”. Therefore, it is my view that no attempt has actually succeeded in eliminating or reducing empirical time.

1.3. Metaphysical and Scientific Foundations of Time

All theoretical *use* of time in one form or the other must presuppose primitive time. The foundational aspect of scientific time is therefore experienced temporality. My reason for illustrating the procedure of objectifying by beginning with the concrete and proceeding to the abstract is that we can, from an epistemological point of view, save a *real* basis for our accounts of reality. Furthermore, our awareness of time must *presuppose* time such as it is, and that we have *access* to this time. Somehow, real time must, time as it really is, be foundational for the human awareness of time as our awareness of time is foundational for the scientific and philosophical idealizations and abstractions. Abstractions and idealizations are secondary to experience in that they are applied to help separate out and thus individualize certain pre-conceived aspects of particular value for the kind of knowledge craved for by the theorists.

We must understand that the human awareness of time is something that evolves and which is a product of interaction between subject and nature¹⁵. That is, temporality is a product that evolves and emerges together with the evolution of subjectivity. This evolution goes hand in hand with a conceptual evolution crossing over into different cultures both historically and intellectually, and thus slowly giving “time”, as we today understand it, a significance of being intrinsic to physical and organic existence. The activity of the human subject is of vital importance. And in the end it must be emphasized that commitments and other metaphysical “beliefs” must be put aside in order to realize that the foundation of concrete time in experience, and ultimately in science, is a necessary product of the active subject in its interactive discourse with nature. My notion of subjectivity refers to that internal subjectivity which activates every subject as an agent in the pursuit of *knowledge*, that is, “know-how” of the world. The leap

¹⁵ I will discuss this aspect in chapter 8. Until then I will refer to this “adaptive” ability and to the “organic” origin of temporality as a phenomenon, which has to do with flux or becoming and which is an experienceable phenomenon.

from primitive to *scientific* time, represented as the “time” in “relativity physics”, or in “thermodynamics” or perhaps in “quantum physics” or even within “statistical mechanics” is large. Large is also the distance of conceptual difference that concerns these various understandings of the nature of time, that is, the one that exists between these physical areas. How are we really to understand these physical perspectives on time: As knowledge about the real nature of time represented by the objective concepts: Or as epistemological-operational abstractions that cannot avoid elevating its results to the level of full-fledged reality, to ontology? Abstract concepts appear in physics transformations of *idealized aspects*, which may or may not have their roots in the concrete experience of things. This indicates that these abstract concepts can only exist in the intelligible and ideal realm of theoretical reason. Abstract time, in the way physics apply it, is a transformation of experience in relation to other ideas; ideas that can be related to each other in specific ways; ways that are depending on the peculiarities of the theoretical context. Physics aim at explaining time in a way in which it is certain that time eventually will fit into the pre-established epistemological explanatory scheme. This means that, in regard to time, physics aims at making time part of its general methodology. Physical time is abstract time in the sense that its purpose in the scheme of things is to be concerned solely with a specific type of relations which can be found only within physical theory. This is not to imply, however, that physical-*theoretical* time necessarily shall be identical to the time of mind. Primitive time is altered, or conceptually transformed in such peculiar ways precisely because physical time must have a different purpose in the scheme of describing *physical* things or processes. The objectification of time, that is, the idealization of certain aspects as well as the elimination of others, of what we otherwise know to be time, cannot give us a theory of what *really* real time is about.

At the very core of this dispute about the nature of time we find the more general discussion between *idealists* and *realists*. This means that later on we also have to decide on the related issue of subjectivity and objectivity and the interplay between “subject” and “reality” within reality. We have to decide on how the subject partakes in the process of determining what kind of “object” *time* actually is.

2

The Problems of Realism

The most *reasonable* view in philosophy is the one that somehow is able to combine necessary elements of both realism and idealism. This is also my aim. It is my aim to attempt a reconciliation of the two views in the sense that I believe that a more realistic foundation of time within the sciences must rest upon a synthesis of objectivity and subjectivity. In contrast to our own position we will find, on the one side, reductionistic objectivism or scientism, and, on the other, an unbridled subjectivism; these two extreme positions constitute and uphold an ideological crevasse, a *separation* of human experience and reality. I will therefore treat genuine knowledge deserving the status of objectivity as nothing else but the fruit of authenticating subjectivity.

I will begin with a brief characterization of realism as such, and then proceed to the position of “metaphysical realism”. Following, I will discuss whether metaphysical realism is the foundational basis and framework of “temporal realism” or not. I see temporal realism as nothing but a specialization of some of the fundamental ideas, which realism believes to be of concern for the interrelation between reality and man. Thus, it also has temporal realism as its claim for justifiability in the realism-hypothesis that makes up the basis of metaphysical realism. I shall also take a look at idealism and various often-quoted misconceptions about idealism. Lastly, I will propose my own view in form of what I term, here applying the Hegelian dialectical term, *synthesis*.

2.1. Realism

I believe that we can say that the philosophy of Immanuel Kant introduced a change in the philosophical and scientific attitude towards mind and its relation to reality.¹⁶ Thus, we can talk about realism *before* and *after* Kant.

Generally speaking, the most essential and characteristic feature of realism is the notion of a *mind-independent* existence, which means

¹⁶ See for instance Vasilis Politis’ “Introduction to Immanuel Kant”, 1996, *Critique of Pure Reason*, Everyman.

that individual or a species of things have an existence that is “in-itself”. Realism is a metaphysical position; it is a stance taken of individual mind-endowed human beings towards the world in perception. On the other hand, to *deny* that something is mind-independent is yet another, however different, metaphysical stance that is called anti-realism or idealism. However, philosophical discourse discloses the fact that we, as philosophers and scientists, tend to choose different specifications for what is to count as “independent of mind” and also in which way this “mind-independent” entity is supposed to exist. There are many metaphysical issues over which realism and idealism have been argued. For example, we have the question about the existence of moral values. Or we have the problem of the existence of souls and minds. More interestingly is whether the past can be said to have been real, or, on the other hand, if the future is real. We tend, nevertheless, to take different specifications for granted and therefore we have a tremendously large variety of senses in which the word “realism” is being used. In order to get a general feeling of the modern sense of philosophical realism, we shall now briefly take a look at the “before” and “after” of Kant.

Medieval scholastic realism had two poles: an *extreme* or exaggerated version and a much more *moderate* one. These two poles of realism were opposed to “nominalism” and “conceptualism”. Scholastic realists in general did not see “mind-independence” as any essential feature of their positions. In fact the “mind-independence” aspect did not present itself as any feature at all in the debate; it is only in modern philosophy that the aspect of mind-independence becomes an issue. It is the focus upon the aspect of “mind-independence” that marks of the shift from “medieval” realism to our modern versions. Scholastic realists emphasized the intimacy between mind and reality rather than focusing on the issue of having to deal with different “substances”.

Medieval philosophy, however, was preoccupied with the problem of universals: the problem of correspondence between concepts and natural things. This signifies that the problem consists of somehow “weighing” the truth of conceptual representations of essences or natures to individual things or species of things which exist in nature. For the realists the issue, of having a world apart from the way we think about it, was simply presupposed. That things existed “independently” of the contemplating mind was an empirical fact. Certainly, it did not constitute the obstacle to thinking as it does for modern realists. Nevertheless, medieval realists did understand the relationship between their concepts and reality differently. The problem of universals has to do with how we can access reality, whether *reality* is understood as the totality of creation (*natura*

naturata) and/or as the creative, generative aspect (God, e.g. *natura naturans*) in or outside of nature itself together with or without created nature. External things or objects are singular, individual, determinative. Our concepts represent the realities independently of all particularity; they are “universal”, that is, *general* and abstract.

Vital to the realist position called “extreme realism” are neo-Platonism and its *dualism* between the transcendental Forms. These exist independently and prior to the creation of the world and created nature. Thus, we might say that man and nature are from the same source. Therefore, there are no problems of operating with the assumption that there are universal concepts in the mind as well as universal things in nature. We see a strict parallel between universals or “essences” in nature and essentials conceived by human thought, since everything in nature has from its source of creation the same character of universality as our concepts.

Nominalism rejects this kind of parallelism. Here, the concept should represent the thing in its concreteness, that is, as it is perceived. Nominalism denies the reality of any abstraction and universality. Concepts that generalize do not describe a real generalization existing in nature. It seems merely a human fiction. Nominalism rejects the claim that human minds can engender universal concepts representing real universal properties. Concepts are nothing but labels for a collection of particular things and events. Neither “extreme realism” nor “nominalism” believe that they can establish a correspondence between the thinking concerned with the thing and the thing existing in nature, since they both, although differently, claim harmony between thought and reality. It is when we assign *different* properties and attributes to the “thing in nature” and to the “thing as something thought” that the problems arise. This is precisely the case when we say that one is particular and the other universal. Then we have the *antinomy* that concerns us in this dissertation, that is, the antinomy between *natures* on the one hand and *thought* or human cognition on the other.

The moderate realist, however, has no problems when he declares that we naturally have and apply universal concepts because these concepts represent faithfully the realities that are particular and concrete.

The second opposition to realism in medieval philosophy is “conceptualism”. It is the view that the human mind must apply universal concepts and therefore these universals are real but only as far as they are “located” within the human mind. These generalizations do not represent the true outside world – the really real. Therefore as essential natures universals are not to be found in particular things in nature. We cannot know and the “conceptualists” state, whether or not

we have a correct representation of the nature external to our minds; or if our universal concepts have a foundation in the nature as it appears by the hand of God. The concrete reality we perceive as realized in the particular thing can only be something this particular thing possess by itself and thus cannot be shared by any other.

The transition to the modern sense of realism came, however, with the philosophy of Kant. Kant saw idealism as the opposing view to realism. For Kant realism was divided into *transcendental* and *empirical* variants. Like the empirical realists, Kant was of the opinion that we know about the existence of things and objects in the world. These are things that appear in space and time. The transcendental realist would go further by stating that the existence we claim to know is wholly independent of our perception and predication. Kant would probably disagree with this view since his view was primarily interpreted as stating that knowledge is about things in the world dependent upon perception. However, this knowledge would rest upon nothing else but appearances. This is not knowledge proper.

Thus, we can say that Kant affirms the reality of universal concepts as something “mind-bound”, that concepts are real only within the human mind. We can also distinguish between our universal concepts and sensations. Thus, we have sensations of a particular and floating world and schemata of universals to create order for our sensations. It is the *a priori* forms of our minds that can be held responsible for generating universal representations. Experience can not yield any basis for our universal concepts, like for instance time and space. Time and space are therefore schemata that arise from our mental organization.

Following Kant, realism has become a multifaceted intellectual phenomenon which gathers around a few core-beliefs like the most important one: *the existence of a world independent of our mental acts*. Now the problem is not so much that there exists a world independent of our minds. The problem consists of how to establish contact with the world so that we can create knowledge about it; knowledge that contains the “essence” of this world as it is in-itself. For many scientists and philosophers this is important since knowledge about the world is knowledge that is not tainted with subjectivity. Nevertheless, the many and interrelated realist doctrines gathering around the axiom of “independence of the mind” can be illustrated by mentioning a few but influential positions. Closely related to the general formulation of realism we find the theory of “epistemological realism”. This theory holds that the real thing or object exists independently of any person’s perception and thought. However, one usually operates with a distinction between “direct or *presentative* realism” and “indirect or *representative* realism”. Of the *direct* branch of realism I would

mention firstly “Aristotelian realism”. This is the doctrine that the human beings perceive of the essence of the object directly through sense perception, i.e. the realized and qualitatively presented “idea” or “form”, characteristic for both the individual and class of object.

The “Moderate direct realism” finds some qualities of material objects to be objectively real and therefore also perceivable directly and immediately through the human senses. Other qualities are, however, potentially real, that is to say, they have not been actualized in the object and are therefore only causally present within the object. These latter potentials do not “exist” in the object since they are merely “potential” qualities and as such dependent on the mind of the human observer.

Another form of direct realism is “Immediate” or “Intuitive realism”. This position claims that physical and mind-independent objects are directly presented to the mind through sense perception. The immediacy of the givens as they are in-themselves presented to our minds also presents us with existence “new” to us and therefore it must be something independent of our own minds.

As the last position of “*direct* realism” I wish to mention “Naïve direct realism”. The “naivete” of this doctrine consists in the idea that perceived objects have their “nature” disclosed directly. This is to say that things actually are the way we perceive them to be.

Of the “*indirect* realism” doctrines I would first like to mention “Critical realism”. We know of physical objects by means of logical ideas. Likewise, we do understand physical objects in terms of logical ideas. However, it *is* the physical *object* that we get to know through cognition, since what we sense and perceive has existential likeness, or even identity with the independent reality. Nevertheless, when we perceive, there are certain qualities present in our perception that cannot be said to be part of the mind-independent reality as it is in itself.

This leads us to “Objective indirect realism”. This kind of realism holds that our human abstract thoughts, that is, our “representations” and “ideas” have likeness and perhaps even identity with the external objects the way they are when they are not perceived.

“Inferential realism” claims that we have immediate knowledge of our own ideas or representations of external objects. Thus, the doctrine still holds, we do not have direct access to the physical objects of the real world independent of our sense perceptions and thoughts. However, the inferential realist infers that his ideas have an external and objective cause.

Contrary to this doctrine, as well as the “Objective indirect realism” we have the “Subjective indirect realism” position. This is simply the claim that our indirect knowledge of the external world,

which is via our representations or ideas, does not resemble the external objects.

Lastly, I would like to mention, “Transfigured realism”. This is a doctrine, which claims to know that the reality that underlies appearances is absolutely inconceivable to us. We only know phenomena of reality, phenomena or appearances that in them have a transfigured reality. This phenomenal “world” has been so altered from the actual and mind-independent reality that there is no resemblance between external reality and our sense perceptual knowledge.

However, among the most influential realist doctrines we find “Metaphysical realism” and “Scientific realism” that somehow have a connection with the doctrine of “Temporal realism”.

2.2. Metaphysical Realism

The general attitude towards realism presents realism as the view that material things, other humans, trees, stones, mountains and so forth, exist externally to ourselves and therefore also independently of our sense experience and knowledge. There is no problem of accepting this definition, however, it does present us with a problem as it may imply that we (humans) are on the *outside* looking *in* on reality. It is this possibility of a “separation” of human experienced reality and a reality that exist “in-itself”, that is, the separation of *man* and *reality* that the metaphysical realist takes to its most extreme articulation.¹⁷

The metaphysical realist believes that man cannot trust his or her senses or other forms of experience in order to conceive of what is really real. The metaphysical realist likes to think that there exists an absolute disjunction or separation between mind and matter. Similarly we find that the difference in definition between the subjective and objective domains of the world is based upon this lack of trust or belief in our experience together with the assumption that the ideal products of man’s mind is subjective and therefore not real. Thus, the metaphysical realist also believes that it is possible to preserve in

¹⁷ The following account of metaphysical realism rests on the following thinkers and works: Hilary Putnam, 1990, *Realism with a Human Face*, Cambridge, MA: Harvard University Press. H. Putnam, 1987, *The Many Faces of Realism*, La Salle, IL: Open Court. H. Putnam, 1983, *Realism and Reason*, Cambridge University Press. N. Rescher, 2000, “An Idealistic Realism: Presuppositional Realism and Justifactory Idealism”. Nancy Cartwright, 1983, *How the Laws of Physics Lie*, Clarendon Press. Karl Popper, 1983, *Realism and the Aim of Science*, Routledge.

theory a definitive borderline between concepts, ideas and symbols *and* things, processes and relations in reality so that it can distinguish in an absolute manner between epistemology and ontology. The problem, as I see it, is that the essential ingredient in the metaphysical realist view is that *real* reality lies outside the *reach* of human experience. The metaphysical realist is thus decapitating experience from the body of knowledge, making the *relation* between knowledge of the world and the world, as the world is believed to be in-itself, *mysterious*. There is a big crevasse between the moderate realist and the metaphysical realist views. The moderate realist states that the world must be something which is prior to our actual experience of it. Metaphysical realism on the other hand goes much further and states that there is a reality which will never be disclosed by experience or by our cognition. The usual explanation for the claim that we will never disclose the really real by our experience and cognition is given in form of the myth that there is “something” in between reality and us as experiencing subjects. This “something” is what makes it impossible for us to perceive true properties. Therefore, there has to be some other and necessary means which enable us to disclose “true” reality. Therefore, the most pregnant problem will be, for the metaphysical realist, to explain the linkage between human knowledge, which must correspond to reality *and* “reality-as-it-is-in-itself”.

The reason given by the metaphysical realist, in order to account for a knowledge that can transcend our experience and normal everyday cognitions, is to claim superiority for a subjectivity-transcending faculty within subjectivity, namely for a “higher” intellectual faculty that can rise above the coarseness and relativity of experience. The problems arising with this view are, of course, the dualism imposed on the human mind which divides mind into two *different* areas that, presumably, have nothing to do with each other. The thing is that one may believe that “higher faculty thought” is not part of the ordering taking place in the experiencing of the actual world since it is not believed to be determined by sense experience. It is thought that this “higher faculty” operates independently of experience. It is a kind of faculty that functions pretty much like any disinterested calculating device opening up for the hidden but fundamental reality by abstraction or subtraction.¹⁸ The essential and shared belief found in these two viewpoints is that we can isolate what is real from what is mind-dependent. This is extremely difficult if it is

¹⁸ For an understanding of the “subtraction” viewpoint see Huw Price, 1996, *Time’s Arrow and Archimedes’ Point*, Oxford University Press, p. 267. See also my paper in Norwegian: Jan-K. Berg Olsen, “Temporalitet og realisme”, *Norsk filosofisk tidsskrift*, nr. 1-2, 2001, årgang 36, pp. 62-82, for a critique of this viewpoint.

time that is the object of the investigation. It seems problematic as there is a confusion of objective time with true, ontological time. I will discuss later on, but for now it must suffice to comment upon the fact that it is hard to see how one can determine any truth about the “ontological” nature of time – whether it is by abstraction or by subtraction – in this manner. We do not – and cannot – “abstract” or “subtract” any real properties of time from our experience – any more than we are able to “isolate” temporal properties, which are properties that are part of our experience as *not real*. It is hard to see how we can – if at all – “detach” from our subjectivity in the sense of having a mind that comprises consciousness and experiences of both ourselves and the external world, thus placing ourselves very much in this world that we experience. Let us grant that we can “detach” to some extent from what we know is just a product of our own temperament. Nevertheless, every “detachment” is due to our subjectivity and thus is to be found within subjectivity as such.¹⁹

There is some kind of relationship between certain ideas. There is a mysterious relation between the metaphysical belief in a higher and detached intellectual faculty and the belief in the “existence” of a fixed borderline between “fact” and “knowledge about fact”, that is, between ontology and epistemology.

But as we might be aware of, it is sometimes difficult to separate between what is *real* in itself and what we *know* to be real. However, a “borderline” between fact and knowledge of fact emphasizes that knowledge of reality should be true, that our knowledge of things correspond to what things really are independent of any perceiving subject, that is, “objectively”. But since it is difficult to verify or falsify beyond the reach of scientifically extended *observation* one cannot empty the possibilities that might be hidden for us, for our experience and observation, because we cannot see to the bottom of reality. This means that we have to allow into the domain of knowledge aspects that cannot – at least not at the moment – be verified, but also to allow aspects which probably never can be verified because they are idealizations and assumptions necessary for the intelligibility of the theory. These speculative aspects are justified by other means than observation or procedures like verification or falsification. However, to give these speculative aspects justification, that is, the right to remain as necessary parts of the theory would mean that we have to justify them as possibilities by a detached

¹⁹ See “Temporalitet og realisme”. I have also treated this question in Jan-K. Berg Olsen, “Some Neglected Aspects in Connection with the Objectification of Time” in V. F. Hendricks & J. Ryberg (eds.), 2001, *Readings in Philosophy & Science Studies*, Vol. I, Roskilde University.

viewpoint and thus give the justification itself an appearance of being objective. This is factual since the opposite, that is, to give the speculative aspects a real objective justification, would mean to go beyond the reach of human experiencing and scientific observation. Thus, we end up with the fact that we can, as far as these speculative elements are concerned, never go beyond our concepts, that is, to something that should be more fundamentally real than these concepts are themselves.

Hence, we have concepts and ideas, idealizations, rather speculative hypothesis and assumptions that we nevertheless cannot do without in our labor to construct a theoretical picture of reality. We cannot theorize about the world only by appealing to subject-independent “facts”, as these “facts” may be in-themselves. We have to assume something about them. Therefore, knowledge about the world will have to include elements and aspects that are necessary for the intelligibility of the theory. These aspects and elements are themselves not *factual* in the peculiar sense that the metaphysical realist demands, that is, as subject-independent realities. This means that the “borderline” of the metaphysical realist becomes rather blurred in actuality, and that is further blurred by the *separation of experiencing from thinking*. Since a separation of human experience, that is, as a method of accessing “reality” as it is in-itself is rejected, an appeal to higher faculty thinking cannot save realism. The “thing-in-itself” will still be out of reach since it will still be independent of human knowledge; it is per definition *inaccessible*.

Thus, we can spot a further contradiction within metaphysical realism. Not only do we have a cleavage between experiencing and thinking as we have a cleavage between a world that we can experience (appearances) and reality (fundamental or microscopic), because the contradiction goes even further. The contradiction is to be found in the core of realism, namely as a contradiction between the view realists have of knowledge as insight, which is a necessary product of a higher intellectual faculty and its outright skepticism about human knowledge *per se*. This is clearly shown in the belief that our concepts (since there is a borderline between knowledge and ontology) cannot tell us anything which is really true about reality, as it is in-itself. In other words, there is the fact that metaphysical realism believes that we can have objective knowledge about the world seems contradictory. Nevertheless, metaphysical realism seems to be *nominalistic*. Metaphysical realism is nominalism since it claims that we never can disclose “reality as it is in-itself”; because concepts are “mind-things” and therefore cannot be similar-in-content to anything independent of mind. I believe the conflicting ideas of realism and nominalism to be elements of the ideal basis which constitute theories

like “coarse-graining” and “the mind-dependence theory of time”. This schism is found, among other things, in the fact that the necessity of applying the human subjectivity as an inter-connected whole is inescapable in the process of putting together the bits and pieces that make up our knowledge of the world. We always end up with our more or less true concepts. The metaphysical realist cannot justify or perhaps he believes that he is not allowed to justify, what makes the concepts true by appealing to *experience*. Instead he must appeal to something *beyond* experience, *something believed not to have a human origin*. In this view, the content of human consciousness becomes a mystical representation of something that is denied accessibility to us through our usual means of orientation in our surrounding life-world. Thus, there has to be limitations to the human intellect, that is, there are circumstances that tell us that the properties and features of real things outrun our cognitive reach. Essential and crucial aspects of reality are placed outside the reach of human subjectivity. Hence, realism speaks for a position that emphasizes mind-independence as a true feature of the real.

For the more *moderate* scientific realist the claim for realism is found in the substantive knowledge of the sciences. The problems that scientific realism generally is struggling with are those concentrated around the explication of the ontological status of scientific entities. Such entities can be atoms or the neuron. Connected to this explanatory work is also the problem of discriminating between properties along the explanation of what kind of properties belong to these entities in the first place. Lastly we find that the problem of transforming these theoretical entities into ontological *real* objects also include some kind of explanation of the *temporal* development of the states of the entities and their interactions with other entities. The *metaphysical realist*, on the other hand, finds the basis for realism in the assumption that we cannot achieve complete knowledge of the real, that our means of achieving knowledge are limited to such an extent that we can only talk about a partial access to reality. The metaphysical scientific realist explains knowledge. This includes scientific knowledge by *emphasizing our shortcomings* when it comes to knowing the real in whatever form it may be.

Nevertheless, it should be clear that whether one is a metaphysical realist or not one would still have the insight that enables one to agree upon experience and thought as not always corresponding with each other. The metaphysical realist has created a cleavage out of this subjective insight. It is the “cleavage” itself that becomes important to this form of realism. However, the definition of what secures the access to the real content of the world is ambiguous. For the realist reality will always remain “in-itself” and this is, of

course, different from most descriptions of what we believe reality to be. In this sense reality as it is in-itself will always remain what it is in-itself and as such it will be the secure fundament with which we as scientists and philosophers refer to and thus control and explain our attempts. However, is the realist correct in believing this?

The whole issue of understanding the relationship between thought, experience and perception is complicated. *We* (humans) will always *experience* reality in the same manner, this is to say, we will always *see* trees as trees, and we will always *hear* birdsong as birdsong and so forth. But the categories by which we determine and describe what is experienced do not always have to remain the same whether they are within the individual or within some specific branch of knowledge. What remains the same to experience or sense perception may appear to be different in thoughtful contemplation. This is better understood if we understand that experience has at least two or three levels, that is, from what is perceived as concretely to the abstract. In this sense we can understand that it is not what is sensed which differs as a sense-object in experience, but what becomes in its more abstract form by appearing differently according to changing categories by which we explain and describe the sense-object in knowledge. Time in *experience* is a disclosure of its specific “nature”, as it is “in-itself”. However, this is not obvious, at least in the context of realism. To most people time appears perhaps to be the same since we all can use tensed language when we talk with each other and thus are able to understand each other. The question of what time is changes according to different philosophical positions. This means that the understanding of the object in question becomes idealized and theory-dependent in different ways according to difference in philosophy. The position that I am mostly opposed to is the form of metaphysical realism, which in the discussion about the nature of time, is better known as “temporal realism”.

2.3. Temporal Realism

Of the greatest concern to the temporal realist is the necessity of justifying the claim that there exists *a tenseless world* with *no transitory properties* and, preferably, *no objective distinctions between “now”, “past” or “future”*. Accordingly will the temporal realist argue that all tensed talk are nothing but mere subjective utterances that

have no bearing upon the objective determination of the facts located within reality but independent of the perceiving subject. This means that an objective account of the independent real occurrences, that is, the facts can only come about by the use of a tenseless language, like when we apply the distinctions “earlier than”, “later than” or “simultaneous with” to describe the order of the tenseless events. One should therefore attempt to reduce all tensed reporting of occurrences, which are assumed to “be” tenselessly in the subject-independent reality, to tenseless language since “every utterance of any tensed sentence has tenseless truth conditions”.²⁰ However, the terms “now”, “future” and “past”, and the relationship between these terms, still have a particularly stubbornness. As we will see, they are hard to get rid of even for the realist.

What are the core beliefs of the temporal realist? First and foremost that reality itself has no innate distinctions between “now”, “past” or “future”. They are all subjective distinctions. We are in a sense talking of a “being”, which does not come to be or cease to be. The distinction between now, future and past is irrelevant to the objective account of facts that has to be true whether it is in the past, now or in the future. The metaphysical realist of time does not like or want to take the questions about fatalism or determinism seriously. This means that most temporal realists, as in the case of Faye, claim that the future is “open”. The future is real beyond the present or actual state of affairs. That we cannot verify the future state *now* has to do with the way we perceive the world, that is, with the narrow and restricting or limiting outlook our senses and consciousness allows us to have of the world around us.

Also the temporal realist distinguishes between ontology and epistemology, or perhaps it would be more correct to call it *logic* instead of epistemology since the realist asserts that future states or events are *logically* determined.²¹ This is, according to Faye, something the realist holds to be *necessarily* true.²² However, this would indicate that the borderline between reality and theory becomes blurred. If something is stated about the future *at this moment* and then becomes verified *when* it occurs, then it is true. But can we say that it is true if it is true when it has not occurred yet? Logically it is. It is logical to say that a fact will be a fact whether it has occurred in the *past* at t_0 , *now* at t_1 , or in a *future* state at t_n . Future and past events are all logically determined at any time.²³ The consequence of the removal of the veil

²⁰ See Jan Faye, 1989, *The Reality of the Future*, Odense University Press, p. 90.

²¹ *Ibid.*, p. 93.

²² *Ibid.*

²³ *Ibid.*, p. 95.

between theory and reality is indicated by the assumption that if it is logical it might very well be real. In fact this only states something about the logical “nature” of facts, that is, of logical identity that in the metaphysical doctrine of *deterministic universality* must be true at *all* times. This is a “ontology” of time where the characteristics of experienced temporality is replaced by a “time stretch” that has the characterizing features of being something that “is” and that can be measured. “Being” is that which is spatially stretched out in time, a time that comprises all there *is*, and “measure” is at what “time” it occurs on the time axis. Time is simply defined differently from that experienced temporality we normally presuppose in our everyday life. Therefore, if “facts” are universal time cannot lapse as a transient, irreversible, asymmetric and heterogeneous transformation of the world.

That the future is *real* is to say that the future is *logically* determined. This means, according to Faye, that objective tenses do not exist.²⁴ That time is divided into different meanings or determinations, as past, present and future depends solely on the existence of a perceiving mind. Which, again, is to say that “perceiving minds” are to be considered as obstacles of true insights of reality. Of course, this leads us to the realist point of view that the *present* constitutes no *objective reality*. It is the subject-independent that is “true” and “real”. The temporal realist cannot see anything in the world that would indicate to us how we should divide the world into past, present and future. The obvious thing would be to understand human beings as part of the “world” or reality, but the realist cannot accept this since he rejects that man can access the true yet hidden reality through experience. The confusion of whether one is dealing with descriptions of an epistemological character or a metaphysical statement is again blurred because the knowledge referred too is about the world which exists independently of man. This is a world that is imagined to consist of events which constitute an objective temporal order without sentient beings. Thus the argument brings in the faculty of *imagination* as some kind of “God’s eye point of view”. This illustrates that we can imagine what the world and its temporal order would look like if it lacked human beings to constitute the present, that is, as “particular events occurring tenselessly at different times”.²⁵ Likewise, the realist claims that it is hard to imagine what change and becoming might be or consist of if man was absent in the world. The demand is furthermore that change and becoming are the same as “particular events occurring tenselessly at different times”. The application of the

²⁴ Ibid., p. 115.

²⁵ Ibid.

word “occurrences” is, for instance, as opposed to “becoming” or “change”, not further explained. Anyway, the ontological statements are not easy to hide in a description that argues that reduction of tenses and the application of tenseless language would serve us better if we needed to *represent* time, that is, as a constructed relational time-order.

2.4. Idealism and Misconceptions

It is a widespread belief among realists that idealism is to mean the same as *subjective* idealism. Furthermore, it is believed that idealism is the *opposite* of realism; that it is *irreconcilable* with realism. In the first case idealism is held to be stressing that the world, reality, things etc. are mind-dependent; that ideas and concepts have priority over matter both ontologically and epistemologically speaking. Ontologically speaking is idealism held to be the view that the world is a *product* of our own mind, that is, of our conceptualizations and/or ideas. This means that nothing *really* exists which is not dependent on the mind. Hence, physical things are either *mental* or *mind-dependent* or *could be perceived under certain circumstances*. Such “identification” of idealism as *subjective* idealism may, perhaps, be credited the influence stemming from interpretations of the philosophies of George Berkeley and Immanuel Kant.²⁶ In Kant’s sense this could mean that human thought and experience always will be determined or conditioned of, and thus limited, to its own reason and its own concepts.

In the second case we often find statements such as in R. J. Hirst, that: “Realism is thus opposed to idealism, which holds that no such material objects exist apart from our knowledge or consciousness of them, the whole universe thus being dependent on the mind or in some sense mental.”²⁷ The main problem is not that it is realism and idealism that is opposed to each other but realism and solipsism. The metaphysical realist Karl Popper²⁸ likewise rejects idealism because he

²⁶ What I try to say here is that we cannot blame Berkeley or Kant for our way of understanding them even if we may not agree. In the case of Berkeley there are many recent attempts to understand him in a broader context than the “usual” one of solipsism and subjectivism. For an excellent paper on this see: Signe Lykke Aggerbeck, “Realismen i Berkeleys idealisme”, in A. Ousager (ed.), 1994, *Erfaring; Tænkning; Ånd*, Forlaget *Philosophia*, Århus, s.121-142.

²⁷ R. J. Hirst, “Realism”, in P. Edwards (ed.), 1967, *Encyclopedia of Philosophy 1-8*, vol. 7, New York–London, p. 77.

²⁸ See K. Popper, 1983, *Realism and the Aim of Science*, Routledge, pp. 80-88.

identifies it with the “transcendentalism” of Kant and “subjectivism” understood as solipsism. He writes that: “The subjectivist theory of knowledge fails...(because) it naively assumes that all knowledge is subjective – that we cannot speak of knowledge without a knower, a knowing subject.”²⁹ For Popper this was enough to convince him that idealism is wrong since *scientific* knowledge is not the personal knowledge of the “knower”.³⁰ Popper therefore rejected the idealistic theory of knowledge because he identified it as “the subjectivist theory of knowledge”.³¹ The weightiest reason for Popper to reject idealism is that knowledge cannot be knowledge if this is something which only goes on in our minds, or as Popper writes: “*On this subjective basis, no objective theory can be built: the world becomes the totality of my ideas, of my dreams.*”³² Since realism and idealism both are metaphysical theories the theory of idealism as “subjectivism” could not be refuted, although the reasons offered by Popper seem good enough for almost anyone to reject this theory. The best epistemological argument in favor of subjectivism states that *all I know* are my own experiences and ideas. As I will argue later on, idealism is still not necessarily identical to solipsism or subjectivism. As a preliminary to my “synthesis” certain aspects should be emphasized to the understanding of the relationship between the world and mind.

To *know* something of the *world* demands the presence of *experience, understanding* and *judgment*.³³ This also signifies that knowledge of the world demands that there is some degree of information-exchange between the three fundamental cognitive factors. In this context, that is, of an individual who interacts with his or her surrounding world, we cannot talk about the individual creating the world, nor that he or she “experiences” that he/she “creates” the world. What we do is that we somehow participate in establishing the identity and certainty of what goes on in the world as “knowledge”. To use the language of phenomenology, we “*constitute*” the world.

Understanding is very much a “creation”. Understanding is an activity, namely of creativity that assembles, affirms or rejects bits and pieces of probable possibilities from experience and perception into the most probable, the most verified. Thus, we are not talking of a creation of the world but of a creation of knowledge of the world. Thus, reality is “understood”, it is “knowledge”: to be “real” is to participate in the

²⁹ Ibid., p. 92.

³⁰ Ibid.

³¹ Ibid.

³² Ibid., p. 82.

³³ See H. A. Meynell, “Metaphysical Lessons of Idealism”, P. A. Bogaard & G. Treash (eds.), 1993, *Metaphysics as Foundations*, pp. 73-96.

understanding of reality. “Reality” signifies nothing other than to be known through creative understanding. However, this does not fuse the “real and ideal”. “Reality” is to be *known* through *experience, understanding* and *judgement*.³⁴

It is the dividing line, the absolute border between subject and knowledge of object, between object and subject-independent knowledge that becomes confused or blurred in realistic epistemology. This is due to some confusion about *nature*, that is, the *meaning* of the concept of “objectivity”.³⁵ In one aspect we can apply the term “objectivity” as descriptive of the way the realistically inclined behaviorists understand humans “objectively”. Humans are, in this particular realistic framework, treated as if they had nothing of those qualities, or abilities, or capacities that we normally would say belonged to man, namely that of thinking, feeling and understanding. Another way of “objective” viewing is to *imagine* what things would be like if there were no humans to watch. We will strive to understand things as they really are and for this reason we can place imaginary brackets around our bias and preconceptions. The objectification of reality, of whether reality is human or non-human, becomes queer once we vulgarize this second sense of “in-itself”. We vulgarize by over-emphasizing the meaning found in the “behavioral-realistic” notion of “disengagement”. The disengagement we feel sometimes is functional or instrumental from a personal point of view. It is perhaps intended to enable ourselves to *control* our personal emotions regarding our environment and is thus not the “objective” as we first believed since the disengagement most likely carries deep within itself an intention or motive for its application.

The main problem of realism is the uncritical belief in the ability of disengagement; of having the ability to have a “look” from an absolute “God’s eye point of view” for *all* kinds of things, and thus to be able to spot the real that is hidden within. The “vulgarization” is the notion that one has really “disengaged” and that one has achieved “disenchantment”. That one can disengage in one’s act of thinking about the world, which also “means” an objective disengagement from one’s own subjectivity, may leave the spectator with a belief of having achieved a “pure impression” of the world as it *really* is. Reality and subjectivity are something that shall be kept apart because subjectivity is defined as the opposite of objectivity. The epistemological distinction between the subject and the world is taken for granted as a distinction which is also real, i.e. a distinction which exists in reality.

³⁴ Ibid.

³⁵ Although this topic of “objectivity” is treated in a later chapter, some preliminary comments are necessary at this point.

2.5. Synthesis

The opposition of realism and idealism is also an opposition of outlook or attitudes towards science. More precisely is the opposition between naïve realists and naïve formalists. Both positions search for an explanation of nature, both positions have a need to justify their science as a legitimate explanation of the real, that is, it is more correctly to speak of a justification of a stance which is ontological or metaphysical. The surprising thing here is that idealism and realism, in the shape as naïve realism and naïve formalism, have merged into some kind of synthesis. However, this synthesis differs from the one I propose. The peculiar synthesis of formalism and realism becomes evident if we take a look at what differentiates the kind of explanation that these positions offer.³⁶ The consequence is that unjustified claims are produced concerning the ontology of some entity in question. The alliance between realism and formalism is seen in the efforts to defend a “conceptual primacy to space rather than to time.”³⁷ Both positions, and this is why we reject this kind of “synthesis”, argue that time, as we *know*, it is an illusion.

The formalism in question explains nature by referring to eternal forms in nature, forms which ultimately are mathematical or geometrical. According to Wegener, this seems to be “vulgar Platonism”.³⁸ On the other hand we have naïve realism with the notion that nature has “something” in-itself, a “something” that is “matter-in-motion”, something non-sensible. What muddles the distinction between these positions is that formalists often use the jargon of the realists.³⁹ This is seen, for instance, by the way truths shall be independent of experience just like mathematical and logical truths are thought to be. As a consequence space-time geometry is presented as a structure which is immanent in nature itself.⁴⁰ Thus, a limit has been transgressed, namely by science itself since statements on ontology have no easy resting place within science; science should abstain from claims about exclusive status for its hypothesis about “fundamentals” as explanations of the essence of nature. Nevertheless, idealizing is hard to get by in science. All “fundamental”, “ultimate”, “supreme”

³⁶ See the paper by Mogens Wegener, “Conflicting Ideas of Relativity”.

³⁷ Ibid.

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ Ibid.

reality is essentially ideal in nature. All idealization is a reshaping of experience. With idealization we strive to give contemplated reconstructions to the qualities of conscious experience. These reconstructions replace the original content of experience and fills in what it lack in actuality, the reason is that experience mainly consists of disagreeable contingencies. What is imagined in this idealizing activity, as a reshaping of experience, seems to be those “things” that are absent in reality; this is an imagination which is reflective and thus directed and guided by a desire that only a metaphysical commitment can initiate. Platonic forms are survivors in formalism because the notion of ideational being has been reshaped by idealization to meet the demands of modern science in those respects where actual experience is disagreeable. What formalism and realism primarily agree on is that experience is contingent, fleeting, momentary and transient, in short: unreliable as a source of knowledge.

Change is instability and when something is insatiable there must be something incomplete about it. There seems to be absence and deficiency. True reality is changeless; it is Being that always remains itself in fixed rest. For “time” this indicates that in nature emphasis is put on the *nomothetic* features, whereas the generative features are neglected. Although, when we experience time, we have an experience which includes both being and becoming in an unproblematic unity⁴¹. This unity is dispersed with in the theoretical operation of idealization which is either formalistic or realistic. “Fundamental reality” is changeless and total; its oneness is harmony, it equals symmetry and symmetry is perfection. There are therefore correspondence between levels of reality and degrees of truth: the more fundamental or complete the reality is the more true seems the knowledge that it refers to. To escape the metaphysics, the blatant hypothetical nature of these assumptions, the realist proposes that “it is not the origin of ideas which should interest epistemologists, but the truth of theories...”⁴² To know something is to neglect origin and discover whatever is permanent. To neglect the origin of ideas, of say, the origin of our idea about time, is to judge between theories in order to find the best and/or true theory is to believe that one can detach or sustain the cause of impartial, thorough-going and disinterested reflection. This is the traditional philosophy of scientism and naturalism and it is maintained as realism or formalism.

⁴¹ See J. T. Fraser, 1990, *Of Time, Passion, and Knowledge*, Princeton University Press, P. 45.

⁴² K. Popper, 1983, *Realism and the Aim of Science*, PP. 81-82.

In contrast to this there is another way of viewing a synthesis that sees in the human cognition a practical approach to the world, which constitutes the fundament for a science that is operative and practical and that ultimately yields objective knowledge.

This means that scientific objects and structures are not put up as something that is metaphysically contrasted to the daily experience of man, and which would constitute a realm approachable only by a naturalistic and scientific rationality.⁴³ We claim with Hilary Putnam that the metaphysical realist thesis is impossible.⁴⁴ Putnam writes: “What I am saying, then, is that elements of what we call ‘language’ or ‘mind’ penetrate so deeply into what we call ‘reality’ that the very project of representing ourselves as being ‘mappers’ on something ‘language-independent’ is fatally compromised from the start.”⁴⁵ This points towards a kind of synthesis of the ideal and the real, which signifies a change in the character and function of the ideal “realm”, which we shape for ourselves in the process of understanding. Now the ideal becomes a viewpoint of things that is not God’s eye point view of things but a standpoint from which we can examine existing occurrences.⁴⁶ This is a suggestive ideality; possibilities can be seen as capable of being realized in nature. There is no longer any “superior reality” that somehow “exists” apart from the world.⁴⁷ This “ideal” has more to do with actual facts than with imaginations. The aim, therefore, must be to come around the problem of how mind and world, subject and object, that are “separate” and “independent”, can, in the words of Dewey, “come into such a relationship to each other as to make true knowledge possible.”⁴⁸

The “fusion” of the real and the ideal does not imply that one has to view the world as dependent upon my perception. It does not imply that the world does not exist independently of my mind. What it says is that all *knowledge* about the real world is dependent upon someone’s mind, upon someone’s perception of the world and its real contents. Real things are in our conception, that is, *as we conceive them*, coated with mind-supplied elements and aspects. This means that there are two necessary conditions that meet, namely, that we have the ability to characterize the world and that the world and its “things” are

⁴³ See John Dewey, 1948, *Reconstruction in Philosophy*, Beacon Press, 103-131.

⁴⁴ H. Putnam, 1990, *Realism with a Human Face*, Harvard University Press.

⁴⁵ *Ibid.*, p. 28.

⁴⁶ See Dewey, 1948:122.

⁴⁷ *Ibid.*

⁴⁸ *Ibid.*, p. 123.

characterizable, that is to say, that the world which is characterizable in the first place is a result of mind intervening.⁴⁹

A theory, which describes reality, is a theory which is based upon reality-descriptive concepts. Again these concepts must be based upon the faculties that we have available to access the world together with what the world may contain. This means that reality, as we know it, through our reality-descriptive concepts, must be based upon perception, “inner” and “outer” experience⁵⁰ and thinking. It is on this fundament, together with the world itself, that we can have an understanding, whether it is scientific or common, of what can be said to exist ontologically.

Things we see, hear or touch are at the same time things in themselves and ideas or immediate conceptualizations. If I sit in my garden and look at a tree I see a tree in front of me, but if I close my eyes it becomes clear that I do not need to see the tree to have an idea about it of being present to my mind. I am still aware of the tree without actually seeing it. This “idea” that I perceive of with my eyes closed is an “immediate concept”, one of those many “concepts” on which my sense of reality rests. Thus, my idea of the tree is a recalling of the presentation not a re-presentation of the tree. Re-presentation demands a higher level of abstraction and idealization referring to other strata of experience where mere recalling is supplied with memory. This means that re-presentation appears at later stages when the immediate idea, the thing we see, has become a link in the process of understanding larger portions of the world through the aid of abstractions and idealizations, through generalizations. However, these things we “see” when we use our eyes and which do not disappear when I close them, are dependent on perception and mind. Thus, we are able to connect to things in the world and to stay connected without actually perceiving them. We can “connect” and this can only take part as a conscious act of the individual mind. Perceived things cannot exist as a thing in contra-distinction to the concept or idea of the thing. Things must be identifiable and the world consists of certain kinds of things. Thus, there is nothing behind the world which we access through our senses, experiences, thoughts, theories, practices and sciences. There is “nothing” behind the world which we *have* access to. That there is “nothing” behind the world we access simply indicates

⁴⁹ In this sense I agree with Nicolas Rescher’s “conceptual idealism”. See N. Rescher, 2000, “An Idealistic Realism”, p. 22.

⁵⁰ “Outer” refers to our sense perceptions, while “inner” refers to what we in fact experience when we experience. This is a fuller experience than a mere sense perception since it would include “space” and “time” as strictly defined “frameworks” of the experience.

that our understanding cannot venture beyond our concepts. Our concepts are the limit. There may exist something beyond the reach of our understanding but that we cannot know since it is beyond our reach.

However, human individuality presupposes some difference in subjective experience about the world. We do not all experience the same things; we do not all have the same “background” so that we can all judge about the same things in the same way. Thus, when we depart from our immediate experience we have to describe things according to our learning, and/or interests, and/or commitments of whatever shape or form. Our own “outlook” on the world and our theoretical or metaphysical interests determine to a great extent the theoretical approach. It also determines our descriptive and classificatory schemata with which we choose to explain the world. The more objective a theory of metaphysical realistic flavor claims to be, the less in touch it will be with the source that fuels this image with some sense of “reality”. A theory that makes an infusion of ideality into reality as the fundamental starting-ground for its idealizations has preserved the real content of the world, which we can access cognitively. This means that there is a connection between the abstractions and things in the world that we can identify. To identify something and to be able to be identified are two necessary conditions for knowledge. And to identify something is human cognition interacting with that “something” being identified.⁵¹ This means that the world *exists* independently of my mind but my knowledge about the world does not exist independently of my mind. Neither does my knowledge exist independently of the world. Thus, I am not a solipsist. I am not a skeptic person either, since I believe that the world around me is manifesting itself directly to me as the content of my experience. The world is manifested in my “outer” as well as “inner” experience since I believe that man as a matter of fact *is* reality and cannot have been made of a different stuff than the rest of the world.

I do not reject the existence of physical objects. What I reject is “ontological dualism” and “materialistic reductionism” claiming ontic truth, scientific/philosophical notions often connected to metaphysical realism, notions that contain beliefs which have been and still are instrumental in the intellectual movement towards a “compartmentalization” of *man* and of *man and the world* into different reality-strata/compartments. That is to say, man into “spirit” and “body”, and reality into man and the world in itself. This is to say, a) “man”, that is, into negative subjectivity in the sense of focusing on

⁵¹ See Rescher, 2000:23.

appearances and illusions. And b) “world” as matter, that is, as “fundamentals” to which everything that otherwise is “appearing” can be reduced, that is, explained objectively. “Matter” in itself; for instance, can support neither qualities nor quantities without the mind.

By the way we blend notions from both idealism and realism, we have to have as a property of our theoretical foundation, a distinction between conceptual “mind-involvingness” and “explicit mind-invokingness”.⁵²

The question of determining the nature of time, “mind-invokingness” would indicate to *characterize* experienced temporality, as an “*illusion*” would be explicitly “mind-invoking”. According to Rescher, illusions typify the kinds of issues which are of relevance to the thought-processes of beings with a mind: to have illusions there must be “mind-equipped beings” to have these illusions.⁵³

In contrast to this we have physical time that mainly rests upon the understanding that there is no time that lapses, that time can be reversed, that time is a structure as symmetrical as that being which the laws of physics represent. In this realist understanding of physical science and its time concept, the time that the physicist operates with seem entirely non-mental: It can be applied as a measure derived from the necessary causal order of the world and is, as such, “time” as an object of physics.

Nevertheless, I will claim that there could never be “physical” time in a world without minds. Physical time is an artifact of a certain purposive (i.e. communicative) sort equipped with a parameter on which moment-determined-events are extracted. Such purposive artifacts all invoke goal directed processes of a type that can exist only where minds are.⁵⁴ For time to be “physical”, only certain aspects of what we normally understand as time is kept and turned into what we know as the “time axis” or the “time parameter”. In its limited version this “time” is a fabrication that has been given discriminative points of regularity from which dates can be determined and events given a moment in the unfolding process of real-world time. Thus time has been given a specified purpose, an epistemological purpose.

Moment determinations as well as moment discrimination are inherently the sort of things produced and employed by mind-endowed beings. In sum, to explain adequately what “physical” time *is* we must

⁵² Ibid.

⁵³ Ibid.

⁵⁴ Ibid. Although Rescher does not talk about *time* in this particular context I believe we can apply the context at hand to understand the scientific purpose of wanting to have a *certain kind* of time.

refer to moment determinations and thereby in turn, ultimately to temporal experience. The point is that to explicate what is involved in characterizing *time* as “physical time” we must eventually refer to minds and their capabilities; accepting that “physical time” is by its very nature something for people to read of from their watches. Time in physics is thus only an artifact created for a certain sort of “intelligence-involving purpose”.⁵⁵ While clocks – unlike illusions – are not mental items, their conceptualization and characterization must nevertheless in the final analysis be cast in “mind-involving” terms of reference. And I believe that this sort of thing may very well be true of all real things in general, since to be characterizable as a real object is to be knowable in principle by intelligent, mind-endowed human beings.

The prospect of perception, experience, understanding, identification, and judgment is crucial for objectivity. To be an object means that it somehow should have an identity, in which it can be separated individually from other phenomena. Hence, all of the above processes are explicitly and fundamentally mind involving processes. Each process is intentional or attention directing. It is the sort of thing that only we humans, to our knowledge, can do. The extreme statement based on temporal realism, that temporal experience is an illusion since we are ignorant of what real time really is, is to relate time to minds in a certain kind of way. Besides of disclosing certain specific purposes and commitments, it discloses the fact that it cannot avoid characterizing time in conceptually mind-referring terms.

⁵⁵ Ibid. I believe that Rescher’s terminology can be interpreted in this way.

3

Subjectivity, Becoming and Time

Several ways of defining the subjective character are attached to time. Thus, there are several ways of explaining how we shall understand the “relationship” between “subjective time” and “objective time”. However, there also are confusions concerning the issue of the existence of a variety of senses in which we can understand the application of “objectivity”. These confusions of “objective sense” lie at the bottom of all exaggerated hypostatizations of the assumed non-subjective abstracted/subtracted aspects of time.

Furthermore, the concept of “becoming” seems special. It is special because it is the concept related to the question of the ontology of time, which has enraged most philosophers of a naturalistic bending. It adds to the concept’s character of being “special” that this is also the concept, which some physicists have tried to incorporate into their physical theories because they have seen the need for a wider and more comprehensible sense of time. The need of a more ontologically comprehensible time is found in the need for an improved intelligibility of the scientific picture of how matter and the universe develop and undergo changes.

Still, “becoming” is problematic as a concept about the nature of time. It is not problematic only because it is the concept that is most similar to humanly experienced temporality; it is problematic because there are logical problems. However, these problems are not of the terminal type since the problem of logic rests upon a reflective or contemplative mistake of misrepresentation. In this connection, misrepresentation is really the same as misunderstanding something crucial about human experience of temporality. To be more specific, the misunderstanding, which has made “becoming” so unattractive to so many modern philosophers, consists in the notion that our *now* “changes” in time.

3.1. Notions Concerning Subjectivity and Time in Physics

We could say that without subjectivity, i.e. subjectively experienced time, no epistemic sense of objectivity related to time would ever occur.

In this sense I am in accordance with A. N. Whitehead's "reformed subjectivist principle": "Philosophy should begin with an analysis of the content of subjectivity, but it should also show how subjectivity is linked to objectivity."⁵⁶ In this sense one can almost legitimately claim that time has no subject-independent reality. Though as *subjective* it does have a *certain kind* of reality. In this sense *time* is real. In this sense temporality is not an illusion. However, we should be aware that this does not necessarily devalue time's being in relation to other features of the universe. Michael Dummett has an interesting point in his essay *McTaggart's Proof of the Unreality of Time: A Defence*. He says that *a subject-independent time, which is a fully describable reality, is fiction*. This "fiction", however, presupposes that we have access to a world, which is detached from our experiencing conditions, and which we – in a quasi-divine sense – connect with entities and their inner nature. Thus, it is a far reach to claim that what actually is a "representation" of something that only has "epistemic objectivity" *really* is something that is "objective ontologically". I believe that the position of Dummett has some good points in the defense of the reality of subjective time. But I still find it difficult with respect to the fact that other things, which are independent of me, are also subjected to some kind of "temporality", that is to say, to *process* and *change*. However, this cannot be due to *me* projecting the *notion* of "process" and of "change" onto them. By applying some "good-will" we can regard Dummett's statement as if natural processes and organic change are not detached from our experiencing conditions, even if they exist independently of us. Thus, if we can *relate* time with change, then time must be something "ontologically real", because we have notions of time as "something" which not only concerns us human beings but everything existing externally and physically independent of us. Changes do take place "in" time. For example, the grief I feel over a lost family member, someone that I will never be able to speak to again, points to the fact that a process has taken place. This shows me that something that once was is no more, and it shows me that this is *real* in the sense that it is a *fact*. He or she was "in" time; he or she *existed*, and now is no more "in" time. These facts that I experience are *ontologically* real. Does my experience of time include that *when* we differentiate between things in our surroundings we perceive of changes that are objectively in the outside world and which intuitively also must belong in a time independent of my viewpoint? The possibility is obviously there. Time is a necessary structure of the mind in order to perceive of the world as such. And changes in the outside

⁵⁶ Cited from P. Hurley, p. 99, in D. R. Griffin, ed., 1986, *Physics and the Ultimate Significance of Time*, SUNY.

world occur independently of me as an observer. What is the relation between these two spheres? When a beloved one dies, one necessarily thinks that it could imply that the beloved person no longer exists in time, that is, his or her time is up. But time continues to mould. So it seems quite clear to me that I do not project that kind of time, which we understand as part of the changing world. In fact everything around me changes. It is a fact that the person I loved no longer exists. I recognize “the passage of time” in the irretrievable facts of life as such. I believe that time finds its expression through human subjectivity, but this does not necessarily imply a denial of time as ontologically objective, i.e. as a “real” temporal feature of the universe and thus it is also a feature of the universe independent of human cognition.

There is subjective time and there is objective time, both are epistemologically and ontologically real. But this hinges, of course, upon what we understand by “objective” and by “objective time” in this sense. What puzzles me is the fact that many a philosopher of physics seems to presuppose that objective time cannot in any way resemble time as experienced. Perhaps that is why one feels that one has to *subtract all of the subjective elements* from time, because one presupposes that a time without these elements will necessarily be “objective” time. Clearly, to the protagonist naturalism is an invisible but active factor in a very metaphysically biased treatment of time.

But in order to put all of this into intelligible words I find it necessary to outline some relations of the problem of having all these multiple notions about the relation of subjective time to objective time(s). Later on we will see that one of the fundamental problems lies within the tendency of not having made a clear distinction within the applied notion of objectivity itself as to its different forms of meaning. This is to say, what one is missing in most cases, where the objectivity and subjectivity of time is debated, is a clear outlining of what is meant by the theorists’ application of the notion of “objective” in relationship to their way of applying time. There seems to be some kind of selection of what kinds of senses are most attractive according to the nature of the theory itself.

However, today’s many theories about time show a plurality of thought and creativity, but at the same time this diversity leaves the investigator in the field at a loss. The more one researches and reads about the subject, the more confused and insecure one becomes on the validity of one’s own hypothesis on the matter. But one thing that one cannot be insecure about is the many and diversified tendencies in the philosophy of time (physics included).

As it is well known by all philosophers and scientists today, the “Newtonian-Kantian” model for space and time as non-empirical

universal forms – with the assumption there can only be one time and one space – was denounced both by a tendency within science and within metaphysics. The tendency within science was prompted by Einstein’s 1905 paper on Special Relativity. In the metaphysics by Kierkegaard – who served as a fundamental source of inspiration for the movement called “existentialism”, Heidegger must be said to represent a kind of a turning point.

However, the phenomenology and metaphysics of thinkers like Charles Sanders Peirce, Dewey, Whitehead, James and Bergson, Husserl and Heidegger establish a kind of link between the theory of relativity and existentialism. That is to say, time, far from being a simple, univocal reality, exists above all in terms of the experience that the subject has of it.⁵⁷ Thus, we are epistemologically presented with a plurality of times. And the question which arose was to what extent these times were related, if at all. What this has led to, as Michael Sandbothe points out, is that there are now “three basic tendencies in contemporary philosophy of time”.⁵⁸

First we have the tendency “to unify our understanding of time”. Thinkers like Bergson and Whitehead are convinced, says Sandbothe, “that time’s validity is that of being a new Archimedean Point which unifies our everyday experience of the self and the world with our academic theories about nature and man”.⁵⁹

It was only with physicists like Ilya Prigogine in the second half of the 20th century, within the frame of the theories of “self-organization” – which surfaced in the interface between physics, chemistry, and biology – that the development of a “global” time concept occurred and was mathematically implemented. In this we found an understanding of a one-directional flow of time corresponding to fundamental natural processes. These processes are prior to and therefore also fundamental for any conceptual temporal differentiation. In this sense we claim the distinctions, which we make with the application of the “A-series”, must lie in the fundamental processes of nature itself. In other words, we find in the chaotic and thermodynamic processes an asymmetry with the effect of bringing out a temporal direction on the fundamental level of nature.

The second tendency that Sandbothe points out is what he calls the “pluralization tendency”. One leading protagonist of this tendency is the French philosopher Paul Ricoeur. Sandbothe says that Ricoeur regards “the break, on the level of epistemology, between

⁵⁷ M. Sandbothe, “The Temporalization of Time in Modern Philosophy”, in Patrick Baert, ed., 1999, *Time in Modern Intellectual Thought*, Amsterdam and New York, Elsevier.

⁵⁸ Ibid., p.1.

⁵⁹ Ibid.

phenomenological time on the one hand and astronomical, physical, and biological time on the other” as being “insurmountable”.⁶⁰

The third tendency he has discovered in contemporary philosophy of time is that one tends to “relativize and historize” time. This approach takes everything, including language, science, etc., to be contingent and a product of chance and time. The American pragmatist Richard Rorty is for instance one of the representatives of this position.

We can also make these points a little more explicit. In contemporary philosophy we find the tendency to commit to a form of dualism which has its roots in the philosophy of McTaggart and his differentiation between the A-series of time and the B-series of time. On the one hand we find those with a kind of relation to the theories of C. S. Peirce, Bergson, Husserl, Heidegger, Whitehead, James and others. The phenomenological approach holds that on the representational level we have the A-series of past, present and future as the fundamental kind of time and which is taken to show that the nature of time is dynamic. The other party holds that it is the B-series of before and after, or earlier and later, which is the correct representation of real time – and has a static nature. Both the positions, the static view and the dynamic view, seem to think that it was possible to “reduce” or subsume the other’s viewpoint under the position itself held as the real one.⁶¹ Essentially both of these positions sticks to McTaggart and his differentiation of A-time and B-time, that is, they uphold the differentiation as such as “real”, and not merely as an analytical “device”. Thus, they commit themselves to a dualism both theoretically and ontologically.

What they do is that on the epistemological level they argue about the correct form of temporal representation, and on the ontological level whether real objective time is static or dynamic. Both views have relevance for the contemporary problems within the philosophy of physics: One view is focused on the *problem* of subjectivity in relation to that of objectivity, which anyone wants for a concept of real time. Of course one cannot overlook the fact that the dualism exposed here introduces new problems. At least the protagonists of static B-time seem to overlook the fact that both series are “subjective”, and that both are epistemologically “objective” in an inter-subjective sense. Instead of excluding each other, the two series epistemologically complement each other, because the one without the other would never give us the temporality and succession we

⁶⁰ Ibid.

⁶¹ According to Richard Gale’s “reformed” view on time we find that this kind of semantic reduction of indexicals is no longer desirable. Gale’s view, the “Co-reporting Thesis” and his opinions about “temporal becoming” will be discussed at a later point.

experience. What McTaggart saw quite clearly was that without “becoming”, the relations of “before” and “after” disappear and the B-series are not possible. Errol E. Harris has made this point explicit.⁶² He writes:

We can date event E at time $t1$ only if, at $t1$, E is past; in other words, only if the A-series is presupposed. But if the A-series does not belong to the physical world, physical events are not related as past, present, and future, and so cannot be related as earlier and later.⁶³

McTaggart himself tried to solve this by introducing his C-series which he claimed to be real. When he denied reality to time it was on the part of the paradox that change involves the A-series; and without it there would be no B-series, no before and after – relations which do not change. Yet we cannot positively identify events as past, present or future by any clear-cut marking. Nevertheless, we attribute all three mutually exclusive relational qualities to each and every event. McTaggart’s C-series have the same elements as the two other series. But instead of the before and after in the B-series he puts in those of “being-included-in” and of “inclusion”, which are said to correspond to those of before and after. What he achieves, as Harris points out, is just to transform the temporal series into a spatial one, with relations of coexistence instead of those of succession. Still it remains a series of distinguishable elements, and if it was not it could represent nothing intelligible. And as Harris says, “a reality without internal differences is inconceivable.”⁶⁴ It does not help at least to deny the reality of time, because nothing in our experience, either of our selves or of the world, is properly intelligible without it, Harris states. I can only concur.⁶⁵

Still, it would be an unjust claim to say that in modern physics we find only one concept of time, which has “objectivity” attached to it. Philosophical plurality has also invaded physics, so that we have to

⁶² Errol E. Harris, 1988, *The Reality of Time*, SUNY.

⁶³ Ibid. p. 49.

⁶⁴ Ibid. p. 35.

⁶⁵ For now, let us just say that it is the supposed chasm between time as an experience and the timelessness of physics that is unreal. This is a chasm which indeed owes its existence to some die-hard metaphysics that obviously have not yet realized that it is a tendency to spatialize – as yet another “subjective” feature – which mistakenly is taken as one of the “crucial” objectifying criteria as such. This kind of metaphysics has two aspects which can rather differently, be put as 1) being blind to the necessary subjective use of spatial concepts. 2) Tending to render qualitative time quantitative by the use of *space-like terms*, and we might add space-like contexts.

distinguish between metaphysical tendencies within the physics of time too.

One dominant view in physics has been that nature on a fundamental level within physics is timeless: That physics provide no basis for features like the one-way direction, which is in principle irreversible -- the categorial differences between past, present and future and of constant becoming. Though thermodynamics provide for anisotropy and hence bring the concept of “time” a little closer to experienced time. Still, there is no one-way going or a distinction between past, present or future. As K. G. Denbigh says: “Which ‘direction along the t -coordinate is the real direction?’ just does not arise in physical science.”⁶⁶ D. Griffin divides the differences among these thinkers⁶⁷ into three major groups:

The first group holds that time has no other nature or reality than the nature and reality we find in fundamental laws of physics. Here, the tendency is to speak of time as an illusion of the consciousness, which has no objective counterpart.

The second group consists of those who agree with those in the first group, that the concept of time can be defined only by physics. But this group does not hold that the concept of time originates in, or is grounded in, the laws of physics, that its origin is grounded in some feature, which is susceptible to scientific treatment. Griffin says, “the most popular form of this position is the view of time as rooted in the laws of thermodynamics, hence it is the direction of entropy, which defines the reality of time.”⁶⁸ Our experience of time is a derivative of this physical process. Adolf Grünbaum is known to hold such a view – where, however, our temporal experiences of becoming are understood to be nothing short of fictions. Thus, we might claim that, like Errol E. Harris⁶⁹, that such a view only creates new and puzzling difficulties. It is puzzling because Grünbaum – for one – rejects a possible inherent relation between experienced temporality and entropy. However, Grünbaum realizes that: “It is (the) inevitable increase of entropy within the processes of our own organisms and brains, which is supposed to underlie our consciousness of the passage of time and thus our perceptions of past, present and future.”⁷⁰

At the same time he argues that experienced “becoming” is an illusion. Because none of those thinkers of this group view time as something significantly ontological or metaphysical, that is to say, that

⁶⁶ K. D. Denbigh, 1981, *Three Concepts of Time*, New York: Springer Verlag, p. 167.

⁶⁷ Griffin, 1986, pp. 4-5.

⁶⁸ Ibid.

⁶⁹ Harris, 1988, p. 43.

⁷⁰ Ibid.

time is not rooted in nature or reality. Harris remarks critically on this by saying that if it is entropy, which underlies our awareness of time, then “the physical process must be prior to any conceptual awareness, and the source of the distinctions we make in the A-series must lie in the physical world itself.”⁷¹ In spite of such a contradiction the people of this group hold that time is only a contingent feature of reality, “...it can be regarded as more or less ‘real’ or ‘illusory’ depending upon the other interests of the author. The contingency hinges on particular features of our universe that conceivably could have failed to occur...” as Griffin puts it.⁷²

Griffin goes on by describing a third tendency, which consists of those who insist that sciences cannot have as a task to define the reality of time. One cannot restrict oneself to the procedures and methods of one of the special sciences when one is trying to define the nature of time. Because every attempt to explain temporality in terms of the restricted methods of one of the special sciences, ends up with reducing a “fundamental concept to a less fundamental one.”⁷³ These thinkers hold metaphysics and philosophy in general to be of a more recommendable approach. Better still is, within the frame of metaphysics or ontology, to try and synthesize the assumptions of all the special sciences with each other and with the presupposition of human experience in its fullness.

However, if we now direct our attention to the notion that physics entail the rejection of time as experienced, what then are we left with?

One answer could be mathematical “space”, since we are here – with the introduction of the “time axis”, which is with the mathematization and geometrization of time confronted with a tendency to spatialize time. This means that we tend to formulate our temporal cognitions with space-like terms, that is, to attach a spatial category like “before” or “after” or “flowing” to our temporal experiences. At least we gain an understanding of how it is possible for us to operate with – and thus confuse – two ways of thinking about time. As Errol E. Harris says: “We think of time as clock time”.⁷⁴ This kind of time cannot be identified with transition or change. Clock time is only a *metric* which we use to measure *some other thing* which is changing, *its rate of change*. But, says Harris: We also think of *time as the process of change itself*, as when we compare time to an “ever

⁷¹ Ibid.

⁷² Griffin, 1986, p. 5.

⁷³ Ibid.

⁷⁴ Harris, 1988, p. 23.

rolling stream.” Harris says that we “fail to distinguish these two senses of time.”

Physicists, for instance, say that time slows down when the universal rate of change decreases and affects clocks as well as all other processes, equating the metric with that which is measured. Yet, on the other hand, when they attend to the metrical aspect of time, they tend to abstract from passage and to think of time as a fourth dimension (in space).⁷⁵

According to Henri Bergson this is spatialization of time, because when one regards events in this manner, like events that are fixed and coexistent in a four-dimensional manifold, or as William James called it, in a “block universe”, then we are truly talking of something spatially extended. It is a spatialization when one assumes that the time axis runs at right angles to the other three spatial dimensions. As Harris points out “literally it cannot.” The only possibility for this to be something, which we can actually work with, is to apply something mathematicians call “configuration space”.

To quote two writers on time:⁷⁶ Fritjof Capra says: “The relativistic theory of particle interactions shows thus a complete symmetry with regard to the direction of time... This, then, is the full meaning of space-time in relativistic physics. Space and time are fully equivalent... To get the right feeling for the relativistic world of particles, we must ‘forget the lapse of time.’” Or, Herman Weyl who says, “The objective world simply *is*, it does not happen.” In short, what we are seeing here is a blatant tendency of spatialization. It seems quite clear that one has to recognize the four-dimensional manifold as a *mathematical context* for the *interpretation of physical measurements*.

The problem here is not that one might have to abstract from experience *but to infer metaphysical truth on these abstractions*. This, of course, would most likely be an *ontological* reduction of time. For instance, if we eliminated time’s empirical *irreversibility* by claiming that it does not conform to the symmetric laws found in physical theories, we could end up postulating that our experience of time’s direction is nothing but a *mere* anthropomorphic prejudice. Neither symmetrical laws nor the fusion of mathematical time and three-dimensional geometrical space eliminate the temporal aspect of *passage*. However, the idea of *passage* or *becoming* appears to be problematic to many philosophers. Thus, speaking of specific

⁷⁵ Ibid.

⁷⁶ Quoted from Griffin, 1986, p. 21.

theoretical frameworks or contexts I realize that it is of some importance to take a look at this notion we can name “becoming”.⁷⁷

3.2. A Preliminary on Becoming

It is “now”, “past” and “future” that constitute the largest difficulty to the philosopher of time, who has settled his mind upon the idea of a non-evolving cosmos. Of course we cannot escape the fact that we *have to operate* with felt and experienced aspects of “becoming” and of “now” in two different contexts related to the meaning of time, namely (a) time understood as *relations* between events and (b) time as an unfolding transience or *process* inherent in existence or being as such. The tendency is to treat time either as a “temporal relation” and/or as a “temporal unfolding process”. However, not many scientists endeavor to find a linkage between these two different approaches to the time-problem. That is, that time can be applied as a relational aspect, which is an *epistemological* application of a construed measure of time. But time can also be understood as a process, which is held to be ontological in the sense that it is in *nature* of time that things -- change that is perhaps *to be change as such*. And as such is the nature of time open to experience because change is a necessary aspect of our experiences in the sense that we have to refer to changes in our *experiences of the world* when we want to report our experiences to others. Nevertheless, in a theoretical treatment of time *process* and *relation* seem to exclude one another. An exponent for this latter view, that is, the view that time is relational and therefore cannot be treated as process, is found in the reformed philosophy of Richard Gale.⁷⁸

Gale refers correctly to the “common” account of “temporal becoming” as *absurd* because it reports time to be the “moving on” of the “present” or “now” to a *later time*, which then becomes a presupposed *later* time on the time axis. To claim that the now is *moving* in time is just as much a spatialization of time as when one is claiming that time is identical to the time axis in four-dimensional space-time. Gale questions: “for how can a moment of time cease to be

⁷⁷ “Temporal becoming” is in fact being discussed throughout the remainder of this dissertation.

⁷⁸ R. Gale has changed his view on time in the sense that he is now ashamed of what he earlier thought of the “now” as changing and as moving on towards the future – a view he identifies as the view of “temporal becoming”. In the following I will keep to his thoughts on time as they are presented in his papers: “Disanalogies Between Space and Time”, “Time, Temporality and Paradox”, and his “Time” in *Encyclopedia Americana*.

identical with itself or even have the possibility of being a different time?”⁷⁹ The crucial aspect of Gale’s view is his emphasis on the *relational* feature of time as the only and real way to talk about, or to refer to *time*, because “now” is thought of as something that rests upon a “referring function”. “Now” refers to “this time”, its function is that of being a reference to some specified event and thus to be the constituent of a relation between two or more events. The *referential* function is necessary for the preservation of an *identity* between “now” and the specified moment of time.

Gale’s treatment of time rests upon McTaggart’s theoretical or analytical distinction between A-series and B-series: The first made up of tenses like “past”, “future” and “now”, and which has the same function as token-reflexive indexicals like “I” and “here”. The second series disclose only relations between events and a specified moment of time, i.e. “clocked time”, that is, *when* or *what time* the events occurred. But unlike most B-theorists Gale find “now”, like “I” and “here”, to be necessary true as long as “now” is *now* and “I” am *I*, that is, according to Gale (who is referring to Kripke’s work), our indexicals are *rigid designators*. As Gale defines: “Indexical terms are rigid; for it is necessarily false that I might not be I or that now might not be now.”

Therefore, we have the claim that a “moving now” is nothing but a perplexing notion, a notion that simply cannot be true. Now is always *now*, it cannot be a different time but always *now*. Temporal becoming is therefore, according to Gale, false. Gale reaches this conclusion because he believes that temporal becoming is identical to the following statement: “If the present shifts to ever later times in the B-series, it must do so at a certain rate. But since it shifts along the time axis the rate involves a change of time over time.” Thus, Gale reaches for a theory about “*event identity*” by presupposing rather than exploring a certain concept of time. That is to say, time is thought to be identical to measured time, to clock time, to the “time axis” whereby we fix or determine and *define* the *moment* as a moment, which is “frozen” in its determination. This is to understand time as identical to the segment of space on a clock with a specified point telling us the hour and minute of the day.

Furthermore, “*event identity*” states something about the identity *between something* as well, and as already mentioned in Gale’s case, between “now” and the clocked moment of time on the “time axis”. We are here talking about a “reduction”, not a reduction that seeks to eliminate our subjective “now”, but as one as our necessary focal point or starting point in telling the time in a way, which makes sense to us.

⁷⁹ Ibid.

This is important since we cannot escape the necessary use of referring to our *now*. The assumption is that there has to be some kind of identity between “*now*” and, let us say “4. 35 p.m.”, to make the use of the B-series comprehensible. This means, that Gale does not attempt to dispense with the A-series in favor of the B-series, but to establish an identity between two statements about one event which on the one hand, reports an A-proposition, and, on the other hand, reports a B-proposition. This is *co-reporting*. “Now” is “4. 35 PM” is necessarily true if 4. 35 PM *is now*. Gale uses the following example:

(1) *E* occurs now.

“Now” tells us about the moment of time *t1*, therefore,

(2) Now is *t1*.

Proposition (2) is therefore necessarily true, says Gale, because it is made up of both a *proper name* and an *indexical term* (both “rigid designators”). Furthermore, we state that

(3) *E* occurs (tenslessly) at *t1*.

This proposition expresses the same truth-value as (1) at *t1*. Furthermore, for us to deduce (1) from (3) we have to apply some kind of entity, which possesses a sense of “now” and an ability to report the event as happening “now” at the moment of time *t1*. Therefore, “now” and *t1* are identical. Now refers to “this time”, which is *t1* and thus answers our question: “When?”

Thus, it should be obvious that Gale has reduced the philosopher’s pursuit for an understanding of time to solely consisting of a pure *epistemological time-relation*. I get the feeling from reading Gale that our awareness of time is to have but *one* function, namely only to answer the question: “*when?*” I believe that Gale has a very sound notion about the necessary relationship between our experience of time and our need to establish and use “time” in a more abstract manner, namely as a relation holding between occurring events. Nevertheless, I believe that some essential part of the ontological properties of time has gone missing in his attempt to infer metaphysical truth on something that solely belongs to a theoretical treatment of time, which can only be treated as *epistemological* properties of time.

According to Gale change is paradoxical and we are left with his reduction of temporal *perspectives* to temporal relations through the referential function of the “now”. Gale’s *co-reporting* thesis demands an

element like our experienced *now*, but not as something which refers to more aspects concerning time than the point-like time moment in a B-series tenseless order. This has to be so since, and as Gale writes, for every A-proposition there is a B-proposition that reports the exact same event. It is to report one event with the use of two propositions that are logically linked together. The point is that neither proposition really makes sense of an event if there is not any linkage by reference between now and the clocked moment. However, Gale chooses to dismiss temporal becoming by appealing to the choice of method and the claims about time that comes around as a result of the investigations performed by the method. In this case the method is the phenomenological one, the one which examines and dissects the experienced or experiences. What this method makes clear, and what Gale does not want to admit, is that there are different ways of describing time. One way to describe time that is inter-subjectively universal is to understand temporality to have something to do with the fact that the world is constantly changing its visual and audible features. From this point of view time is not to be identified and defined solely by our ability to use it referentially and relationally. In fact these relational and referential aspects do not explain how we can – as we in fact do, experience change in the first place. It neglects the fact that we are, like experiencing subjects, operating in the midst of a transforming world. This is a transformation of features of changing shape, color, form and figure in the living world that enables us humans to perceive them.

However, if time is defined in the manner Gale demands we are left with a time that is momentous and a world that is changeless. Time is only something we construct from our awareness of “now” – an awareness whose sole meaning is to *refer* to “this time”. There is no transition between “events” and there is no evolvment of the “events” themselves, left is only a queer world of “A-series” and “B-series”. This is a logical world of tenses and tenseless propositions of indexicals and rigid designators. A world where “identity” means the necessary logical identity of “now” as always being *now* and which is, as such, always believed to be linked up with a specific clocked moment which is reported by two different propositions conforming to McTaggart’s A- and B-series distinctions. The indexical “now” can never change. This is logically impossible. Therefore, says Gale, it is impossible for “now” (as a referent to “this time”) to shift to a later time. If it shifted to a later time then this time would cease to be identical with this time; i.e. would cease to be identical with it.⁸⁰

⁸⁰ See Gale, “Disanalogies Between Space and Time”.

Thus, we find that Gale is focusing on two aspects of becoming – two aspects which according to Gale, render the concept of becoming *absurd*, namely (1) that the present, as already mentioned, shifts to later times in the B-series at a certain rate along the time axis. The absurdity is that the rate involves a change of time over time. (2) Gale thinks that temporal becoming denies the necessity of identity. If the present (this very moment of time) was to shift to later times, it would cease to be identical with itself.⁸¹

How shall I respond to this? Gale rejects that we can understand time or the nature of time phenomenologically. The reasons he gives are unclear. We know that the phenomenologist investigates human experience: What constitutes the experience and what are the components of these experiences. Furthermore, many analytical philosophers find it hard to reconcile analytical investigations of time with the idea that our experiences are somehow related to objective nature. It is the metaphysics of disjunction between human mind and objective nature and what is imbedded into analytical thinking that perhaps is at work here. How can we discover objective temporal properties by investigating our temporal experiences? The question is rather: Why can we not understand temporal becoming phenomenologically? Admittedly, the phenomenological approach is different than Gale's analytical method. It does not aim to "neutralize contradictions" in the analytical sense by a dissection of everyday language. The aim is rather to understand time as a phenomenon, which is open to conscious human experience and which is the source of the human endeavor to objectify time in various ways.

Objective time is as a specific way of articulating our idealizations and abstractions in relationship to temporal experiences either a confirmation of experienced unidirectional time like *entropy* or a rejection of this in favor of the symmetry of physical laws. These attempts are only *over-verbalizations* of intuitive or primitive temporality. By this I mean that an objectification of time will always be a hypostatization of some analytically abstracted and isolated features chosen to become real properties in the realm of science. These "properties" conform to theoretical contexts, and are, at the same time, serving as both a metaphysical/cosmological as well as an epistemological purpose. Gale's "frozen-moment" philosophy serves as an example of the same style of philosophizing about the world, but here it serves as an exposition of the primacy of analytical method. Gale's rejection of becoming rests upon his dislike of the

⁸¹ Gale, "Time, Temporality and Paradox".

phenomenological introspective method, which in the case of Husserl, finds time to be identical with irreversible change. Gale's "now" as "a frozen moment in time" becomes a metaphysical "fact" where modal logic and analytical dissection of everyday language determine whether time is identical with the changing world or not.

It is hard to come to grips with Gale's concept of time, with what he believes time to be, because he is not explicit about his notion concerning the *nature* of time. However, we can understand his analytical approach to time, that is, his attempt to construe a theory about the necessary application of both A- and B-series in reporting a time, the co-reporting thesis. Briefly, this is not a theory about the nature of time but about making sense of telling time and our necessary appeal to both A- and B-series. Therefore, his statements about the ontology of time, that is, about time not having anything to do with change, are *misplaced*. In a negative sense, Gale states that time is not "temporal becoming" since this includes the notion of transition – which is excluded by his emphasis on the momentary or frozen *logical* nature of "now". This thesis can, however, claim identity between now and $t7$ by reporting the same event: If now is identical to the occurrence of event E and event E occurs at $t7$ then now is identical to $t7$. All this is good and well, but it does not explain what time *is*. The work by Gale on time is a theory about how to report time without having to make contradicting statements. The A-series and the B-series are contradicting each other, they are describing time differently, different aspects or features of us who use the notion of time. That is, one aspect is used to describe *time*, the other aspect is applied in order to describe how we need to *report* about time to others, a time based upon the first aspect, upon the A-series. Gale does not see it in this way. It has all and everything to do with reporting what time it is without having to reduce one of the series to the other one, that is, to subsume for instance the A-series under the B-series, which have been the case of most B-theorists of time. In this sense, Gale's theory is a clear improvement in the discussion about what is necessary in order to comprehend any reporting of time. But he does not state the origin of this peculiar reporting clearly enough as he would then have to embark on a phenomenological investigation of human experience. What Gale in fact achieves by his co-reporting thesis is that he connects what McTaggart analytically separated in 1908. What we should be aware of in the case of Gale is that it is reported time, and only for the sake of reporting time, that his thesis holds well. We should also be aware of the fact that it is not lived time in its entirety which is being disclosed by Gale, only a part of it. The other part becomes too logically contradicting for Gale to accept since it discloses a very different property of time, namely "becoming".

“Lived time” differs very much from Gale’s “reported time”. Lived time is full and complex, it encompasses present and past, it includes expectations and hopes about the future based upon our present awareness of the present and our past. But it is also an ordering of our perceived content, a temporal and spatial ordering of earlier and later, of before and after. However, it is also an experience of time passing, of transience connected to our perceptions and our “trains of thought”. This means, as present and past: That which is *now* is really *present* to me in my perception that is *now*; and it becomes past, it is not present anymore. My present awareness, the one which constitutes *my* “now” is not changing, only the content of perception is changing and that in an irreversible order. “Reported time” as Gale writes about *has only with our present content to do*, that is, with the temporal ordering of my perception that occurs *now*, with my timing of and need to report whatever specific event are happening *now*. It is a *theory* of our representations of how to order events in time that we are presented with in Gale’s theory. This is a very important contribution although it is not metaphysically satisfactory. Foundational metaphysics seek to disclose the fundamental nature of our time concepts, which in this case of co-reporting time cannot exclude experienced temporality. Foundational metaphysics should not omit the investigation of temporal experience or the principal reference to certain features of experienced temporality.

In spite of what I have said so far, Gale has given a correction of one feature, which has survived in connection to the concept of temporal becoming as a rather unclear notion claimed to be corresponding to temporal experience, namely the movement of our *now* in time. As Prior and others have seen before Gale, our *now* does not *move* in time. Our *now* has to be identical to itself as our *now*. It is an absurdity that *our* *now* moves and *changes* in time, that is, along a superimposed time axis, as Gale points out by referring to Prior’s rate of “one second per second”. What our *experience* really tells us is that my *now* is always *now*. It is what is within my perceptual awareness *now* that *changes* and “moves”, that “takes time” according to my *now*.

The reason why the *now* has been described as “moving” and “changing” is precisely our unavoidable and necessary application of spatial metaphors on everything experienced. It is by metaphors like “river”, “moving”, “changing”, etc. that we describe time by reference to processes perceived in our locality. Things and events do not remain the same within my present perception; my present perception does not remain the same perception all the time. Therefore, my opinion is that Gale dismisses the concept of temporal becoming too fast. There is a “transition” taking place which we in fact refer to as the “moving on of time”. This means that our *now* must refer to something more than just

being identical to “this time”, that is, our *now* must be something else besides being referential. From the perspective of our awareness *now* we should be able to recognize that our awareness that is *now* has a changing content, which still will be at a “this time”. But our awareness now will also include the indirect reference to *something* that is factually in *transition* or *transformation*, or *moving* and/or *changing* its appearance *now*.

We should make a distinction between the meanings of “now”, which are (1) the logical “now” and (2) the actual, living, awareness that each and everyone has *now*. The first sense of “now” is Gale’s opinion of what now is, that is, the *logical* “now”. Here, now is identical to “now” as a representation of “this time”, or “this time” as a representation of “now” where “now” for instance is t_1 . The logical “now” is only a referential now which only meaning is to refer to a specified moment of time being “now” at t_1 . In this aspect it is important to know that *truth* can only be truth for a moment of time with reference to “now”. That “now” is logically speaking always *now* is always true, but that “now” is always and only referring to a “this time” is not always true. “This time” is the logical meaning of “now”, which is *valid for a frame* that has been hypothesized to become identical to the *truth for a frame*.

Now is not always the logical “now”, but must also include the actual *now*, that of being lived actuality, thus truth must also refer to something more than the logical “now”, it must include a reference to contingent truth. It must refer to the experienced time order that contains the aspect of transitivity. That “now” is identical to “this time” is valid for Gale’s frame of theorizing about our co-reporting representations of time, but it is not identical to the possible metaphysical truth of what now is in itself. It is; however, valid to talk about “now” the way Gale does within his theoretical frame, where his focus is not on the metaphysical problem concerning the nature of time. Instead we see that his emphasis on “now” as a necessary referent as a rigid designator has to do with an epistemological interest for a comprehensible representation of temporal order.

The second meaning of now is therefore more complex and perhaps puzzling, because this meaning is also concerned about the question of the *metaphysical foundation of time*. This is to say that our necessary reference to our experienced world does not give us only one option of meaning and definition of now, namely as “this time”, but also as something else and perhaps more fundamental still. As metaphysicists we would like to see beyond the epistemological application of our temporal representations; to see beyond the mere representation of temporality. More fundamental still is the fact that the now I refer to is my *now*, only as my *now* does it give sense of

talking about a “now” as identical to the moment on the time axis when the event was perceived or happening. Thus we have a complex situation, namely that the aspect of having a reference to the past as a perspective included in the subjective frame of reference. It is only on this fundamental level that it makes sense for us the way we go from one moment in time to another, that our *now* is not frozen in the sense of being forever identical with t_1 , that “now” was *now* only when t_1 happened. It is only with reference to our actual experience that we have retained the *transition* of one content being now t_1 and another contents being t_2 , a transition that does not involve a “changing now” but only a changing object or event. This living and subjectively actualizing *now* cannot be fully understood by being treated as a “now”, which exists isolated from the unavoidable reference to memory and expectations. So when anyone is identifying “now” with “this time” our living, the actual *now* must be presupposed.

Nevertheless, Gale has realized that the way ahead is not any longer to reduce the A-series of time to the B-series, but instead to create a connecting bridge between “now” and the tenseless timing of events. However, I believe that Gale makes a preference for the B-series in his exposition and that he is thus keeping to McTaggart’s analytical distinction from 1908. Gale does not rid his theory of the problem of having to deal with two different and contradicting worlds which are ordered differently: That is, one being ordered subjectively with the use of tenses and indexicals and the other only being a tenslessly ordering of events. In this context it is possible that Gale has performed some kind of reduction anyway. It is a possibility because it is his notion of “this time” which is paradigmatic for his definition of “now”, that is to say, for his claim that the only time that is of interest is the best *relational* theory of time. A relational theory of time only makes sense if it has reference to some kind of rigid designator, an “I” or a “now”. However, this “now” must not be confused with the *now* that is the basis for any talk about transition. The B-series becomes normative for the definition and understanding of a logical “now” which is isolated from the actual experiencing *now*, a logical rigid designator that is identical to “this time” and only “this time”. Still, this kind of “now” gives us a tool to report time with a reference frame, but it does not contain a reference to the aspect of time that defines time as such, namely the *now* of awareness which perceives transitivity. This aspect is introduced only by reference to a real experienced content, with reference to a living subject that has the ability to orient him/herself and to differentiate among appearances of things and events in the world according to the rule and order given by intuitive temporality. By claiming this, we have moved from the domain of epistemology to that of metaphysics, since this concerns the

foundations of time and not only the temporal representation, timing and reporting of events.

To summarize, what does all this boil down to? Well, it boils down to the problems that concern subjectivity as such. This is to say, to certain problems of sense and comprehension arising when description is sought for something “real” along with the assumption that subjectivity has *nothing* to do with *reality* as such, or with the description of it. In my opinion, the case is this: One assumes that what is *real* cannot resemble anything that we can conceive of in *experience*, that the objective, understood as the *real*, or as subject-independent *actual* existence, must be like the *opposite* of subjective-based knowledge of reality. All the above-mentioned positions show us that no matter how one tends to look at the problem of time, it is really a problem about the relation of subjective time to the notion of objective time which is in fact is the issue. These positions and tendencies show us that we cannot escape the fact of subjectivity. If we’re somehow going to talk of an “Archimedean Point of View” it must be the view from *within*, from within subjectivity and thought itself, and as such we must try to comprehend the complexity of our “innate” polarity of the subjective and the objective as such. Only such a view can give us an understanding, firstly of what kinds of notion “objectivity” we are *confusedly* applying, secondly, what “true objectivity”⁸² is and how we reach it.

⁸² “True objectivity” depends upon what it is that is supposed to be *objective*. My point is that the status of “objectivity” depends on its object. True objectivity – as a view that is true about its object is always a “view” or “perspective” on something by *someone* – though this is no one in particular. Thus, as will be shown, objectivity has to do with the reality status of the object and/or the “perspective” that always is mixed with someone’s epistemological-metaphysical presuppositions.

4

Subjectivity and Objectivity

To conceive of the nature of time one has to understand fully the complexity of the subjective and objective aspects of human thought and the different meanings of objectivity. It is a common mistake, for instance, to take any notion about “objectivity” to be “something” identical to that which is *ontologically real*⁸³, when it instead is a “framework-characteristic”. That is to say, it can only exist within a specific theoretical frame. Only “objects” have objectivity, and objects are objects because they are somehow connected to the cognizing faculty of the subject. That is, objects are *objects* because of their relation to a perceiving and mind-endowed human being. Any object in nature is necessarily connected to something else; thus, any object in its “objectivity” cannot be understood as an object that is in itself, merely because it is defined according to its measurements and to its material extension, weight and density. Its relation to human experience and thinking cannot be overseen. Thus, every object becomes real or objective as part of specific branches of knowledge.

4.1. The General Features of Subjective-Objective Distinctions

What is the issue of the subjective and/or objective realities of time really about? It is first of all about the nature of human reason and conceptualization as such. Secondly, it is about reality – that is, the problem of what reality is, or when reality temporally speaking is as opposed to actuality, which is *now*. Thirdly, it is about the *reality of time*, which, in other words, is about the existence of local macroscopic temporal properties. Perhaps it would be more correct to say that the question of the objectivity of time and/or reality of time really is about the metaphysical outlook on time. This is, on the one hand, about theories which present us with outlooks which accept aspects such as unidirectionality, transience, becoming and irreversibility to be somehow connected to human temporal experience *and* his/her local

⁸³ Meaning, “a manifest property of reality”.

physical world. On the other hand it is also about outlooks, which present us with the rejection of these temporal aspects as real properties.

We have to emphasize human *thought* as a definite *source* of *true* knowledge and of course as a source of *objective* knowledge as well. However, the insight tells us that if we wish to determine the *truth-value* of objective knowledge we cannot begin with ready-made abstractions. Instead we should be honest about *how* we really go about in order to achieve the particular type of objectivity in question. This is to say, *how* do we as human subjects *think* and *experience* in order to come up with the particular features of time that are needed to fulfill the purpose of the theory. Here is metaphysical tradition or academic culture an important issue. I believe that if we begin our work by accepting concepts which have already departed from its relationship to the concreteness of experience, and then we can become caught up in the theoretical context. The mind becomes absorbed in some fascinating abstract aspect-reality, that is held in high esteem by authority, a context that more than anything else *obscure* our access to time, that is, to the *concreteness* of primitive or experienced time. We trust our thought in the domain of abstract and theoretical thinking. Why should we not trust it? Thought is after all deeply immersed in temporality. Why be skeptical of concrete and experienced reality? After all is it the source of objective time?

No matter how skeptical some of us are about the human ability to achieve objective knowledge, we, nevertheless, have to face the positive results of science. The historical fact of what happened to Nagasaki and Hiroshima in 1945 confirms the success; it shows us that physicists have managed to disclose some *real* nature of the atom. Moreover, we do in fact stake our lives on the assumption that we achieve essential insight into a reality, which also exist, independently of our subjective awareness of it. Although this “independent” world is accessible, it is accessible only through human cognition and theoretical concept-construction. Thus, it can be claimed that subjectivity is the foundation of and in any kind of knowledge -- even if it is knowledge about a world existing independently of the subject. This is a powerful claim, as Thomas Nagel⁸⁴ has put it since we are ourselves parts of objective reality both in the “cognitive-epistemological” sense and in the “ontological” sense. However, we tend easily to connect all kinds of “objectivity” to *reality* as such, or perhaps it is the other way around, that we superimpose reality on every kind of objectivity. Perhaps we come to conceive of what appears to be

⁸⁴ Nagel, 1979, *Mortal Questions*, p. 202.

objective also as something which *necessarily* has to be *real*. According to Nagel objectivity can, within a particular frame, be regarded as something that necessarily shall exclude our individual point of view. That objective truth is something that shall be impersonal and viewed externally. Therefore, Nagel insists that there is no *one* subjective viewpoint and no *one* objective viewpoint.⁸⁵ It is an objectified individual viewpoint that is being applied rather than the personal point of view on things.

The *split* between the subject and object is, as Schelling pointed out a long time ago, a product of reflection.⁸⁶ According to Schelling it is through reflection that we learn to distinguish between external things and ourselves, between external things and their subjective representations. However, another distinction is required, namely that we have to distinguish between subjective representations of external things and external things with the modification that the very distinction which singles out the external as something else than the subjective representation, is itself a subjective representation of the external thing. *From here is the split between subject and object definitive and cannot be healed by returning to the original situation of immediacy.* This means that on the subjective side of the polarity between subjective and objective perspectives within human subjectivity itself, we have “the point of view of a particular individual, having a specific constitution, situation and relation to the rest of the world”.⁸⁷ From there on the drive is toward greater objectivity which is taken further by the subject by its growing consciousness of and abstraction from its particular concrete personal position in the world. This movement towards objectivity also includes abstractions leading to the development of self-awareness. However, now other elements also enter the arena, perhaps metaphysical and/or other “background” theoretical elements that will be influential in the act of distinguishing or discriminating the forms of perception and other actions that is assumed to be characteristic to humans alone. These elements, together with the natural drive from within subjectivity itself, are furthermore part of the movement “away from the narrow range of a human *scale* in space, time and quantity toward a conception of the world which is not the view from anywhere within it”.⁸⁸

This is, of course, to be understood in the way that there is no one-way thinking without the possibility of a return to subjectivity,

⁸⁵ Ibid. p. 205.

⁸⁶ See Alan White, 1983, *Schelling: An Introduction to the System of Freedom*, New Haven and London: Yale University Press, p. 23.

⁸⁷ Nagel, 1979:205.

⁸⁸ Ibid.

that is, to the concreteness of experience. We do not remain in the objective end of the polarity. Each object and every objectification demand a new effort of a careful selective thinking and considering one has to take, before objectivity, usually a frame-required detachment, is obtained. The natural condition of subjectivity is an oscillation between extremes where there is no one pure objective point of view without subjectivity and no one subjective view without objectivity.

4.2. Transcendental, Phenomenological and Psychological Notions

Now, if we confront our immediate experience, that is to say, *an experience that is unmixed with reflection*, we find that the opposition of the “subjective” and the “objective” is wholly foreign to it. This means, according to Cassirer⁸⁹, that what is grasped by consciousness here and now “is”. It is precisely in the form offered by direct experience. He says, that here we have a content that is located within very vague temporal limits. The past, in so far as it is taken up into memory, is just as given and as “real” as the present. But when we begin to reflect upon the given content, i.e. when we start to distinguish and discriminate the given by logical thinking, that is, by reflection, we destroy this impression of perfect unity and completeness.⁹⁰ This impression of unity and completeness, i.e. this more *direct* and *primitive* type of perception is, in the psychological terminology of Jean Piaget, marked by “centralization”, that is, relative *immediacy* and *inability* to distinguish. The other aspect, the distinguishing aspect, is the “decentralization” characteristic of *intelligence*.

With intelligence, that is, with perspectival thinking, we have the capacity to transfer our attention, without losing hold of the mutual relevance of the successive foci. According to E.E. Harris⁹¹ this is an analytic capacity, which, at the same time, is correlative to a higher and more articulated synthesis. By applying Piaget’s terminology, Harris maintains, that “centricity” is far from being lost through “decentralization”. We could, however, as Harris does in order to make the terms more explicit, refer these psychologically conceived terms to those of transcendental philosophy, and thus in Kantian

⁸⁹ E. Cassirer, 1953, *Substance and Function: and The Theory of Relativity*, p. 272.

⁹⁰ Ibid.

⁹¹ Errol E. Harris, 1993, *The Foundations of Metaphysics in Science*, p. 429.

terms call “centreity” the *synthetic unity of apperception*, while “decentralization” corresponds to *the self-differentiation of the unity of relational “categories”*. Kant’s terminology is of course not psychological but epistemological.

Piaget⁹² has another angle to the matter than the traditional transcendentalist view, an “angle” to the matter which, in my opinion, helps correcting the picture of mind inherited from Kant. Piaget views the issue of mind and the development of distinguishing categories *genetically* and recognizes the fact that ready-made categories are not imposed by the mind upon a sensuous manifold. The categories are not ready-made. They emerge through a process of active development.⁹³ The only “thing” that we can claim to be innate is the ability to form such categories, that is, “the ability to analyze and synthesize, to distinguish and relate”, as Harris puts it.⁹⁴ This means that the innate ability, we humans have, is “to explicate the implicit articulations of a diversified totality.”⁹⁵ This is the essential function of our mind. The contrast between “centreity” and “decentralization”, Harris claims, when it is contrasted with *perception* resolves itself into that of subjectivity and objectivity. Similarly, according to Cassirer, “every critical doubt that is directed against the universal validity of any perception, bears within it in germ the division of being into a ‘subjective’ and an ‘objective’ sphere.”⁹⁶

Thus, the goal of all empirical knowledge will be to gain some *invariant* that has both necessary and constitutive factors in each empirical judgment. Though, we all know by now that perception is conditioned and limited by the organic, neuro-muscular conditions of sensibility and the spatio-temporal circumstances of the percipient.⁹⁷ Thus we can say with Cassirer⁹⁸ that *subjective* are those perceptions, which we term as associative connections, in the sense of these connections being united only under particular circumstances. Associative connections are not necessary and they do not appear every time, even though they are given exactly the same circumstances. On the other hand, along side these we discover *fixed* connections. These

⁹² Jean Piaget, 1960, *The Psychology of Intelligence*.

⁹³ Be aware that this counts for the phase of immediacy but not if we consider the later phase when we contemplate and analyze the content of immediacy: In the later phase “background” assumptions and preconceptions together with other metaphysical commitments enter the arena as “categories”.

⁹⁴ Harris, 1993, p. 429.

⁹⁵ Ibid.

⁹⁶ E. Cassirer, 1953, *Substance and Function: and The Theory of Relativity*, p. 272.

⁹⁷ Harris, 1993, p. 429.

⁹⁷ Harris, 1993, p. 429.

⁹⁸ E. Cassirer, 1953, p. 273.

connections are valid for any whole field of objects and belong to the field independently of the differences given in the particular place and definite time of the observation. These connections remain steadfast in the flux of experience while others dissolve and vanish. *These fixed elements* are “*objective*”. Why are they objective? Because they remain the same, that is, they do not change with the passing of time. It is on this persistence that we have an experience which is characteristically unchangeable. With its distinctive and definitive character of division into past and present, experienced time is an excellent example of a “fixed connection”. In this manner it is also a disclosure of an irreversibility feature that is non-changeable within experience as such. On the other hand, subjectivity becomes synonymous with change itself, just as any determination of the unique here and now is assumed to be subjective.⁹⁹

However, I believe we should state with outmost clarity that there is no evidence of absolutely changeable elements of experience at any level of knowledge we have reached anymore than there are absolutely constant elements. Although I regard the order in temporal experience to be uniquely common, intersubjectively speaking. Thus, we often find that temporally structured experiences are mistaken as contents of experience instead of being a property of mind enabling us to experience external events and things in an ordered way. However, certain content is always referred to, and compared with, another content of our experience. For instance, many perceptual illusions are due to subjective exaggeration of objective difference, and others are the result of our neural and psychological idiosyncrasies.¹⁰⁰ However, the “relativity” of perception is only relativity to our singular viewpoint and us as percipients. Correction of this subjectivity is due to our decentralization ability. This ability of thought enables us to establish a different kind of relativity: the relativity of thought proper.¹⁰¹ This sense of relativity means that we can relate to an objective or absolute standard. At the same time, the possibility always remains that even this content will be corrected by another and so far unknown “content” and thus may no longer be taken as a true expression of co-variance.¹⁰²

Thus, we see that both from a transcendental and an empirically based psychology the polarity of the subjective-objective is described in a way, which can easily be interpreted as being in general agreement with the thoughts of for instance a modern thinker like Thomas Nagel. However, we can extend this “agreement” even a little further. Because

⁹⁹ Ibid.

¹⁰⁰ Harris, 1993, p. 429.

¹⁰¹ Ibid.

¹⁰² Ibid.

in the context of the subjective and objective we cannot omit the meaning and significance brought in by the “phenomenological” concepts of “synthesis” and “dihairesis”. Even if we are here confronted with different “philosophies” in the sense of metaphysical outlook and methodological approach, we can detect clear similarities between these approaches that must give some weight to the correspondence of the results. To exemplify this third approach, the phenomenological one, we will take a very brief look at Heidegger’s metaphysics. However, in order to *detect the polarity of the subjective-objective* within the phenomenological context of Heidegger, we have to start by plunging into his analysis of perception, that is to say, his understanding of “intending” and “intuition.”

Heidegger states that *when we perceive of something* we, first of all, have to bring the perception into *relief*. And to bring something into relief takes place in new and special acts of *explication*.¹⁰³ Let us consider an example that Heidegger uses to make this aspect explicit. Imagine there is a chair in a lecture room:

The simple accentuation of the **q**, of the ‘yellow’ in the perceived chair, in the **S**, that is, in the whole of the subject matter perceived as a unity. Simply drawing out the color as a specific property in the chair first makes the **q**, the ‘yellow’, present as a moment, (that is, in a form) which was not present before in the simple perception of the thing. Accentuating **q** as something which is in **S** however also involves accentuating **S** as a whole containing the **q** as part of the whole and accentuating the whole which contains **q** as a part are one and the same act of accentuating **S** as a whole. Moreover, this accentuation of **q** as something situated in **S** basically accentuates this relation of **q** and **S**.¹⁰⁴

This means that the chair which now is represented as “being yellow” becomes *yellow* or visible through the articulation, or as Heidegger puts it, “through the arrangement which we call the state of affairs.”¹⁰⁵ The “accentuation” that Heidegger talks about, is grounded in the perceived subject matter. But as perceived, the composition or the “construction” that is brought out in the subject matter is not a real part of this matter. Though it is a subjective contribution to bringing out the matter and so it is also a contribution to bringing out the real.

¹⁰³ Martin Heidegger, 1985, *History of the Concept of Time: Prolegomena*, p. 63.

¹⁰⁴ Ibid.

¹⁰⁵ Ibid.

Objectivity is to be achieved in the accentuation of the properties and parts of the thing perceived. The thing becomes expressed and visible in the way it actually is in itself, so to speak. In accentuating a thing in this manner, we have a form of authentic objectification of the thing. And, as Heidegger writes, “what is primary here is the relating itself, through which the members of the relation as such first become explicit.”¹⁰⁶

We are faced in the above with two distinct acts, but these acts, however, cannot be taken apart from each other; they constitute a unity. The unity of these acts is imbedded in the “intending” of the very relation of properties and parts of the thing. The unity of acts is an overarching unity, which brings the entity in this objectivity as something “given”, as a “bodily object”. The “objective” bodily object has as an expressed characterization a specific relation that is articulated in the form of subject and predicate. It is precisely the acts of “synthesis” and “dihairesis”, or to use the broader terms of Harris and Piaget “centreity” and “decentralization”, which we are talking about here. Synthesis and dihaireis must therefore be *integrated fundamentally* in the acts of centreity and decentralization. *But this means that cognition must be understood as consisting of both the acts of “taking together” and of “laying apart”. Both acts are necessary for us to even be able to talk about an object of some specific kind. Synthesis must therefore be understood not only as “gluing” or “fusing” two or more parts together, but as an act that cannot be understood as something separate from the act of “laying apart”, of differentiation.* These act-elements give, or more precisely, these elements are actively part of the construction of objects in the first place, whereas the two terms “centreity” and “decentralization” signify the split between us as subjects and of the object understood as an entity independent of us. “Centreity” is a state of mind comprising “something” before it is “decentralized”. Decentralization is the state of mind after the act has taken place; it describes the result of an act. The act itself is synthesis and dihaireis. Thus, it is only in the decentralization aspect, in treating intuition and thinking as “objects”, that we are able to conceive of cognition as a flow of acts that consist of both laying together and taking apart, and which concretely “give” us the object. The object as such is a representation made possible through the complexity of construction, that is to say, of *cognition*. This corresponds to the way which Husserl has pointed out, that, “whatever subjective ‘standpoint’ we may assume, recognizing always occurs; and no matter how we vary the standpoint, we find nothing absolutely new but only

¹⁰⁶ Ibid.

something made distinct-specifically, something made distinct within fixed boundaries.”¹⁰⁷

Thus, the “object” we are consciously aware of, for instance a specific *bodily* object, is a representation and a conceptualization. These concepts give us time and again the same objects, because we objectively – in the concreteness of the representation – have just one thing. “It stays the same because we always move within the same related group of intuitions or cognitions, where the transition leads from what is known to what is known”, as Husserl puts it. And he continues, “and does so in such a way that the total content that we have in each moment already contains in itself the intention aimed at all the content of the further moments.”¹⁰⁸

The concepts become fixed points of reference for cognition, i.e., for *experience*. But this does not mean, as I have already argued, that they become fixed in the sense of unchangeable categories and thus gain a categorical function. These concepts are only partly “categorical”; they take part in the determination of the perceptual world. Then again they are subjected to change as soon as something “new” is added which contradicts the content and where the new content is more complex in the sense of giving more “fulfillment” to the perceived. We can therefore say that we have groups of intuitions or cognitions which are representations of one and the same object. These intuitions are cognitions that offer known parts and properties of the object. Furthermore, we have transitions between these groups that consequently offers fulfillment of a part of the intention directed towards it.

Hence, when we intuitively “separate” and “join together” parts and properties in experience, we construct an object of some specific kind and also the object as a “concept” as such. We should not forget that by creating these distinctions, we also establish a conceptual “link” between us as cognate beings and the world as something “unknown” to us. Thus, it is through our subjectively based objectifications or conceptualizations that we can access the world in order to render it something as known.

¹⁰⁷ Edmund Husserl, 1991, *On the Phenomenology of the Consciousness of Internal Time*, p. 152.

¹⁰⁸ Ibid.

4.3. Subjectivity as the Problem

No matter how one regards Nagel's view on the subjective "movement" towards an objective "sphere", it will remain, nevertheless, a likely possibility that we create objectivity as a way to gain an intersubjective access to, and thus a commonly acknowledgeable knowledge of, the world. A remarkable feature of this conceptual development is the one which marks the passing over from a subjective viewpoint to one that is objective – and that this is not across some pre-fixed line of demarcation. Rather it is a somewhat floating transgression or metamorphose of subjectivity as such. It is an effort of thought that elevates consciousness to an awareness of a different conceptual level; a new level of thinking which opens up further the possibility of perspective that is in its unique abstractness impersonal, that is, ideally objective. Thus, each new level would probably contain less and less of the specific subjective, that is, of the specific personal point of view. But mind you, *not necessarily less of a specific subjective experiential, and thus necessary, property like temporality*, but less of that which is experienced as important to the experiencing person as such and which is clearly given to ourselves as "something" that is *private*. Or as we remember Cassirer said, less of that which only is "*associative connections under peculiar circumstances that are not necessary even if given the same circumstances*". Thus, Nagel says: "The distinction between subjective and objective is relative."¹⁰⁹ There are different levels of more or less subjective-objective viewpoints. A general point of view is more objective than an individual point of view, which again is less objective than the point of view of the physical sciences. Having said this, Nagel then turns our attention to a quite interesting feature of this "polarity". The "problem of disjunction" is about the metaphysical opposition between a person and his subjectivity and the objective world as it is in-itself. Or as Nagel puts it, "the opposition between subjective and objective can arise at any place on the spectrum where one point of view claims dominance over another, and more subjective one, and that claim is resisted."¹¹⁰ We resist because the assumed higher level of objectivity is in need of justification. It might be intuitively so, but it does not correspond to what we know about reality at this point. We resist because the new factor does not fit in the whole. Thus, we move on and accept the fact as soon as we have established a connection with some other part of the whole.

¹⁰⁹ Nagel, 1979, p. 205.

¹¹⁰ Ibid.

In the “physics of time” we are confronted as theorists with two forms of “wholeness”. One considers “becoming” as a feature of reality. Another one does not want to consider this feature at all, but when it does consider “becoming”, the sole aim seems to be to eliminate it as a property of subject-independent reality. This means that one actually aims at eliminating the fact that *if* we are to confront time in its experienced complexity, we also have to face the logically contradictory “nature” of time. If we omit these contradictory temporal aspects we do not have to consider them. Hence, this last group can claim that “time” understood in terms of “duration” and “becoming” is subjective and as such an illusion. Then we are faced with another problem, because within our own conception of the “objectivity” of time we have to measure time by means of motion; but then again motion presupposes the notion of time spatially described as a “flow”! How can we explain away the circularity?

I believe that E. A. Burtt’s words still make good sense: “The scientific notion of time has almost entirely lost touch with duration as immediately experienced. Until a closer relation is regained, it is probable that science will never reach a very satisfactory description of time.”¹¹¹ Furthermore, to omit experienced temporality, because it is held to be an illusion, does not free any of us from being puzzled over how a tenseless and non-temporal world could initiate and produce the emergence of the illusion that we know as “time”. This should perhaps help us to see that in spite of the enormous amount of verified and “unfalsified” knowledge we encounter within physical sciences, the problem of time is not such an *easy* task even for physicists. Because with the subject-matter “time”, we are confronted with a property of nature that has a nature of its own and that is not in any sense like other aspects within nature that physics *can* deal with. No matter how *physical* or *mathematical* one *makes time to be*, it will still be a metaphysical, “fictional” transformation of something known to all of us, namely, of the time that we encounter in *experience*. And as such one cannot simply rule out *any* aspect of time, no matter how self-contradictory time then would appear to be. So to *resist* a notion that appears more objective, because it has less subjective experiential features attached to it, is not necessarily based upon some reluctance to get rid of these “subjective features”. *On the contrary, it is actually an objective consideration of the problems that we get submerged in if we choose to exclude the whole for the sake of saving – from the experiential point of view – one highly speculative “odd” theoretical constituent.*

¹¹¹ E. A. Burtt, *Metaphysical Foundations of Modern Science*, p. 262.

Another point that Nagel has made, and which I feel is necessary to clarify, is that subjectivity is not any *private* matter. In a very specific sense the experience of time does have a private character. The qualitatively experienced “duration” of an event might very well have different measured durations in others perceiving the same event. What I experience can be based upon some psychological factors that are dominating the temporal aspect of my consciousness in the time of experience. No wonder that some have been eager to dismiss the totality of time experience as mere appearance and thus also as an *illusion*. Of course they have then neglected to differentiate between content, that is, the particularity of the experience, and how the experienced content is always ordered in the same manner, that is, inter-subjectively. For instance, as Mary F. Cleugh points out “an hour as measured by a clock, may seem long to one observer and short to another.”¹¹² Furthermore, when we, for instance, are very busy for an hour or so, we experience this hour as short in passing. Nevertheless, when we think back on the same event it seems long. So then, *what* I experience can be conditioned by various factors, but *how* I experience, that is, that I “expect”, “remember” and “present” is true and objective properties of every experience. The events appearing in these series are ordered in such a way that I can say: “Event A took place before event B, which is the same as saying that B happened after I did A”.

The successive ordering of events as such does not change at all. This experiential feature will always remain a common *property*. Remember Ernst Cassirer’s definition of objectivity, where regular features which are necessary, i.e. that show themselves *every time*, are the “objective” features. Nevertheless, the problem about a subjective representation of an objective time-ordering series is puzzling and in many opinions not at all solved. We should therefore confront some of the problems pointed out by scientists and philosophers working within what we could call “psycho-physics”.

Something should be said about the different problems that surface on the explanatory clash between two “different” worlds like the physical description of the material world and the phenomenological manifestations of philosophy, that is, the old opposition between scientism and humanistic sciences.

Conferring with history we find that the compass needle is no longer directed to the transformations of the physical into phenomenological manifestations. This is i.e. exemplified by Malebranche who sought to give a new interpretation of the Cartesian extension as an intelligible extension accessible through human

¹¹² M.F. Cleugh, 1937, *Time, and its Importance in Modern Thought*, p. 7.

participation of God's ideas. Another is Berkeley who sought to transform the physical into perceptions of the ideas of God, hence "being is to be perceived".

Now the compass needle points towards the tendency of explaining mind in terms of the physical. While the first might be described as the anti-realist approach, this last approach is what defines scientific realism. The turn of the compass needle came with the realization of the fact that the physical cannot be interpreted in terms of a transcendental version of the mental. Therefore, the mind must be interpreted in terms of the physical, not by physics but by *psychophysics*. Thus, we have the situation where it is not physics that shall take notice of time as experienced. *Scientism* has this issue covered by *psychophysics*. Subjective time is thus one of the topics, which psychophysics are discussing. Psychophysics aim at scientific-like explanations of everything subjective and qualitative, of the mental life of the human being. Concerning time it is the *illusion of time* that preoccupies the researcher. The psychophysicist claims that *the illusion of time is real*, however, the content of the illusion, which defines it as an illusion, is not the issue of being real or not but of being correct or not -- compared with the objective experimental situation construed. The claim of scientism is that physics is not incomplete in the sense of not taking subjectivity and subjective time seriously. Physics merely split up the tasks between *fundamental physics* that has no interest in the issue what so ever and *psychophysics* that has. This new type of scientific approach is different to an earlier positivistic version, which sought to explain subjective experience as a direct emanation of neurochemical reactions. The supposition is nullified by the very truth that such things as neurochemical reactions do not exist, which do not already presuppose the presence of a subject of experiencing.¹¹³ This type of approach sought to explain why we had subjective experiences of this or that kind. The new type seeks to explain that we have a great deal of illusory material to cope with in our daily life.

Among the new psychophysicists we find Daniel Dennett. Dennett's focus of attention is not on the "I", the first person – the point of view of the experiencing person. It is rather the "third person", an individual who is submitted to experiments where the event-ordering time-series, as he *experiences* them, is questioned after being compared to the actual pre-arranged events, which are the external and controllable experimental conditions that determine the truth-

¹¹³Albert Shalom, "Temporality and the Concept of Being", in P.A. Bogaard & G. Treash, (eds.), 1993, *Metaphysics as Foundation*, SUNY, p. 186.

value of the response. The procedure here is that the scientist compares the test-person's response against the stimuli offered.

Dennett discusses an experiment in which the brain seems to play tricks with the actual temporal order. A person is given a device that makes him feel some taps that are given to his arm in a certain sequence. In rapid succession, they tap him on the wrist, then on the elbow and finally on the shoulder. The person will then report the sensation he feels. The reported sensation was that he felt the taps traveling up the arm. The point here is that he felt some taps in between the actual points of contact. The problem then is, how does the brain know that it is going to receive an elbow tap after the wrist tap, so that it gives the person the impression that he feels a tap on the forearm in between?

Dennett explains the above as an example of "parallel processing". The point here is, according to Dennett, that there is more than one version of the sequences of the events streaming through the brain. He reports that the brain edits the stimuli, compares and rejects, and eventually blends it together in order to create a response, which is in fact an illusion.¹¹⁴ And of course there has to be some sort of integration in the brain of parallel data streams, as the brain has to process nerve impulses from different areas of the body. These impulses obviously arrive at the brain at different moments. As Paul Davies has pointed out¹¹⁵ our very survival may depend on how fast we in fact are able to respond to such relatively slow traveling nerve impulses. In a moment of imminent danger and where hand-eye co-ordination is regarded as the necessary instances for action, the brain simply has to skip information. It cannot afford to await the arrival of any further information through the diverse nerves of the body to be fully able to evaluate the situation in full, to even ensure synchrony of the hand-eye co-ordination. The effect of this is that the brain must simply anticipate the probable outcome of events based often on scanty and fragmented information. Any anticipation is continuously revised as new information comes in. Therefore, I believe that Davies is correct in suggesting that there must be some sound biological need for reversing the order of arrived sense data and the time order inferred by the subject.¹¹⁶ The puzzling conclusion is that the Brain often does what you are going to do anyway even before you do it consciously. Obviously, the brain can of course make fatal errors in its anticipation of the outcome, but it seems very probable that it is also often correct in its decision or choice of action.

¹¹⁴ Davies, 1997, *About Time, Einstein's Unfinished Revolution*, p. 270.

¹¹⁵ *Ibid.*,

¹¹⁶ *Ibid.*

Furthermore, if we look at the problem related to time here, we see that the construction of a comprehensive and corresponding representation of time order is complex. First of all we have the flux of the arriving non-related data (it *is non-related* because it has not been differentiated and/or put together by the mind yet). This is to say that the brain receives all kinds of signals which do not “belong to each other” because the signals are not synchronized. However, these bits and pieces of information are in fact the only bits and pieces of information, which the brain can deal with instantly in order to put together a consistent impression of a possible external time-order. For the brain, this means to have a probable estimation of the actual time sequence of the external events.¹¹⁷ However, nerve signals are not, from the side of nature, primarily intended to inform our intellectual curiosity or to give us material for contemplation, but rather to make or force us to act instantly. We know that nerve signals, like nerves, are physical things. They are physically present and function in every situation which people are involved in. Nerve signals must, like any other physical thing, obey the particular physical conditions of the processes they are involved in, which signify that also nerve signal are subject to “physical laws”. Therefore, the time order of physical events is important. We cannot act before we receive the information contained in the impulses. Impulses are report stimuli. The brain acts on stimuli and at the same time make up missing data which make a probable continuation of the received stimuli. The received stimuli are, however, factually received. They are not “made up” of a brain constructing a probable outcome. Thus, if we look at the anticipation aspect we see that the construction of a probable outcome is immediate on the first arrival of diverse and fragmented data. The brain has to make an immediate choice among the bits of data; to put together the most likely continuation of the event. This also indicates a kind of reference to experience, that is to say, that perhaps the brain uses past experiences as “normative” structures, that is, *experiential* structures that are applied “deterministically” on actual events happening. On the other hand, if we look at the physical aspect, we see that the electrical sequence in the brain seem to correspond to or shadow or simply respond to the time sequence of events in our external and local world.

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I believe that we must have some sort of correspondence between the temporal order where actual physical events take place and of the temporal order that is experienced. This assumption is the

¹¹⁷ Ibid.

¹¹⁸ Ibid. p. 272.

most likely one. For example, take Stuart Albert's¹¹⁹ psychological experiments, where two groups of volunteers unknowingly had to put up with clocks that had been tampered with. In one room a clock was slow, in another room a clock was fast. The point is that *everyone felt their mental functions adapted automatically to the accelerated or retarded pace*. A possible conclusion is that the brain will adapt to the temporality immanent in the situation it is immersed in. However, as Dennett has shown, this is not always a fact. It is especially when we have to construe the continuation of an order of events by *conjecture* we may go astray. Therefore, it is rather naive to assume that mental events always mirror external or physical events perfectly; that we have an external stream of events perfectly synchronized to those occurring mentally.¹²⁰ On the other hand, human beings have complex psyches; we have to deal with many aspects at once that belong to different levels of consciousness. And so we may have different ways of experiencing time.¹²¹

This would certainly explain the above, that we have certain mental states, which alter the rates of passage. The subjective experience of the passage of time depends on the rate at which information is processed.¹²² The faster the processing takes place, the more thoughts and perceptions one experiences per unit time, the faster time will appear to pass. Without too much hesitation, we can say that we are *co-coordinating* our experiences differently. *We coordinate differently when our focus of attention is on our own state of mind* and when *our focus of attention is directed outwards*, that is, onto something else than our own state of mind. In the second case we adapt to the external circumstances, as shown above by Albert. However, in the former case (our own state of mind) we cannot always relate our point of view with that of others because other subjects may not be in the same state of mind as I am. My state of mind, in so far as it is toned by a private situation, like pain and/or specific feelings in fact *conditions* my *perception* of the situation. Nevertheless, I will

¹¹⁹ S. Albert, "Subjective Time", in J.T. Fraser, N. Lawrence, and D. Park (eds.), 1978, *The Study of Time III*, Springer-Verlag, p. 269.

¹²⁰ Davies, 1995, p. 265. Note for later that "physical events" - as they are used here - are perhaps confused with physical *measurements* where one is using - as a measuring device - a clock that necessarily represents time *homogeneously*. The clock is a fabricated timekeeper. To say that physical time is "homogeneous" - in the same way as it is displayed on this timekeeper, is a mere *assumption* - since we *know* time only from our temporal and *heterogeneous* experiences. The time of mind is, as *duration* - and compared to the clock, heterogeneous.

¹²¹ Davies, p. 206.

¹²² *Ibid.* p. 273.

always, *irrespective of any circumstance*, experience time as a continuous or successive change of moments.

Thus, I can “detach” from my own *particular* situation or circumstance, which gives a different perception of the temporal particularity of the events, especially its duration. However, the essential temporal properties “now” as opposed to “past” events, and the likelihood of anticipated outcomes will be *invariant* irrespective of the particularity of the situation. Therefore, the transition to a more “inter-subjective” *objective* viewpoint does not have its primary foundation in *what* we experience but in *how* we experience. We do not hesitate to determine the felt duration as contingent because we cannot escape the objective viewpoint, that is, the oscillation of thought between alternative viewpoints. Thus, we can relate to Thomas Nagel’s statement “the object is to discount the features of our pre-reflective outlook that make things appear to us as they do, and thereby to reach an understanding of things as they really are”.¹²³

The hidden purpose of our strivings for a more objective viewpoint could perhaps be that we truly want to reach a viewpoint that *saves the content, the “what” of the experience*. That is to say, we might very well be content with the so-called felt duration of time, but then again others might not relate to or understand this. It must then be “contingent”, and only a correlation with a different viewpoint can save the content in relation to the others and their more or less accurate point of view. Thus, we can transcend the particularity of the experience, and, at the same time, some of my own circumstantial peculiarities.

But does this render my initial experience untrue? Was it a mere illusion? Within the whole spectrum there is not any point where we can put the finger down and declare that this is *real* and that is not. But we can say that we are gradually advancing to aspects of reality which are *outwardly* more real, that is, “in themselves”.¹²⁴ This does not mean that what we have experienced is unreal, it is only less “outwardly real”, but as an experience it is still very much “inwardly real”. *The point that I am trying to make is that we actually make all of these peculiar, various and complex distinctions*. Thus, we can claim that the “real” can spatially be viewed as “stretched out” within the

¹²³ Nagel, 1979, p. 208.

¹²⁴ This “in itself” is peculiar; as I have already argued, “in itself” is a particular metaphysical viewpoint. Although not for the same reasons as Kant claimed. It is quite the opposite since we claim to be part of that same Nature, and not closed off from it, by the way we perceive and experience it.

whole spectrum of the subjective-objective. Our view then is that “objectivity is *not* incomplete, but rather a *partial* picture of reality”.¹²⁵

Thus, to return from the above issue of time to the assumptions concerning the subject as the problem in science, we must conclude that subjectivity cannot be eliminated. Either one attempts to disintegrate subjective time because it does not fit into the sphere of measure and certainty, that is, of concern to science, or the attempts to integrate it as problems will eventually arise. In the first case psychophysics deals with human temporality, it takes care of the “illusion”. Subjective time is assumed to be an illusion because subjectivity cannot or will not await all the stimuli before it takes action. The test person does not report correctly the objective order of the given stimuli or of how many times the stimuli were given. It was in fact too much “response” if compared to the stimuli given. But then again, why call it an “illusion”?

On the other hand, any attempt to explain subjectivity scientifically will have to deal with at least one principal difficulty. This difficulty concerns the formulations that the analyses offer to our understanding of subjective time’s status within nature. The difficulty is that the analyses begin with the physical, proceed to the sentient and are finally subsumed under the conceptual without giving an account of how such different manifestations can derive from the same initial physical state. It makes sense to assume that physical nature must underlie subjective manifestations of time. But the explanation provided by neurologists and brain/mind identity theorists does not give us an understanding about the actual fact of sensation, thinking or time awareness. Concepts like “organizational integration” or “self-differentiation” are interesting but they do not relate subjective manifestations to physical reality in any way intelligible. Our brains disclose an extraordinary complexity and neurochemistry, and the relations which follow is simply to *refer* to this complexity, which, however, is very different than an explanation of, for instance, sensory experience. The reference to complexity is not an explanation of the phenomena. The problem of subjectivity consists in the sense of subjectivity that is situated without of reach for the scientist, since he cannot provide an explanation of something so fundamentally different from the physical structure of physical process as, for instance, the temporality structuring of the simplest of sensations.

¹²⁵ Nagel, 1979, p. 210.

4.4. The Problem of Disjunction

This brings us back to the problem of opposing views; i.e. between the *nature* of the world apparent in experience and “nature” as it is represented in the physical sciences. Though I will present some critical remarks that appear to be directed to physics in general, I have to specify that they will only be directed toward scientism and metaphysical realism. That is, against the tendency which holds experienced time to be an illusion and hence, ultimately, eliminates time as we know it as a property of reality.

Hence, Nagel writes that: “The difficulty of reconciling the two standpoints arises in the conduct of life as well as in thought. It is the most fundamental issue about...knowledge...and the relation of mind to the physical world.”¹²⁶ This is indeed a most concerning issue. We can experience this fact in the way that the homogeneous and symmetric time concept in physics represents the layman and his innate feeling of the time flow, with a sharp dividing line between reality and abstract theory. This must be understood from the level of conception as representing a mere accidental “construction”, or more precisely as a *phantasm* of the mind. The subjective experience we all have of the flow of time stands in contrast to the abstract time concept within physics. The layman tends to hold his experience of time in an unqualified way as real time. However, from the point of view of the physicist the rejection of this feeling for a more theoretical and instrumental assumption seems more “appropriate”. The layman’s point of view finds support in Michael Polanyi’s statement that we as human beings must see our world, our “universe”, from our forms of rationality; we must speak about the world in terms of our language, which is shaped “by the exigencies of human intercourse”. For “any attempt rigorously to eliminate our human perspective from our picture of the world must lead to absurdity.”¹²⁷ On the other hand, we are faced with what we might call “physical *fundamentalism*”. First we are confronted with the problem of the rejection of time understood as “becoming”, i.e. as *transience*, *unidirectional* and *irreversible*. Second, with the claim that if it is not within the framework of physics it is not real – that everything which presupposes temporality is unjust or not correct, because what is presupposed is an *illusion*. Thirdly, the problem that, in spite of rejecting subjective time as an illusion, the same fundamentalists still have to presuppose and to put their trust into the very same “substance”, that is, the “medium” for this illusion.

¹²⁶ Nagel, 1986, *The View from Nowhere*, p. 3.

¹²⁷ Michael Polanyi, 1998, *Personal Knowledge*, p. 3.

And this “substance” is nothing else but the human mind – because *thinking* is still the “key” to solve the riddle of time.

I believe that the fundamentalist view – together with the philosophical loyalist declarations – have been imbedded deeply into serious philosophical problems. These three points are intimately related, that is, “*mind*”, “*time*” and “*physics*”, and are areas, which cannot be separated in any way conceivable. Mind or thought is the ultimate resource in any discovery. And one of the essential features of mind and thought is temporality. When temporality is rejected it is because the physicist or the philosopher believes that *it is only a feature of the mind*. But there is another reason as well; perhaps that we can conceive of another time-series, equally part of the inventory of the mind, but when it is *analytically* separated from the dynamical structures it allows us to treat time as a causal ordering series. Thus, we are – as *physicists* and *philosophers* – analytically liberated from the dynamical and *qualitative* properties of time.

However, one seems to forget that the objective time concept is only *analytically* devoid of subjective elements. It is still a creation of the human mind, and thus it must have its origin in the subject, i.e. in its ways of cognizing and thinking. The objective time concept within physics must have, as its basis of evolution, something conceptual. Perhaps several different ideas and concepts are conjoined, which, eventually, have led to the “*objectivity*” of time. And what makes up the core of this objectivity is in some respects relative to the one individual. Though it is attainable by anyone – the issue in question has now an “existence” of its own. We can ascribe such a notion to Albert Einstein, but add that he in the final product of his analysis could not take these fundamental notions seriously anymore. He succeeded in reaching a level of detachment where the subjective temporal structures of experience no longer represented any reality at all, but could only serve as mere appearances, that is, they were proven illusions for the physicist. Thus, we also find that Newton’s concepts of space and time, at one time the objective physical concepts, were “revealed” to be nothing more than mere appearances. At the same time the advance of objective thinking closed the door even tighter on experienced time due to the relative familiarity between Newtonian time and our experience of time.

What the new advance did not leave behind was the general commitment of the physicists to the assumed true nature of the fundamental laws of physics. This is to say, the belief that these laws represent subject-independent reality. Whatever else that shall yield the same degree of reality as these laws, must share the same characteristics as these laws, namely their *eternal truth-value*, their *indifference to change*, their *timelessness*. Furthermore, geometrization

and measurement became important for the scientist in order to operate with time in the sense that he or she can treat events in time with space-like terms. In fact, the idea was to treat time and space not as one unity but as similar as it was possible within the co-ordinate system.

I believe that we can see a particular *commitment* at work here. Just consider the question: How can we apply something as *subjective* as time “objectively” – how can we apply it in physics? The answer given from contemplation of the problem contained in my question resulted in an attempt to “eliminate” the temporal or transient aspect of time analytically.¹²⁸ That is to say, by rendering time secondary to the fundamental laws of physics. Thus, we can transform the concept of “real” time into a concept which appears “law-like”. Hence, we can apply time as a causal order in which we only are faced with measurements of “events”. But then again, are we really faced with time at all anymore? The belief, that the essential nature of time is revealed, prevails. Here, we have an *ideal* time for any physical occurrence: The “*t*” in physics is believed to be stripped from every subjective property that we normally understand as inherent in time – it is not “*time*” anymore, but the *time-interval*. Is it then, like in Planck’s neat formulation of the physical criterion of objectivity that everything that can be measured *exists*? Does this imply that only when we can measure time are we in the true sense dealing with physical time in the *sense external and subject-independent or ontological* time? The point I wish to make is: What are we *actually* dealing with here - *ontological* objectivity, that is, a viewpoint that concerns real observable entities of the real world or a *cognitive-epistemological* form of objectivity, that is, an objectivity which deals with conceptual aspects that cannot be experienced or located in the

¹²⁸ Of course I have not forgotten McTaggart. McTaggart’s analytical separation of the B-series from the A-series has resulted in a most disturbing temporal dualism. McTaggart’s temporal dualism has a paradox at its core; a paradox resulting from a theory built upon the commitment to naturalistic metaphysics, which assumes that objective (i.e. *external*) time cannot resemble anything like the temporality in our experience. However, because of the impossibility of keeping the temporal series absolutely distinguished from each other, McTaggart went so far as denying the existence of an external time since it could not be *represented* by the B-series alone. However, McTaggart never really denied the existence of an external time; he denied that it could be represented, as subject-independent, by the B-series *alone*. The reason for this is that we always have to *presuppose* the A series and therefore we know that the B-series cannot represent time correctly and truthfully, simply because we cannot get rid of, or operate with time independently; of the qualitative aspects in the A-series. The naturalistic assumption in this particular context is that objective or external time does not have A-series’ properties. I will be addressing McTaggart’s philosophy of time later on.

real world by any means of observation but that still makes sense within specific theories? The ontologically real always includes the epistemologically real, but epistemological objectivity is not necessarily identical with ontological objectivity. Thus, the physical concept of “time”, as a representation of real time is a standing metaphysical problem.

Most people experience that one essential aspect concerning living and experiencing is the irrevocability of time. In other words, we experience the irreversibility of time, the impossibility of a reversing of time and the events past. Now the question is: Is this really so? Is not this merely an anthropomorphic prejudice? Perhaps the philosophers of science and physicists are right in abstracting from this? I assume that if irreversibility is an anthropomorphic bias then it can be claimed that although the “*t*” of physics is useful it cannot be completely identified with time. One has to distinguish between hypostatization of an abstraction on the one hand and the epistemological concerns about time as an aspect of method. In other words, the distinction must be made between legitimate abstraction and falsifying abstraction.¹²⁹

Besides of the existential irrevocable aspect of subjective temporal experience, something may very well be gained by regarding time as a relation and an interval, which is abstracted from its content. Although “*t*” is different from space it can be compared to space intervals, and finally, it can be handled, controlled and developed mathematically. Our concern, however, is with the open or implicated claim that the “*t*” of physics discloses the “nature” of time, since it is held that it gives satisfactory account of time as a method of relating events, of measuring distance etc. If this is claimed, too much has been stated. This is, in my opinion, an unfounded claim. Surely, I do not wish to indicate that physical time is not useful. I mean quite the opposite, as it is precisely the term to be used on this concept: It is its legitimization to be *useful*, which is why it is applied and is being developed within the framework of physics. However, this methodological concern of physics with the concept of time is not the sphere of metaphysics.

Thus, what has been said so far does not aim at discrediting the physical sciences – an impossible thing to do, but it is instead an attempt to shed some light upon the difficult matter of explaining the nature of time. Because one cannot help wondering if it is the conventionality of measurement, or the naturalistic dogma of the physical methodological approach that shall decide upon the nature of time. Or if some other and different approach could yield some decisive

¹²⁹ See also Cleugh, 1937, pp. 49-50.

knowledge to the confused who keeps on pondering over the problem of the *real* nature of time. Perhaps it is not the psychological features of time that are bothering the physicists, because these features can be omitted by reduction and elimination by emphasizing mathematics and measurement. Perhaps it is the *suspicion* that measurement alone *cannot* capture the “essence” of time since it does not correspond to anything like the experience we have of time. In other words, this opens up for the problem of correspondence between measurements, the concepts that physics has of the processes and the real-world processes, the events which are being measured. The problem still is that some scientifically inclined physicists and philosophers still regard psychological – and even biological time as a mere illusion, like in the words of Einstein: “For us believing physicists, the distinction between past, present and future is only an illusion, even if a stubborn one.”¹³⁰

However, philosophers with a scientific bent are presented with a problem. I believe that to follow a line of discussion which aims at reduction and elimination, not only shows us that these philosophers confuse different meanings of objectivity, as well as undermining the ground on which they stand with such immeasurable confidence. If essential features of the mind are illusions to the scientist, as the phenomenological or psychological features of time, then an essential feature as *thinking* might very well be an illusion too. Because we have no other way to prove that rational thought corresponds to reality than to refer to the concepts of rational thought, i.e., we cannot see any “reality” without the use of concepts. But then one might add that we can experiment, or somehow “see” if the hypothesis holds well. Still, any experiment or experience is, fundamentally speaking, based on the rational subject: We will always have to relate to reality as a *construction* by the mind. So if mind is an illusion, then time is an illusion. But then physics would be an illusion too.

However, the “*t*” of physics, understood as an abstraction from our general awareness of time, is being applied within physics according to conventions of measurement. Thus, I believe that it is gaining a high degree of *epistemic objectivity*, but not of ontological objectivity. That is to say, the “*t*” is an epistemological and metaphysical product. It is a product of the constructions that both originate in the mind of the thinking subject and in the tradition or intellectual culture that the thinker works within. Thus, it is also a product which meaning depends upon the theoretical context in which

¹³⁰ Quoted from D. Griffin, 1986, p. x.

it was conceived. Insofar as the claim is that the “*t*” represents the *real* nature of time, we are not dealing with physical theory any longer, not even with epistemology, but with ontology or metaphysics.

4.5. Objectivity and Ontology

We shall now consider that different opinions on the subject matter of “objectivity” will influence the overall understanding of the object at hand. Because any determination of “objectivity” is a matter of argument and opinion, as in itself it is not objective. That is, we have to consider that we have various *meanings* or opinions about objectivity, opinions we assume are “objective”. We apply our understanding of objectivity in the operation of determine the object at hand. Thus, we will attempt to clarify our use of objectivity as such and perhaps by making clear to the reader what sense of objectivity we think that one legitimately *can* ascribe to time in physics.

We have already discussed the subjective-objective polarity to some extent. Still there are some aspects of Nagel’s metaphysical notions concerning time and objectivity which are problematic. Nagel is of the opinion that objectivity, as it is traditionally ascribed to time by post-Einsteinian physics, “cannot be faulted for leaving out the identification of the here and now”.¹³¹ Nagel believes, as many others in spite of the peculiarity of missing a necessary point of reference, in the *now* of the observer that reports the event, that if now was included the conception would not be objective. He expresses his view by showing how this represents a problem but that annexing it to the objective or to the physical something, which is not already in it, does not solve the problem.¹³² The problem here is that Nagel seems to forget what he is arguing for, namely, that any objectivity presupposes a subject making the objective distinction. It is the same matter concerning objective time; for instance, Einstein’s observer represents a necessary “frame of reference” that can report the moment of time when the event occurs. Any reporting of a “moment of time”, as Gale has pointed out, must presuppose a “now” that refers to the ordering of the event in the tenseless B-series, that is, as the determination of the event as being identical to a specified “this time”. However, Nagel’s argument is intended to make us aware of the peculiar operation of

¹³¹ Nagel, 1979, p. 210.

¹³² Ibid.

“objectifying” something in order to make this something real and legitimate in the eyes of the relevant authorities.

By “annexation” Nagel means, “if one fails to reduce the subjective to familiar objective terms, and is unwilling to deny its reality outright, one may invent a new element of objective reality especially for the purpose of including this recalcitrant element...”¹³³ What does Nagel mean by “objective” in this case? And does this indicate, that contrary to his notion about different levels of objectivity, there is a definite and closed sphere of objectivity, which clearly excludes a definite and closed sphere of subjectivity when it comes to time? That subjective time shall remain within the subjective sphere, and that annexation is a strategy to “save” the phenomenon seen from the viewpoint of a fixed objective sphere? Nagel firmly believes that everything shall not be brought under “objective description”.¹³⁴ But what does he mean by objectivity in the case of time here? It is not clear whether he refers to ontological objectivity in the sense where experienced time would belong to the ontologically real, or that “objective description” refers to something epistemologically objective. If he is in favor of the first case he clearly contradicts himself, but it makes sense if it is in the last sense. Still it does not sound right, because he seems to presuppose, or take for granted, some kind of time concept, which in no way can include properties that are evidently subjective.

The emphasis on *epistemic objectivity* is important here. The concept of time *reversibility*, within a *limited formal sphere* of physics, has *epistemic* objectivity. And considering this formal schema of physics, it makes sense that subjective time presents great difficulties. Thus, Nagel’s two other “strategies” make sense. These are “reduction” and “elimination”. One can try to reduce the “appearances” so they fit under an objective interpretation; or, if this does not succeed one can, as we have seen, “dismiss the deliverance of a subjective viewpoint as an illusion...”¹³⁵ But still, I think it is necessary to go somewhat deeper into the difference between the *ontological objective* and that of the *epistemic objective*.

As I have tried to argue, mathematics plays an overall important role in physics where measurement is an inter-subjective tool. And I have argued that just because something cannot be measured, it does not necessarily mean that we are faced with something that cannot be ontologically real. *We should not mistake the ontologically real object of being necessarily identical with the inter-subjective object of*

¹³³ Ibid.

¹³⁴ Ibid. p. 210.

¹³⁵ Ibid.

mathematics. However, this happened to be the case with the theory of primary and secondary sense qualities, which was elaborated in the 15th and 16th Century by Galilei, Descartes and Locke.

In *the theory on the subjectivity of the sense-qualities*, only the quantifiable aspects of matter were argued to be truly objective, whereas qualities like smell, taste, and color etc. were subjective sense conditioning factors, that is, circumstantial to the relative condition of the perceiving subject. These qualities could not be quantified, and were therefore not “objectively” *real*. They were simply crossed out from the list of real things; they did not belong to the world “out-there”, but only as more or less contingent features within us as sentient beings.

Hence, we can easily see that the objective and the subjective distinctions can at least take two forms or have two different senses or meanings. Let us take a look at the important distinctions.

Nicholas Rescher¹³⁶ operates with three well known but *fundamental* distinctions between different meanings of objectivity. First we have “*ontological objectivity*”, secondly, “*epistemic objectivity*” and thirdly there is “*cognitive objectivity*”.

“Ontological objectivity” is *that which is physically real, independent of human mind*. It is an objectivity which is “object-oriented” and which deals with “actual existents – with concretely realized objects of the real world.”¹³⁷ This kind of ontological objectivity is defined by the turn from or as a contrast between, what is connected with real existing things in time and space *and* what is mind-bound or ideal. Hence, the distinction between real things and appearances or mind-bound and ideational ideas is identical to the distinction within the doctrine of metaphysical realism. Ontological objectivity includes the human brain but it does not include the human mind. For that reason, the notion of ontological objectivity is not satisfactory and it has to be further developed.

British philosopher Pete Mandik¹³⁸ claims that we, first of all, have to distinguish between “metaphysical” objectivity – which I hold to be the same as “ontological”¹³⁹ and “epistemic” objectivity. As with Rescher, Mandik claims that the core of the *metaphysical* notion of

¹³⁶ Nicholas Rescher, 1997, *Objectivity, The Obligations of Impersonal Reason*, p. 3.

¹³⁷ Ibid.

¹³⁸ Pete Mandik, 1998, “Objectivity Without Space”, *The Electronic Journal of Analytic Philosophy*, Issue 6, p. 1-3.

¹³⁹ It is ultimately the same because how can we know what the world is like independent of any subjectivity? Therefore, metaphysical and objective objectivity are the same as far as we separate between subjectivity and objectivity in the sense that objectivity is something independent of and thus *external* to the mind; that the only thing we are then left with are *our assumptions about how it might be*.

objectivity is the notion that true objectivity is the form of existence, which is independent of our mind. The subjective, then, is the “existence” or *phenomenon*, which is dependent on our mind. This means that we have to consider a further distinction, namely that of a “subjective” and “objective” ontology. *Ontology then has to be understood as something which is not only objective; it has to include subjectivity as well.*

Mandik claims that the difference between the epistemic and the metaphysical forms of objective/subjective differentiation hinges on the different objects that can be said to be either subjective or objective. But in contrast to Rescher, Mandik makes, as I have already mentioned, a further differentiation between the ontological real which transcends the definition of the ontological objective as something being identical to the physically real. Mandik’s distinction of ontology is into objective and subjective categories. There are real physical things in the world; however, also subjective experiences that reveal certain inter-subjective characteristics which are properties of the world. *Thus, the claim that any ontology of the world, on what is the inventory of the world, and on how this inventory is, also has to comprise subjectivity. This is to say subjectivity must be included!*

What distinguishes “epistemic objectivity” from *ontology*? Rescher’s “epistemic objectivity” is about our claims, assumptions, hypotheses, ideas and notions that have an *impersonal* nature. Here, we are not dealing with the subject matter, i.e. as in our case with *time* as such, but with the “justification” of our claims and contentions about time. One might then assume that epistemic objectivity has a clear-cut distinction between appearance and reality; that *objectivity* only deals with the reality of things. Subjectivity is, on the other hand, assumed to co-ordinate with appearances. This is misleading because objectivity is only symbolically distinct from subjectivity; that is, as Rescher writes, “objectivity is not necessarily detached from the issue of appearance”.¹⁴⁰ Objectivity is also obtained through considerations of how things could, or even should, appear to us.¹⁴¹ Epistemic objectivity is indistinguishable from rational correctness. It consists, says Rescher, in going on in such a way that most reasonable people will have to recognize the sense of it, given that any sensible person having the same information would do the same.¹⁴² The predisposition that sidetrack people from being objective include: Prejudices and “passions”, like greed and envy; conformity, to do the popularly done thing; personal loyalty and affective involvement with particular

¹⁴⁰ Rescher, 1997, p. 5.

¹⁴¹ Ibid.

¹⁴² Ibid.

groups and persons; ideological allegiances; personal bias; wishful thinking, following our own desires rather than evidence and argument.¹⁴³

The point concerning time, however, seems that “the difference that between what pertains to persons at large and what pertains to a particular person individually, between what is generically cogent for people in general and what is individual-specific.”¹⁴⁴ The question is then, what is inter-subjectively true/real and what is true/real only to me? I believe that this specific differentiation between what is part and parcel of ontology, of “reality”, is of great importance. As Mandik says, the metaphysically objective and subjective are broader categories than the epistemically subjective and objective. All things in the broadest sense of the word “thing” e.g. objects, events, etc., are either “metaphysically subjective or objective. *If something requires thought, or any mental act like being represented for it to exist, it is metaphysically subjective. It is metaphysically objective, on the other hand, if it exists without the help of intellect or thought.* And we shall see that this differentiation is of importance for the overall *treatment* of time.

Now we also have to face something I believe is of great importance in a general characterization of *objectivity*. And this is what Rescher calls a “pictographic analogy”. The analogy is that of scenery painting. First of all, that there is no such thing as a “view from nowhere” or “nowhen” or the like. There is always a particular vantage point. Secondly, that Mandik’s differentiation between objective and subjective aspects of ontology is of great importance. Both points merge into one in the sense that objectivity cannot be without a perspective or framework. Objectivity becomes a point of view where a reporting that resembles photographic *accuracy* is the aim. This is to say that objectivity is a representation, which presumably anyone can recognize as a depiction of a particular event from the specific “objective” framework.¹⁴⁵ Rescher writes:

Physicists see objectivity as a matter of the invariance of results under changes of an observer-correlative coordinate system. Analogously, we may regard cognitive objectivity in general as a matter of an invariance of result under changes of an opinion-correlative system of personal or communally held prejudices, preferences, biases, or the

¹⁴³ Ibid., p. 6.

¹⁴⁴ Ibid., p. 5.

¹⁴⁵ Ibid. p. 6.

like. An objective judgment is one that abstracts from personal idiosyncrasies or group parochialisms.¹⁴⁶

So, then, what could possibly be more objective concerning the ontology of time? A highly abstract and scientific representation of certain quantifiable “features” that can only be accessed through a study of physics; or an understanding of time that has temporal experience as its epistemic basis? In the second sense it would definitely cover both the *subjective* and the *objective*, and thus gain a high degree of “photographic” accuracy, since we have a correspondence between the empirical given macroscopic temporal properties of the external world and the intersubjective temporal properties experientially accessible through temporal intuition. However, theories of time that are able to establish a linkage between the time inherent of the external and the time of experience would have more ontological objectivity than those theories, which limit the reality of time either to subjectivity or to the physical. This would then, of course, have to be done without reducing our experience to something less fundamental.

However, *an ontology that comprises both the “subjective” and the “objective”, is the only sort of ontology which renders the concept of a subjective-objective polarity as meaningful.* The concept of subjectivity is meaningless if its meaning is not to be included in the real, as a *property* of the real. Again, a *differentiation* of the meaning of the concepts of subjectivity and objectivity is important, as Mandik has shown. Because “time” is, as an “object”, a very special kind of “object”.

We do have a conception of an objective time. But then we are more precisely talking of an objectivity of *judgement* where we seek an *invariance* of result under changes of opinions. We therefore abstract from or advance upon personal idiosyncrasies. This aspect of the subjective-objective polarity means that we have to discuss “cognitive objectivity”.

Rescher says that *cognitive* objectivity deals with the nature of our knowledge. That is to say, with our beliefs that form our notions about what is *ontological* objective. Or as Rescher writes: “The one deals with what exists, the other with our views about it. How are the two related?”¹⁴⁷ Rescher’s question is particularly interesting in the view of the stance of physical realism and its claim of objective *reality* for a restricted understanding of physical time, the “*t*” of physics. Rescher is here asking the same question as I am, namely: “What is

¹⁴⁶ Ibid., pp. 6-7.

¹⁴⁷ Rescher, 1997, p. 97.

involved with this ontological mode of being ‘objective?’”¹⁴⁸ Although Rescher asks rather generally, I would like to direct the attention directly towards the peculiar object of the “*t*” of physics.

It is clear that everyone are in fact committing themselves to a specific form of metaphysical position when he or she claims that only the symbol “*t*” is the only true symbolization of *real* time: That is, as something we remember to be, *as something entirely disconnected from human experience*. If we agree with such a position, we do in fact, within a specific intellectual culture, stand committed to several interrelated aspects. First, we have what Rescher calls the “substantiality of entity”. For *time* this would mean that “*t*” is a “*something* with its own unity of being: Having an enduring identity of its own.”¹⁴⁹

Secondly, Rescher points to the aspect of “physicality or reality”. This means that time, or the “*t*” must exist somehow. Things or physical entities exist *in space and time*, but where/when does time reside? Time is thought of being in and between these physical entities, it is inherent *in/between* physical *processes/events* in nature, both in the *microscopic* and in that of the *macroscopic* realm of matter. Or, like Rescher one could say that the “*t*” is “having a place as a real item in the world’s *physical scheme*.”¹⁵⁰

Thirdly, we find “publicity or accessibility”. Everybody should have access to the “*t*” as “being something that different investigators proceeding from *different points of departure* can get hold of.”¹⁵¹ We can certainly say that “*t*” is accessible mathematically and physically speaking. But it is not universally accessible. The “*t*” of physics, understood as a representation of time as for instance one *static aspect in a four-dimensional space-time continuum*, does not allow access to everybody. This is obvious if we consider the fact that *all* of us cannot have the *same* “point of departure”. Different points of departure, that is, different approaches, different cultures and traditions, will exclude even the remotest possibility of getting “hold” of the specialized and thereby the limited, “nature” of time. This should be clear as a necessary *disjunction* exists between the different points of departure or cultures and of the specialized and limiting nature of the *theoretical context*, which is *fundamental* to the *understanding* of the “*t*”. In the special case of the Minkowski *world* we are only able to talk of one metaphysically restricted “point of departure”, that is, of an intellectual culture or metaphysical background which looks for an

¹⁴⁸ Ibid. p. 103.

¹⁴⁹ Ibid.

¹⁵⁰ Ibid. Italics mine.

¹⁵¹ Ibid. Italics mine.

answer to their scientific riddles within the fundamental and symmetrical formal structures.

Finally, we have the criterion which Rescher calls “autonomy or independence”. This is the crux of the realistic physicist. Because this mean “independent of mind.” Is the “*t*” of physics absolutely independent of mind? This actually means that the “*t*” of physics should be “something that observers find rather than create.”¹⁵² *Therefore it is no doubt true that the time within physics that has been granted the metaphysical possibility of reversal is a creation (in the sense of being pure fiction) of the human mind.* Thus, we see that criterion 1 and 2 are about ontology. The two last criteria are epistemological, and these two are attached to the two first criteria.

But does this mean that the “*t*” of physics is an entirely wrong conception about the *nature* of time? I believe that it is “wrong” in the sense that it claims to be the *real* time, and that it is the true *symbolization* of external, natural or ontological time. Furthermore, it is wrong in the sense that it claims the impossible, that is, it claims to be a conception that discloses, objectively for the physicist, the nature of time as it is in itself *independent* of man. Though the last sentence might not be spoken outright (who would dare?), it is implicit in one’s assumptions: Assumptions that have their origin and base in the naturalist and/or scientific commitments of classical physics. It seems wrong as too many temporal aspects remain which have been omitted or have not been explained. Furthermore, there are certainly temporal aspects that have not – and cannot be confirmed – by relativity physics or statistical mechanics. These aspects are the philosophical and metaphysical problems concerning “directionality of time”, that is, of transience and of becoming. These problems are about how the properties of time, understood both from within and from without the formal scientific scheme, are *related* to temporal experience. They all deal with the linkage between the time of the mind and of the world.

It seems an enormous metaphysical problem, if one claims reality for the “*t*” of physics but denies the reality of our experience, that is, of time’s unidirectionality and transience or becoming. When reality is claimed for certain features and denied to others, the philosophers and physicists seem to forget that they are simply leaving various facts about time as wholly *outside the cognitive and logical range* of the inquiries of their *particular approach*. Their approach only allows for certain aspects and features. It allows only for a certain *kind* of interest to be explored, and to leave out the uninteresting parts,

¹⁵² Ibid.

which do not consider the cognitive depth of time which bottom we cannot possibly plumb if, for instance, relativity physics stands alone.

No matter how one tends to view the concept of “objectivity”, one cannot avoid the fact that objectification is a matter of method, based on pre-scientific experience. However, objectivity in finished accomplishment is i.e. exhibited as “physics”. This is represented by the accomplishment of mathematics. The form of “pure thinking” is an idealization of the pre-scientific world; an idealizing that purely remains *within* the realm of the *ideals* of physics. The German philosopher and mathematician Edmund Husserl have put this point forward.¹⁵³ He argues that the accomplishment of objectivity – in the sense of “physics”, was “designated by its method of determined idealization and of systematic operative construction of ideal objects out of pre-given objects”. The world – or the totality of such objects – is already objective because the knowledge it affords *is identical for anyone that practices the method*.¹⁵⁴ However, this exact objectivity as an accomplishment of human thinking presupposes a method of systematic and determined idealization, which creates ideals or possible worlds that can be produced determinably and be systematically constructed *in infinitum*. But it also presupposes the self-evident applicability of these ideal constructions to the world of experience. Perhaps the significance of the mathematical accomplishment was that the scientific representation of, for instance, time limited to the structure of space-time, was a structure to be abstracted and following hypothesized in such a way that it would become a universal “property” of the world. Objectification would thus have significance for the understanding of reality only as a world of bodies where everything related to the things, which in themselves seemed to be non-material, was removed.¹⁵⁵

“Reality” in-itself, that is, in its *totality*, is “cognitively opaque”. As Rescher says, “we cannot see to the bottom of (‘it’)”¹⁵⁶ And this is a fact because we never confront capital Reality, but only the plural of realities. Ultimately, this means that today our knowledge of time is certainly more extensive than before. At least it is *different*, but for sure, it is not complete. To see that this is correct we only have to contemplate the following. The determination of any kind of “reality” for *time* can never – within a *reality-limiting theoretical context* – be fixed once and for all. Time cannot be fixed since a property of reality is confined to *exist* solely within one *specified* sphere of reality. Time can

¹⁵³ Edmund Husserl, 1978, *The Crisis of European Science*, p. 349.

¹⁵⁴ *Ibid.*

¹⁵⁵ *Ibid.*

¹⁵⁶ Rescher, 1997, p. 101.

only be approached as *a reality* - which is *open* to – and expressed through the diversity of *human* approach.

However, it should be obvious to everyone that our different opinions, notions and conceptions concerning *objectivity* stem from a quite different source than science itself. “*Objectivity*” and “*subjectivity*” are themselves concepts and thus creations of human thought. They are concepts that enable us to discover aspects of life and the world through the differences offered by the subjective development of mental perspectives. Time can never be *sensed* in any form or way. But still, time is *experienced*. And the experience of time is an issue for thought only. Thought also operates the representation of time, a representation which will ultimately depend upon the perspective offered for instance through the intellectual culture with which the subject identifies.

As an “experience of thought” time is itself something created. This does not mean the same thing as time does require thought, or to be represented, as something that can “exist”. It does not mean that time cannot “exist” independently of the human mind, only that without the human mind we would not encounter time at all. *Time is epistemologically speaking metaphysically subjective, because there is no other way to encounter time than through our experience of it, even in the particular manner one understands time within physics.* But does this mean that we cannot escape our subjectively conditioned notions about time and finally encounter “time-as-it-really-is-in-itself”? *I believe we can if we are able to conceive that our subjectivity is immanent in the “whole”. That subjectivity is ontologically real, that the subjective and the objective both constitute what we call “reality”.* This would, however, be the “picture” if one successfully establishes a real correspondence between our perception of unidirectional transience and of an irreversible arrow of time in nature. However, this could never be done by physics where the natural point of view is to begin with physical formalized nature as fundamental reality. The result would then be a reduction of experience. But if one was to begin from experience and see how we actually extended our local point of view we would not make any faults. Hence, the problem is not how to eliminate experienced time from what is ontologically objective, but how to include it without “reducing” it.

Consider the fact that all of physics is *dependent* upon *creative thinking* – thinking that in its entire doings is structured by a time that is directly given within thought and indirectly experienced through self-conscious reflection. Thus, it is not *primarily* a subjective creation even though it is subjectively given. The time we experience is something that “dawns” on us after we encounter it – it is a reality “given” from within. In our consciousness we have encountered

something originally, something that we are not “responsible” for, as it just *appears* to us. Nevertheless, it is our doing and our responsibility to describe this encounter in this or that particular fashion. What we encounter is some sort of process, a kind of dynamical change where nothing stays put, but irreversibly keeps on changing. We call this *time*; we create the concepts, which capture this phenomenon’s characteristic and essential properties. *But we do not create the process, the changes and the dynamical structure which our experiences reveal to us. These processes are not human inventions; on the contrary they are “nature” itself being exposed to us and to our experience.*

It seems possible then that the time which physics deals with, in the form where its transient procedural fundament has to be eliminated, is even more metaphysically subjective than in any other form of expressed or represented time. Because its existence is totally *dependent* upon a variety of inter-related theories, which form a framework necessary for the existence of the specific *inter-subjectivity* of the concept in question. Without this context there is no reason for this concept to exist.

Furthermore, objective time, in the sense physicists *use* it, justifiably have *epistemological* objectivity, though this only can be within the particular sphere of knowledge. *Thus we must say that as far as the physicists’ only interest in time is to exclude essential experiential meanings of time, its real aim is not to discover the real nature of time. For the physicists is only interested in what concerns the “physicality” of time, that is, in solving problems related to measurements of motion and the like, that is, of how to apply time basically as a “relational” concept within the specific theoretical schemata of physics.* This is the only context where we can talk sensibly about the objectivity of “*t*”, that is, as a relational parameter applied as a methodological tool within the schemata of physical theories. In this sense physics is in its own right, and in this sense we have to understand that the discussion within physics itself is about the epistemological problem of how to instrumentally apply the “*t*”. It is not and cannot be about the “ontological” nature of time.

Nevertheless, we should be aware of two things: (1) If the physical reality described and assumed by physics is identical to reality as such, we have to face the problem that subjective experience like, for instance, the world of perceptions, would dissolve into something less than reality, perhaps into phantasms. In such a pure physical reality, color, smell, now and past would be a “fictive” component of something that otherwise was reality. (2) The opposite position is equally impossible. If we rule out science and objects of theory and thought like, for instance, atoms, it would then become a mere abstraction in the presence of specific things of perception. Physics unquestionably

does penetrate deeply into the metaphysical matter of “reality”. It is, however, precisely the problem of determining the “nature of time” that fundamental physics cannot take upon itself; that is, to solve in *isolation* from the organic, psychological and spiritual spheres of the world.

5

The Metaphysics of Einsteinian Time

Einstein has often been, and still is, credited for having changed our view on time. The feeling that is being transmitted is that Einstein has once and for all disclosed the true nature of time. The truth is that Einstein changed the physical meaning concerning the physical concept of time. Thereafter people gradually adapted to the new views along the gradually stronger emphasis put on science in general and as a consequence of its successes. However, Einstein was primarily concerned about making operational the concept of time within physics. It was the epistemological aspect of time measurement that occupied Einstein. But this does not mean that Einstein's thoughts were completely devoid of metaphysical influences. His treatment of time presupposes certain views about the nature of time, and thus carries a large degree of hypostatization, idealization and abstraction. However, for Einstein, the *realist*, there was no great disjunction between the abstractions of physical theory and physical reality.

5.1. Einstein's STR and Ideas Concerning Time and Epistemology

Einstein was concerned with the antithesis between the two cognitive components that enable us to know the world, that is, the *empirical* and the *rational*. But this schism of dual access also gives evidence to the problem, which we have discussed hitherto. One tends to make physical ideas, concepts, measurements, laws and their logical relation, that is, the necessary components of a physical *theory*, to be something that necessarily and always yields *ontological* truth. If we, for example, read the famous EPR paper "Can Quantum Mechanical Description of Physical Reality be Considered Complete", we will understand how important these epistemological-metaphysical components were to Einstein. Rosen says in an interview¹⁵⁷ that a physical theory "must

¹⁵⁷ See G.J. Whitrow, (ed.), 1967, *Einstein, The Man and His Achievement*, pp. 80-81.

distinguish between the physical or objective reality, which is independent of any theory, and the physical concepts of the theory which are intended to correspond with the objective reality.” So in deciding the elements of physical reality, one has to determine with certainty the value of a physical quantity without disturbing the system in any way. With the determination of such a value one is believed to have found an element of physical reality corresponding to this physical quantity. Anyway, these were the criteria applied in EPR.

However, Einstein never got tired of stressing that the *origin* of his Theory of Relativity (TR) was not speculative, but based upon the *desire* to make his theory fit the observed facts as far as possible. So when he was “forced” to abandon certain notions connected with time, it was, in his view, not arbitrary but conditioned by observed facts. Thus, we shall take a look at these “conditioning” aspects, that is, at his “advancement” upon subjectively experienced time. However, our use of the term “advancement” here refers to Einstein’s dictum that the “axiomatic basis of theoretical physics cannot be abstracted from experience but must be freely invented.”¹⁵⁸ Thus, later on we shall also have to consider what he leaves out from his analysis of time in the context of his Special Theory of Relativity (STR).

One idea that kept its grip on Einstein’s beliefs was that reality in some fundamental sense had to be “deterministic”. For example, what repelled him most about the quantum theory was the fact that it brought in an uncertainty aspect on the most fundamental level of physical reality. He could never accept this: “It struck at the roots of classical thought, for it questioned the deterministic view on which science had hitherto been based.”¹⁵⁹ Otherwise there is a difference in “metaphysics” between the young and the older Einstein.

The young Einstein of 1905 was influenced – not by the type of *rationality* we find in the writings of the *older* Einstein – but in a realist and operationalist sense, by the verificationist positivism of Ernst Mach. We should, however, not over-emphasize this aspect either.¹⁶⁰ Nevertheless, in relation to Einstein’s notion about time in STR it is important to understand these metaphysical *empiricist* underpinnings of STR. Mach’s empiricism was not considered by

¹⁵⁸ Quoted in Northrop, “Einstein’s Conception of Science”, Schilpp, P.A., (ed.), 1997, *Albert Einstein: Philosopher-Scientist*, Open Court, p. 394.

¹⁵⁹ W.B. Bonner in G.J. Whitrow, (ed.), 1967, *Einstein, The Man and His Achievement*, p. 67.

¹⁶⁰ We have to make a note that Mach was an *anti-realist* while Einstein never seems to have endorsed such ideas. Furthermore, it should be noted that Einstein was never an operational empiricist in Mach’s sense. The following discussion of Einstein and Mach is based on P. Feyerabend, 1987, *Farewell to Reason*, Chapter 7: Mach’s Theory of Research and its Relation to Einstein, pp. 192-218.

Einstein to be “metaphysical” but strictly epistemological. This means that the verifiability theory of meaning became important for Einstein’s own *realist* commitment. Thus, it helped to determine his early philosophical position. Einstein saw that by applying this verifiability theory of meaning he could perhaps escape from complications resulting from ambiguous questions.¹⁶¹

Both Hume and Mach influenced Einstein’s early thinking. Hume influenced Einstein by his emphasis on the “empirical” and his obvious feelings towards *common sense*. Einstein found that Hume offered a *criticism of common sense*. Ernst Mach had a more direct influence. Mach was of the opinion that the fundamental laws of physics are only the final products and summary of a long and tedious labor of conducting experiments and collecting data. To be specific, one of the important issues that had a tremendous influence on Einstein’s thinking was in fact Mach’s criticism¹⁶² of Newton’s ideas of space and time together with his criticism of the Newtonian mechanics.¹⁶³ Thus, it is interesting to shed some further light upon this influence in order to attempt a determination of Einstein’s metaphysical position in regard to his epistemological treatment of time.

Einstein’s prime objection was perhaps directed towards the absolutist’s conception of time of which physical theories were placed in relationship with the physical thinking of Newton.¹⁶⁴ Hence, Einstein was primarily concerned with the concept of physical time in Newton’s theories. In Einstein’s view, it was evident that Newton’s idea of physical time was neither precise enough nor narrow enough for the purpose of a modern, and perhaps mathematically stricter, physics. Einstein thought that Newton had meshed the concept of time with theistic notions. These notions were not necessary for a concept of time which was regarded as an operational concept to be applied in the measure of distance through clock readings. Einstein’s aim and interest in this matter was to “purify” the physical concept of time.

What was it that Einstein, as a physicist, sought for a physical concept of time? One thing is, of course, “testability”. One consequence,

¹⁶¹ See also Hans Reichenbach, “The Philosophical Significance of the Theory of Relativity”, in Schilpp, P.A. (ed.), 1997, *Albert Einstein: Philosopher-Scientist*, p. 291.

¹⁶² Albert Einstein, *Physikalische Zeitschrift*, XVII (1916): “I can say with certainty that the study of Mach and Hume has been directly and indirectly a great help in my work... Mach recognized the weak spots of classical mechanics and was not very far from requiring a general theory of relativity half a century ago.” (p. 101.)

¹⁶³ See also G. J. Whitrow, (ed.), 1967, *Einstein, The Man and His Achievement*, pp. 12-13.

¹⁶⁴ It is not my intention to participate in the discussion about absolutist time versus relative space-time; I am only bringing it up in order to shed some light on the metaphysical position of Einstein.

which can be spotted with the “transformation” of the concept of time, was a rejection of the metaphysics that surrounded Newton’s view on the *nature* of time.

5.1.1. The Non-Verifiability of Newtonian Absolute Time

The notion “absolute” in Newton’s thinking includes a number of senses. We all know the famous passage in Newton’s *Principia*:

Absolute, true, and mathematical time, of itself, and from its own nature, flows equably without relation to anything external, and by another name is called duration. Relative, apparent, and common time, is some sensible and external (whether accurate or unequable) measure of duration by the means of motion, which is commonly used instead of true time; such as an hour, a day, a month, and a year.¹⁶⁵

Thus, we have to make a distinction between *absolute* time and *relative* time. Absolute or metaphysical time is the real time of the world. It is the time *in which* our universe is *imbedded*. This substantial time is an all-embracing “form” and is thus held independently of physical events.

In comparison to absolute time we see that *physical* time is the same as “clock time”; this is to say that physical time is identical to our endeavor to *measure* the real-world absolute time. Notice that it is not a “block universe” which Newton is thinking of here. The kind of time that was on Newton’s mind was a transitory time. A time that he in theory tried to draw up in diagrams, diagrams representing phenomena that had to be visualized as moving.

Newton’s conception of an *absolute* time is based upon his theism. The absolute and real time of the world is rooted in the eternal being of God. Hence, it was not the absolute time of Newton that Einstein changed. It was Newton’s concept of physical time. Einstein managed to make Newton’s absolute time irrelevant.

Newton distinguished between properties of time from a different perspective than Einstein did. Newton found time to have

¹⁶⁵ Ibid. The quote is found in W. L. Craig, “Relativity and the ‘Elimination’ of Absolute Time”, in *Recent Advances in Relativity Theory*, vol. 1, eds.: Duffy & Wegener, Hadronic Press, 2000, p. 47.

absolute and *mathematical* features, as well as *relative* ones, that is, apparent and common features. In order to avoid “common prejudices” it is necessary to make this distinction and to distinguish the absolute from the relative. Clock readings *represent* absolute time; on the other hand there is no identity between measures, the readings and the nature of absolute time. Physical time depends upon the accuracy of the measuring devices. True time is measurable, but our measurements of the flow of time are always only approximate. Our clock readings will always be more or less accurate attempts to describe the absolute time of God’s creation.

It is in relation to physical time that Newton failed: His notion of an absolute and “flowing” time became hurt by the physics of Einstein. The notion about a time that “flows” became incredible. In Newton’s eyes it is the absolute time created by God, which is the foundation of becoming. God created a simultaneous “Now” that is absolute and everywhere, a “Now” for the entire universe. Whether “Now” is “the Now of God” or whether God himself stands outside and above his own creation is not to be decided by me in this dissertation.

However, the theistic metaphysics by Newton which fused absolute time and physical time was among those notions that Einstein could not tolerate as part of a sober physical explanation of the universe. The notion of a flowing time; of becoming; of the absolute simultaneity of created time by God; of the Universal Now, was not only non-testable but also posed a unfruitful diversion from the real issues that only a verifiable physics dealt with. Only a testable concept of time can be given the status of objectivity and thus become a property of the reality which is of concern to physics. Thus, Einstein freely omitted the notion of the “absolute” and instead concentrated upon the empirical properties connected to clock readings.

5.1.2. Mach’s Influential Empiricism

Einstein connected his rejection of absolute simultaneity with the phenomenalism and empiricism of Mach and Hume.¹⁶⁶ Thus, Einstein writes that:

The only justification for our concepts and system of concepts is that they serve to represent the complex of our experiences; beyond this they have no legitimacy. I am convinced that the philosophers have had a harmful effect upon the progress of scientific thinking in removing certain fundamental concepts from the domain of empiricism, where they are under our control, to the intangible heights of the *a priori*. For even if it should appear that the universe of ideas cannot be deduced from experience by logical means, but is, in sense, a creation of the human mind, without no science is possible, nevertheless this universe of ideas is just as little independent of the nature of our experiences as clothes are of the form of the human body. This is particularly true of our concepts of time and space which physicists have been obliged by the facts to bring down from the Olympus of the *a priori* in order to... put them in a serviceable condition.¹⁶⁷

It is especially the *definition* of simultaneity in STR that is based on Mach's requirement that every statement in physics has to state *relations* between observable quantities. This requirement gives Einstein both an epistemological program and a metaphysical basis for his rejection of absolute time. This indicates that time should only be applied as a measure; that is to say; it should *only* be treated as *relational*. This suggests again that theoretical statements should only be related directly to controllable sensations, or better still, to some verifiable means. This means that theoretical statements are restricted in their meaning to situations where one can measure and observe in order to render the statement meaningful. But it also shows that observed time must be a well-ordered system of observations according to some presupposed temporal structure which is imported by the observer and is discretely modified and thus superimposed upon the world afterwards.

Thermodynamics brought up the *example* which was to guide Einstein in his thinking. This is to begin with *principles* and never with so-called "facts" based on contingent experience. However, the

¹⁶⁶ Schilpp, P.A., (ed.), 1997, *Albert Einstein: Philosopher-Scientist*, p. 21.

¹⁶⁷ Albert Einstein, 1988, *The Meaning of Relativity*. Princeton.

principles cannot always replace experiences which describe regularities in the macroscopic world. Thus, we find ourselves in a peculiar situation as we have already stated that Einstein was an empirically inclined realist. It is time then to modify this view. We have to understand the conflict of Einstein being both an empirically inclined realist and a “rationalist”.

In order to understand this we have to focus upon the positivism of Mach as an *anti-metaphysical philosophy of science*. The 25-year-old Einstein became attracted to this *anti-metaphysical* position. But also Kant influenced Einstein with his emphasis on rational principles of a strict logical nature. These are principles of a logical nature that Einstein thought of as being able to reach beyond any empirical aspect. But because of their strict logical nature they functioned simultaneously as an extension of the empirical enquiry. The principles thus avoided to become identified with metaphysical principles.

However, one of Einstein’s rational principles was that of a thought experiment. For example, Einstein imagined himself to pursue a beam of light with the velocity of light in vacuum, c . If he would have been able to do this he would probably have seen, what he imagined, the beam of light to be a “spatially oscillating electromagnetic field of rest”.¹⁶⁸ Feyerabend, for instance, writes that there is no significant difference between the procedure of Einstein and the notions and moves recommended by Mach.¹⁶⁹ There are irreconcilable differences but the similarity between Mach and Einstein seems to extend to details. When Einstein was asked about the source of his conviction he referred to “intuition”. Thus, he paralleled what Mach called the “intuitive” or “instinctive nature of fruitful principles”. According to Mach, principles need empirical testing. Einstein agreed with this.¹⁷⁰ In Einstein’s opinion science should always attempt to discover a “unifying theoretical system”.¹⁷¹ He states further: “The logical foundation is always in greater peril from new experiences or new knowledge than are the branch disciplines with their closer empirical contact. In the connection of the foundation with all the single parts lies its great significance, but likewise its greatest danger in face of any new factor.”¹⁷²

¹⁶⁸ P. Feyerabend, 1987, p. 194.

¹⁶⁹ Ibid.

¹⁷⁰ Ibid.

¹⁷¹ A. Einstein, 1954, *Ideas and Opinions*, p. 234.

¹⁷² Ibid., p. 325.

5.1.3. Verification and Time

Einstein's emphasis on empirical verification in STR can be seen in his instrumentalist redefinition of basic key concepts. Judgments about time must always have a physical "meaning"; that is, they have an operational significance within the theory so that time can be something that can be dealt with practically by the physicist. Thus, we have to understand that his claim, which we first of all have to understand as the "meaning of time" – is made to depend upon what we are supposed to understand by simultaneity.

Simultaneity is defined by synchronization of light signals. The light signals have to occur at the exact same local time. In order to establish a physical meaning for a common time for spatially separated clocks, Einstein had to put in the presupposition, which is a natural assumption that light always travels with the same speed. This transforms whatever notion of *time* one might have had before. Time is transformed so that it only gives one fundamental meaning: The meaning is that time is relational, and only relational time can become physical time. Physical time is therefore identical to "clock readings" – which are observable for anyone. A clock reading can serve as a subject-independent or objective relation holding timelessly between events in space. Compared to this Eleatic and non-temporal view Kant's version would actually have "saved" the notion of "becoming" for the concept of time.¹⁷³

Einstein puts great emphasis on the *ideality* of time, and that this ideality is *instrumental* for thought as such. Einstein says that *this specific temporality has nothing to do with physical reality*. Only as "relations holding events together" can our sense of time become *justified*. Thus, Einstein manages to escape from subjective temporal experience and its relationship to the metaphysical concept of "becoming". In the same manner he also escapes the notion of "ether" when it comes to space – which, in his mind, is nothing but yet another absolutization of space – a re-entry of Newtonian metaphysical space.

The Theory of Relativity (TR) aims at elaborating on the relations between physical concepts and empirical facts in a precise way. The justification of any physical concept lies exclusively in the expressed concept, that is, in its clear and unambiguous relation to

¹⁷³ H. Reichenbach, 1971, *The Direction of Time*, p. 13.

experienced facts. It is in this context that we have to understand that he is *advancing the physical-metaphysical understanding of time upon the notion of experiencing time*. That is to say, he advances in the sense that he is modifying our understanding of how to “experience” time. *The experience of time is to be re-defined as the observation of time, which is a consequence of the renewed “operationality” for the concept*. Thus, we are given a possible interpretation of how time can become something *physical*. The physicist shall see time as an *objective observable*, that is, the physicist is told how time should be observed *within the frame of physics*.

5.1.4. Relative and Relativistic Time

The term “relative” presents some difficulties, especially when it is referred to by possible meanings of “relative simultaneity”. This is most commonly taken to mean that time, as experienced by the individual observer, is flawed. For Einstein human temporality represents only an *apparent* time, a series of *qualitative* aspects and temporal perspectives that cannot exist independently of human mind. Human experience of the sensible world is relative: It is relative what we experience. It is assumed that the relativity of what is experienced includes temporality. Therefore, the measure of distance by using time as a measure between events would depend upon the situation of the observer relative to the events that are being measured. Two observers in relative motion of each other would get two different sets of measures. Hence, we would find that to adjust different clocks apart from each other would prove the impossibility of absolute correlation, that is, of absolute simultaneity between the times on the different clocks, which allow us only in this particular context to talk about *different times*.

What is actually meant by the concept of “relativity”? In order to grasp the meaning of Einstein-time it is necessary to take a look at the concept of “relativity” applied by Einstein.

The principle of relativity originates with Galileo’s thinking. In Galileo’s *Dialogues Concerning the Two Chief World Systems*, 1632, we can read about the famous passage of his thought experiment concerning the two “observers” onboard a ship. They are sailing on a perfectly smooth sea at constant speed. The observers shut themselves in below deck so that they cannot see what is happening on the outside. Below decks the observers have brought butterflies and bowls of water with fish. They observe that both the fish are swimming and

the butterflies are flying *before* the ship is sailing and *afterwards* when the ship is sailing. They look at all their experiments and register that nothing unusually happens. They observe no alterations whether the ship is at rest or in constant speed.

These considerations led Galileo to generalize the observations in what has been known as the *first* formulation of the principle of relativity:¹⁷⁴

Have the ship proceed with any speed you like, so long as the motion is uniform and not fluctuating this way and that. You will discover not the least change in all the effects named, nor could you tell from any of them whether the ship was moving or standing still.

At the time when Galileo came up with this definition it was met with skepticism as science was still following the geocentric doctrine of Ptolemy. The doctrine saw earth as immobile; if the earth did move clouds, birds and insects would lag behind its motion. Another way to formulate the principle of relativity could bring us closer to Einstein, namely by suggesting that the mechanical laws of physics would be the same to any uniformly moving observer with a constant speed in a straight line. The observer who moves uniformly with constant velocity is an “inertial” observer. According to Galileo two observers would naturally disagree about the position in space of two separate events because they would be moving with relative speed of each other.

Einstein defines his version of the principle of relativity like this:

If, relative to K , K' is a uniformly moving coordinate system devoid of rotation, then natural phenomena run their course with respect to K' according to exactly the same general laws as with respect to K .¹⁷⁵

We see that Einstein applies Galilei’s definition,¹⁷⁶ although he modifies the formulation by meeting the requirements of the precision in a formulation that Einstein sought for himself. The two definitions are otherwise identical. Einstein took great pain in trying to exemplify the principle of relativity to meet the demand from people who wished to understand his theory. The following illustrates the principle

¹⁷⁴ Quoted from Taylor & Wheeler, *Spacetime Physics*, p. 176.

¹⁷⁵ A. Einstein, 1954, *Relativity. The Special and General Theory*, p. 13.

¹⁷⁶ This aspect has been dealt with by Ragnar Fjelland, “Den Spesielle Relativitetsteorien”, in Stein Ugelvik Larsen, ed., 1992, *Lov og Struktur*, nr. 45, pp. 1-17.

perfectly.¹⁷⁷ Sometime during the 1920s, Einstein gave a speech about his theory. Einstein entered the room and, before the eyes of hundreds of people, he slammed his hand on the desk twice thus producing two loud banging sounds. He proceeded by asking if his second beating on the desk had hit the same point in space as the first one. The reluctant answers were affirmative. Yes, Einstein had hit the same point in space. Einstein, however, illustrated now how the scientific mind works by a disengagement from the particularity of the concrete situation. That is, by some kind of “elevation” of the reflecting mind to a more broadened view, to a new perspective of the event that facilitates new conclusions. Einstein rejected the answer. Einstein explained the rejection: The room they occupied is located somewhere on a rotating planet, which travels around the sun with the speed of 30000 km per hour. By the time he had hit the table the second time they would all be thousands of kilometers away from the point in space where he had hit the table the first time.

Thus we have to deal with at least two different systems, which both include data about the occurrence that took place. What connects the events? The observers must either see each other, or there must be some other means that can be applied to determine the relation between the two events. Einstein’s original solution to this problem was his second principle, namely: “The principle of constant velocity of light *in vacuo*.”¹⁷⁸

Again, we can use a different example to illustrate this. You are traveling on a train. You leave your seat at 13:00 for lunch. You come back to your seat at 13:30. The train travels with 80 km per hour. Let us say that the train does not have windows, and that it travels very smoothly with a constant speed in a straight line. Your feeling would be that when you sat down again at 13:30 you came back to the same point in space which you left at 13:00 hours. Any observer, who observes you from the outside of the train, would disagree, since he has observed the train as moving with at least 40 km during those 30 minutes it took you to eat your lunch. From the inside of the train you are unable to determine whether you are moving or not, because velocity can only be measured with reference to some objects; and that the result of this measurement changes if we decide to measure the velocity with respect to a different reference point.

With different inertial frames of reference yielding different data, some other and neutral means of translation of the information

¹⁷⁷ This example can also be found in Peter Micheltore, 1962, *Einstein, Profile of the Man*. I have, however, used a Danish translation from 1966 called *Einstein, Fremads Biografier*.

¹⁷⁸ Again see Ragnar Fjelland, 1992:2, and Einstein, 1954:120.

between the frames of reference are needed. It is here that the invariance formulation provided by the Lorentz transformation comes in handy. Thus, Einstein has the following generalized formulation of the Lorentz-transformation:

It expresses x', y', z', t' , in terms of linear homogeneous functions of x, y, z, t , of such a kind that the relation $x'^2 + y'^2 + z'^2 - c^2t'^2 = x^2 + y^2 + z^2 - c^2t^2$ (IIa) is satisfied identically. That is to say: If we substitute their expressions in x, y, z, t , in place of x', y', z', t' , on the left hand side of (IIa) agrees with the right-hand side.¹⁷⁹

Data from one frame of reference can thus be transformed and utilized together with the data from another frame of reference because they can be connected by the beam of light and thus correlated with each other through the invariance of the Lorentz transformation formula. The principle of covariance or invariance is thus the basic axiom of STR.

5.1.5. Non-Temporalism

The four-dimensional space-time continuum of STR is, in STR, kept in the background *as the background* for every natural phenomenon and for all laws of nature. Spatial coordinates and time are, in the context of STR, only relative in so far as they depend on the state of motion of the selected inertial system. Therefore, the metaphysical “motive” found in STR, if one can use such a word in this context, is to identify the Platonic or *invariant realities* behind contingent appearances and experiences. Concerning the question of time, this indicates that Einstein also had to assume some kind of non-temporal metaphysical *nature*, which defined the essence of objective or physical time. This must be seen in relationship with the fact that Einstein felt it necessary to operate with a law-bound universe consisting of “universal”, i.e. *non-temporal* invariant meanings. And it is at this point that we are confronted with a problem. According to Kurt Gödel STR did discover “a new and very astonishing property of time, namely

¹⁷⁹ Einstein, 1954, p. 120.

the relativity of simultaneity, which to a large extent implies that of succession.”¹⁸⁰ Gödel claims that with STR

...one obtains an unequivocal proof for the view...(which) deny the objectivity of change and consider change as an illusion or an appearance due to our special mode of perception.¹⁸¹

In the course of our discussion we will, however, see how this view came about and where this claim went wrong.

It is in this connection that we have to keep Einstein’s “criterion of reality” in mind. That is, the sense in which we have to understand that the nature of *time* is but one among many ideal elements furnishing the sphere of *non-temporal* invariant meanings of reality. Notice that *reality* is in this context understood as a *non-temporal* “something” that has *non-temporal* “properties”, like, for instance, “facts”, which will always remain “facts” *non-temporally*. Temporality, on the other hand, is contingent and *mind-bound*. Here, the distinction between the internal processes and the external relations comes into the foreground when we realize that one can achieve a rejection and suppression of the subjective origin by a distinction between *temporality* and *time*. Time is to be understood in this context as a non-temporal fact, that is, as a “clocked moment” or as an objective relation among occurrences.

As a realist in the verificationist sense, Einstein makes it evident that he sought a correspondence between his theory and reality by means of physical concepts. That is, that every aspect of physical reality must have a counterpart in physical theory. Here, one could say that this aspect of physical reality could only be found in physical theory. Of course this seems right as: “physical non-temporal properties” appear only *in theory*. They are given the significance of being *physically real* in the guise of objectivism because these “non-temporal properties” are part of a theory in which holds hypotheses that have been verified or attempted falsified by experiments or observations. The theory as such is then valued as strong and credible and tacitly included is the metaphysics or ontology of “non-temporal facts”. Thus, Einstein’s “criterion of reality” is:

If, without in any way disturbing a system, we can predict with certainty the value of a physical quantity, then there

¹⁸⁰ Kurt Gödel, “A remark about the relationship between relativity theory and idealistic philosophy”, Schilpp, ed., 1997, *Albert Einstein: Philosopher-Scientist*, pp. 557-562.

¹⁸¹ Ibid.

exists an element of physical reality corresponding to the physical quantity.¹⁸²

This is not a necessary criterion, but it seems to be sufficient.

What makes STR interesting is its claim of having an incisive answer to the problem of *objectivity*. Here, objectivity is understood to mean *independence of the observer*; it must have as few anthropomorphic traits as possible. As we have seen, we have to distinguish between the “mind-bound” temporality of the observer and formalized time relations. Thus, we find that the latter has certain ideal properties such as being “finite” or “isotropic” or by having a “constancy of metric”; *properties* which “mind-bound” temporality does not possess. But it is not these *ideal* properties that make them objective. And it is not observations and physical phenomena that constitute the objectivity. The *objectivity* of STR is to comprise the same as *invariance of physical laws*.¹⁸³

A falling object may describe a parabola to an observer on a moving train, a straight line to an observer on the ground. These differences do not matter so long as the law of nature in its general form, i.e., in the form of a differential equation, is the same for both observers.¹⁸⁴

That is, it saved as a *non-temporal fact*. Then we realize that the distinction between “non-temporal” facts and the “nature of time” becomes blurred. The nature of time is subsumed under the ideal universality of facts. The transitional nature of time is wiped out and left is what exists beyond time. In order to be *objective* and *universal*, these facts must be conceived of in exactly the same manner by each and every “observer” at any time, that is, presently as well as in the past but also in all future. However, the *invariance* of STR is restricted to inertial systems. The *fundamental laws*, or the “differential equations”, which are applied in the description of reality, *must be invariant with respect to Lorentz-transformations*. It is from these fundamental “non-temporal” laws that the relativity of observation follows as a logical consequence.¹⁸⁵ It is claimed that to achieve objectivity of descriptions, STR must confer relativity upon subjective

¹⁸² Einstein quoted in V.F. Lentzen, “Einstein’s Theory of Knowledge”, Schilpp, ed., 1997, *Albert Einstein: Philosopher-Scientist*, p. 362.

¹⁸³ H. Margenau, “Einstein’s Conception of Reality”, Schilpp, ed., 1997, *Albert Einstein: Philosopher-Scientist*, p. 253.

¹⁸⁴ Ibid.

¹⁸⁵ Ibid. p. 254.

sense-observations.¹⁸⁶ This must be done because fundamental laws in electrodynamics involve the constancy of light, *c*. This again means that *c* in different inertial systems requires that moving objects contract, that clocks, for instance, run slow.

Thus, there is substance to the claim that the postulate of relativity may be the most universal expression of the physical concept of objectivity. The fundamental “non-temporal” laws are *made* objective, that is to say, *made* into observer-independent properties of physical reality because human temporal experience is being conceived off as contingent and illusory. The physicist, however, cannot avoid the important role of the observer but the fact is that the observations caused by these observers have to be understood as relative in comparison to other frames of reference.

It remains to see how well Einstein is able to resist the temptation to compress the totality of forms into a metaphysical unity since STR cannot claim to grasp absolute reality, *reality as such*, and to give it *complete* and *adequate* expression. As mentioned, STR is occasionally identifying *physical* reality with *ideal* reality. The danger lies in committing to the realism of dogmatic metaphysics, where one separates out of the totality of possible concepts of reality, a single one and sets it up as a norm and example for all the others.

For the physicist the problem lies in his concern with objectification. Ernst Cassirer says that when the physicist affirms the superiority of “objective” space and time over “subjective” space and time the judgments express only a false “absolutization” of an ideal of knowledge. This ideal is applied as a norm, by which each of the physicists determines and measures the real content of the world.¹⁸⁷ Whether this “absolutization” is directed on the “outer” or the “inner” is indifferent. We should keep in mind that we, in Einstein’s STR, are only confronted with “reality through theory” and not with “reality as such”. This is to say: We are presented with a particular set of conjectures, hypotheses, idealizations, abstractions and metaphysical presuppositions with postulates concerning both epistemology and ontology from a metaphysical realist and physicalist perspective.

Problems raised by STR, as a *physical* theory about space-time, make up a theory, which in its final judgments belongs exclusively to the domain of physics, that is, where the solutions are to be found within physics itself since these problems can only be of an epistemological nature. Physics cannot answer what space and time are in a philosophical or metaphysical sense. Hence, time and space

¹⁸⁶ Ibid. Italics mine.

¹⁸⁷ Ernst Cassirer, 1953, *Substance and Function: And Einstein’s Theory of Relativity*, p. 455.

should be surveyed in all its nuances of meanings and expressions. STR, as a physical theory, is not concerned with the nature of time. Neither does it solve our quest for an understanding of the relation between the nature of time in our awareness of time and the problem of answering the question of the nature of time in itself independently of the interference from human temporality. We might say that there is a particular scientific tendency from the beginning of the development of STR, namely, that of a particular motive concerning the nature of time conjoined with the development of the concept of space. As a physical theory STR focuses on the meaning of time in so far as it will improve the system of empirical and physical measurements but also to give credibility to the notion of non-temporal fundamental laws as well as to the notion of a deterministic universe.

Thus, it is within the assumed “non-subjective” domain of physical “reality” that the *objectivity* of entities in physical theory can be upheld in its *realist* interpretation. It is when one cling to this kind of realist-metaphysics that “over-verbalizations” and hypostatizations become problematic. “Freed” from the accidental subjective features one assumes that “fundamental non-temporal physical reality” is *something* that can be disclosed by *contemplation*. There seems to be a belief in which it is legitimate to transport an assumed ontological schism into scientific theories. This is a schism between a physicalist-realist-specified knowledge of an observer-independent reality, where the “subjective” elements are *known*, and an illusion-ridden world of subjective appearance. The schism seems to be an integral aspect of the metaphysics that can be related to most philosophical interpretations of STR identifying STR as a scientific theory disclosing the *nature* of time, the universe as *static* and temporal experience as illusory. It is STR’s contrast to the subjective world of appearance that determines the objective and thus the “task” ahead for the scientific community. It is, however, in the act of performing this “task” that we are most blind to the fact that the activity is itself part of that sphere, that for so many is subjective-relative. We are perhaps blind to the fact that this “subjective-relative” must be run through, not as something irrelevant but as something which grounds any logical and/or theoretical validity. That this is the sphere where the verification has its real source.¹⁸⁸

Einstein neither gives a satisfactory philosophical answer to the question of the real nature of time nor to that of reality. It is only where the theory leaves the territory of physics and epistemology and enters pure metaphysics, although the metaphysics is disguised under

¹⁸⁸ Edmund Husserl, 1978, *The Crisis of European Sciences*, p. 126.

a mantle of scientific terminology, which the metaphysicist should begin to object. The nature of time, the nature of subjectivity, subjectivity as the foundation of conceptualizations etc., are philosophical problems and are not of scientific interest to physicist. Although Einstein aimed at a physical theory where the concept of time was given a new definition, it obviously was impossible to refrain from all metaphysics.

Einstein seems to have changed his mind several times with regard to the question whether “becoming” can be considered an objective characteristic of time or not. Einstein said that “becoming” is not real, it is only a subjective feature. Instead reality should be conceived as “deterministically law-bound”, “static” and “symmetric”. The fact is that Einstein did not have much interest in the *philosophical* problem concerning the *nature* of time. The most important thing for Einstein was to conceive of the world from the physicist’s vantage point. The metaphysics that entered Einstein’s theory were from his own learning or background. His commitment to the role of being a physicist embraced and included the naturalistic assumptions of his time and gave directions for the understanding concerned about the legitimate scientific notion of nature, of the physical universe and of how we *conceive* it.

5.2. Simultaneity in STR

Obviously, Einstein does not begin with *temporal experience*. His starting points are special *physical principles* which he presupposes are true of the real physical world. These principles are made instrumental to both the determination of the real content and of the discrimination of the illusory temporal experiences that are distracting our objective thinking. His reason for choosing certain particular principles is due to their philosophical appeal or logical significance.

The apparent contradiction consists in the assumed fact that if motion is relative, then a ray of light should only have a speed that varies relatively to the motion of the observer. But then it would not have a constant speed. Einstein reconciled the two principles by modifying kinematics. Hence, each inertial system is given its own special time. According to Newton a given way of measuring time would associate only one time with an event, not *times* relative to different frames of reference. In Newton’s case this meant that events of the same time were “simultaneous”. According to Einstein, this makes sense as long as one considers the two events as occurring at

the same place as well as at the same time. However, it does not make sense when two events occur at different places. The relation between these distant non-coincident events is not directly accessible by observation. Thus, would the time assigned to the events would be observer dependent; we would have different clock readings for the same events. To decide upon the problem of simultaneity of distant events one has to put clocks at the location of the events – and one has to make sure that the clocks will go at the same rate or beat “synchronously”. How can one test the equal rate of the beating of two clocks, when they are placed at different locations?

According to Max Born¹⁸⁹ there are two methods of regulating the beatings of the clocks. First we can bring them together at the same location and regulate them so that they are in unison, and then place them back to the original locations apart from each other. Secondly, we can apply time signals to compare the clocks. This means that one may use a sound signal if visibility is close to zero, or light signal if visibility is not obscured. There are also other means like wireless radio signals, etc. However, in the case of applying sound signals one has to take into consideration that the signal takes a certain amount of *measured* time to travel the amount of space that separates the two events. If the velocity of sound is known the error can be eliminated (sound travels about 340 m/sec). For instance, event *A* and event *B* are at a distance $L=170$ m apart from each other.¹⁹⁰ If the sound signal goes from *A* to *B*, then it will take the sound $t=L:c=170:340=0.5$ sec to travel from *A* to *B*. The clock at *B* is set 0.5 sec after the moment that the sound reaches it. But then again *A* and *B* must be at rest. The sound from *A* to *B*, when *B* is in motion towards *A*, when *A* is stationary, will need less time to travel because *B* is moving towards *A* and is still continuously moving. And then one would also have to take into consideration the absolute velocity of *B* and the air resistance. Without knowledge about distance, velocities and so forth, no absolute determination can be completed by the use of sound. It can only be relative. Light would make the error smaller. But then again we know the speed of light, which is the same in every inertial system and which we apply to define as “simultaneity”. One will always be confronted with this circularity, however small and insignificant, from an observer’s point of view, the relativity might be.

The clocks are *ideal* clocks. An ideal clock will always have the same rate of beating, it will not slow down or increase its rate where it is at rest. The clock in question will, within this system, define the “proper” time of the system. However, the thing is this, if looked at

¹⁸⁹ Max Born, 1965, *Einstein’s Theory of Relativity*, pp. 225-308.

¹⁹⁰ *Ibid.* The following example is taken from M. Born.

from another system that is in relative motion to the observer's, the interval or the rate of the clock will appear to run slower. In effect it becomes *meaningless* to ask what the *real* duration of the event was.¹⁹¹

What we need are some directly accessible observational features of the world in order to tie down the time relation between distant events. We need something that can connect the events so that we can join our observations into a unity. So these ties must be, as Sklar has suggested, "coordinative definitions". At least it must be something basic within the theory (for instance, laws of light constancy in vacuum) that connects simultaneity to real features of the world.¹⁹²

Now, if we return to our experience of the simultaneity of spatially distant events, we find that they *appear* to be simultaneous, and thus the Newtonian concept of space and time makes sense. But, according to Einstein, this cannot be so, because this is only an appearance that originates in our temporal experience and its limiting perspective. In immediate experience we do not consider the *velocity* of light and the fact that light takes time to travel through space, which, in Einstein's opinion, means that *we neglect the time of the propagation of light*. From the point of view of immediate experience we do not differentiate, i.e. *measure*. This signifies that in temporal experience there is no *differentiation* to be found between "simultaneously seen" and "simultaneously happening". A consequence of this non-existent differentiation is that the difference between time and local time is blurred. However, this is exactly why the second fundamental principle, the law of constancy of light velocity for all inertial systems, is so important to Einstein.

Furthermore, in order to make time objective by the use of stationary clocks and bodies, one has to include the geometry known as "Minkowski four-dimensional space-time continuum". From the principle of the constancy of light velocity for all inertial systems follows the transformation of the spatial coordinates x_1 , x_2 , x_3 , and x_4 (which is the observed, or *measured* time coordinate). It is this transformation that is called the Lorentz-transformation and which is a necessary condition meant to render different clock readings from different frames of reference and of the same *co-variant* events. It is the Lorentz-transformation itself that is *invariant* to all inertial frames of reference. That is, the invariant transformation formula facilitates a "translation" of different empirical contents by different observers in such a way that all of the observers, in the end, will have one and only one empirical content identical to every observer.

¹⁹¹ See M. Born, 1965, pp. 225-308.

¹⁹² Lawrence Sklar, 1977, *Space, Time, and Spacetime*, p. 277.

By introducing the Lorentz-transformation procedure Einstein was able to adjoin time to the spatial coordinates and thus obtain an algebraically equal character. In this sense STR could instead have been called the *theory of invariance* since it is not relativistic at all. On the contrary, it was precisely an invariant property in nature which was sought for and which appeared above the contingency of individual experience. The assumption of a fixed and absolute velocity of light in vacuum would provide the means to satisfy the demand for accuracy of the measurements. The procedure has advanced beyond the subjective experienced simultaneity and has in this particular given context set aside the relevance of temporal experience. The only adequate sense in which time still plays a role is as the time-parameter in the geometry of the four-dimensional space-time continuum.

5.2.1. Philosophical Interpretations of STR

In order to obtain invariance for *all* frames of reference, to render time an objective observable; Einstein's solution was exactly that of finding a way of *omitting* temporal experience as such. He thus prepared the ground for the growing sentiment within science and philosophy which indicated that experienced temporality is *not* a disclosing of real temporal properties. Temporal experience is not an unveiling of reality since experience only reveals itself as containing bits and pieces of perceptual information, which are put together haphazardly and are therefore inaccurate as material for measure. On the other hand, by now scientific time can be said to have offered the only valid representation of accurate time measurement. Time is now defined physically as "regular recurrence"; a rate of change which beating never slows down or that increases its rate, thus making "time" mathematical.

Hence, we have to consider a couple of important notions about the concept of time in STR: *The observer through the intermediary of space introduces the concept of objective time.* The "rigid body" is, in Einstein's notion, the basis for space. Likewise, the clock is his basis for time. Here we find two independent posits:

1. Objective local time, and;
2. Objective extended time.

The first notion was introduced by connecting the temporal sequence of experiences with readings of a clock defined as a

“periodically recurring closed system”. This means that Einstein put the concept of “periodical recurrence” ahead of the concept of time. That is to say, *ahead* of the concept of Newtonian time, because as long as he was not sure about its (Newton’s time) empirical (or *metaphysical*) origin it could not be trusted. He found it *wise* to put the *concept* of a “periodical recurring *closed* system” in its place. Apparently he was already in STR defining time in relation to the clock and the clock defined accordingly in relation to his conception of fundamental physical systems as *closed* systems. What are the definitions?

During the years following STR Einstein gave several definitions of the time of the “clock”. In his paper “What is this: A Clock in Relativity Theory?” Ludwik Kostro has illuminated several of Einstein’s definitions.¹⁹³ First is the 1910-definition:

A clock is a thing which is characterized by a phenomenon which repasses periodically through the same phases, in such a way, that we are obligated to admit – on the basis of the principle of the sufficient reason – that everything which happens during a given period will be identical with everything which will happen during another period no matter which.

And in 1915 Einstein wrote that:

A system which repeats, in an automatic way, exactly the same process is called a clock.

Furthermore, in 1921 he gave the following definition:

We understand by a clock something which provides a series of events which can be counted... A clock is also a body, or a system with the additional property that the series of events which it counts is formed of elements all of which can be regarded as equal.

The “feature” that Einstein concentrates upon is *homogeneity*, this means in practice that “time” is represented by an ideal “clock” in Born’s sense, and as such it is opposed to the scientifically speaking contingent *heterogeneity* we *experience* as observers. As Kostro also points out, in Einstein’s later quotes it becomes more and more clear

¹⁹³ In Duffy & Wegener, eds., 2000, *Recent Advances in Relativity Theory*. All “clock-definition” quotes are from Kostro’s paper pp. 88-89.

that it is an *ideal* clock that Einstein has in mind. The “clock” is therefore a theoretical or “subsisting” entity. This means that the *ideal* clock “exists” as something *real* only so far as it is “a something” *within* theory, that is, a concept, where the problem of *how* to determine the *accuracy* of observing and *verifying* time is the issue in need of a solution. Why? Because real clocks in space and time are *imperfect* since all real bodies are subjected to decay. Furthermore, real clocks have mass and are thus subjected to gravitational time dilation. Clocks are themselves subjected to the heterogeneity of the world. Real clocks are real objects in an actual world, which is subjected to the fluctuation and dissipation and thus disclosing its heterogeneity as part of real world processes. Although *real*, these processes are too unpredictable and contingent to be regarded as something that theory can rely on in the pursuit of accuracy and predictability.

In any case, with the concept of *periodically recurrence* applied in STR, Einstein is free to omit features related to time that are equal to the above contingency in both our temporal experience and in Newton’s notion of physical time. That is to say that the “notion” of having a unidirectional development of the world in time is utterly irrelevant.

The second notion is based upon synchronization of distant clocks by signals, and is thus taken to be a time that can be related to events in the whole of space. It is, as it must be, the idea of *local* temporally unfolding processes that is extended – although strongly modified, to the idea of “time” in physics.

As implied before, Einstein manages the move towards a redefined physical definition of time, by replacing the time order in experience with the readings of a clock. The lived temporal experience is replaced by a concept that tells a story about static and uniformly recurring time and where no indication is given that could indicate its real metaphysical “nature”. By “nature” of time we understand for example whether *time* is transient or not, or whether it for instance has a *preferred* direction. By avoiding these scientifically troublesome aspects one seems to think that an *impersonal* “view” of the matter has been obtained. It is quite the contrary, because what we see exposed here is actually a set of statements of how to conceive physical time and its realist meanings. This is, therefore, a metaphysical presupposition that tacitly implies something about the “nature” of time. Moreover it is a conception of a *peculiar* kind of time, namely of how a *time* is believed to be *independent* of human observers.

Secondly, the omission of temporal experience was made possible when Einstein realized that the law of transmission of light could be connected to the special principle of relativity by the Lorentz-transformation. Einstein, as we have seen, begins his speculations

about time, with the general principles he finds to be more in step with his own assumptions about the fundamental nature of reality. These first principles exhibit the “non-temporal” characteristics as those other symmetrically constructed *fundamental laws* of nature. I believe that the “non-temporality” of the principles functions as a *regulative* idea for his further investigation. For instance, Einstein’s dedication to scientific realism indicates that he possibly believed strongly in laws of statistical mechanics to be essentially disclosing a fundamental and non-temporal reality. These laws are “time symmetric” – the laws are universal laws because they are assumed to state the truth about *how* fundamental microscopic nature functions, be it of yesterday, today or tomorrow. Thus, we find the tacit assumption that there is no determinable objective direction of time in relation to objective events measured by the use of time. It is not until then that the nature of time is covertly decided upon. In short, time has no direction; thus there is *no* now, *no* future or *no* past.

One of Einstein’s motives was clearly to elaborate on his concept of space-time in such a way that no alterations could be made to the non-temporal nature of the formulations found in the *universality* that grounded the peculiar status of the fundamental laws of nature. Any such claim of universality in this scientific way is strange, contradictory and hostile to experience. Experience is, however, governed by its own temporal law since experience can only state that we cannot possibly know anything for sure about what the future holds in store for us. We can assume and guess, but we really do not *know*. The “universality”, which is an effect of scientific temporal realism, is being exchanged with a new meaning that transcends the former significance of universality, a meaning that was based on a correspondence with the temporal law of mind. “Universally true” meant “true for everyone”, which is the same kind of truth we are faced with in our everyday life, that is, with contingent or historical truth. By this it is not said that it is necessarily the same as stating a relativistic point of view; which, in my opinion, would violate the *meaning* and *identity* of the *truth* of being “a truth”. The new meaning of the concept of “universality” is formed upon the assumption that the world behaves according to necessary and logical truth. The exchanged meaning of universality, the idea revealed in Einstein’s thinking, is therefore identical to the proposition “true through all time”.

Therefore, each frame of reference will provide the observer with a system for measurements that are applicable throughout the entire universe. In spite of the fact that each system gives different values to the measures that are being determined by reference to it. The Lorentz-transformation will, in a systematic way, interconnect these different values. That is the beauty of it; the construction of the

Lorentz transformation was especially made in order to take account of the invariant velocity of light in every system. The point of this construction was therefore to keep the fundamental laws of physics constant in all frames of reference at *any time*.¹⁹⁴ Or, as Einstein wrote: “General laws of nature are co-variant with respect to Lorentz-transformations”.¹⁹⁵

Now, with the above discussion in mind let us turn our focus again to the concept of “simultaneity”. The simultaneity that Einstein rejects is only one special case of simultaneity. Simultaneity is relative in the sense that it implicitly involves a reference to a system, and that, by changing to another arbitrarily chosen system, we have to set aside our former definitions of simultaneity. Einstein does not deny the possibility of an objective determination of absolute simultaneity within a single system. Because when the train stops at the platform and our different frames of reference are not in relative motion, we share the same frame of reference. Thus, one cannot say that A’s judgments of simultaneity are “better” than B’s (where A is on the platform and B is in the train). The different sense perceptions of these different individuals will then correspond to each other. However, to determinate a distant event would be the same for both of these individuals. It is only if the train and the platform are in movement relative to each other or the observers are too far apart, that one has to discard absolute simultaneity. It is this problem, as a physical problem about *measuring* simultaneous *distant* events, to which Einstein proposes a solution.

By dealing with this problem of distant simultaneity we cannot refer to experience. We can only compute the “simultaneity” of distant events. Paradoxical as this may sound, the computation is only possible if we already know the velocity of the signals, something which is impossible without measuring it first. Thus, we can measure if we make some arbitrary assumptions, e.g., that light is propagated with equal velocity in all directions. This raises the problem of the “conventionality” of simultaneity. First one sought to set up a relation of distant simultaneity so that one could synchronize clocks far apart from each other, in order to determine the velocity of light from one point to any other point of their different directions.¹⁹⁶ Einstein thought, like most physicists in 1905, the light-velocity in any direction is a constant in nature just like gravitation.

¹⁹⁴ E. E. Harris, 1993, *The Foundations of Metaphysics in Science*, p. 47.

¹⁹⁵ Einstein, 1954: 42-43.

¹⁹⁶ Lawrence Sklar, “The Conventionality of Simultaneity! Again?” in Duffy & Wegener, eds., 2000, *Recent Advances in Relativity Theory*, p. 207.

Time, understood as an objectified observable, is clearly, from the point of view of physics, an advancement of our understanding of how we are to behave in order to determine, with greater certainty, the time relation between events in space, that is, how the events are related in time-space.

According to Milic Capek there are two important reasons why STR became philosophically important in the sense that it was understood to be in favor of the static interpretation of time. First we have Minkowski and his ill-chosen words which describe the union of space and time.¹⁹⁷ Capek has stated that the reason why we think of time and space as “space-time” and not “time-space” is due to the fact that we give priority to the spatial aspect in our effort to geometrize events and moments, or to render them “space-like”, as Einstein said. However, to keep this within the boundaries of mathematics is obviously not that easy, simply because, as Einstein also pointed out, we wish our concepts to be taken as “given *realities*”. We want our theories to describe and disclose factual reality, to have descriptions of reality that is identical to “Being-in-itself”. Thus, we find that Minkowski’s 1908 paper is the source of much of the misunderstanding that has occurred in philosophy, since physical time “*t*” has been overemphasized as “real” time thus confused it with the *actual* time of the world. The misunderstanding can be traced to Minkowski’s choice of words. Instead of keeping to a terminology that has a distinct and unambiguous meaning within a specified theory and where the fusion of space with time is expressed by the phrase “four-dimensional continuum of points-events”; he now describes this as a “four-dimensional *world*.”¹⁹⁸

Furthermore, I believe that Capek is right in claiming that Minkowski probably did not choose his words by accident. This would certainly explain why so many philosophers and physicists have followed Minkowski in using the same ontological terminology instead of a more metaphysically restricting epistemological language. Furthermore, it must be stressed that in using the same terminology the followers also apply the meaning inherent in the terminology, namely the use of the word “world”. Minkowski is not restricting his notion of space-time to the “geometrical” or “mathematical” sphere, but by using the term “world” he implies that its meaning is descriptive for the metaphysical “nature” of time. The ontological status of his

¹⁹⁷ Milic Capek, “The Myth of Frozen Passage: The Status of Becoming in the Physical World”, R.S. Cohen and M.W. Wartofsky, eds., 1965, *Boston Studies in the Philosophy of Science, Vol. II: In Honor of Philipp Frank*, pp. 441-463.

¹⁹⁸ *Ibid.*, p. 445.

conception clearly shifts from the domains of theory to the domains of reality itself.

Where does Einstein fit into this context? Einstein seems to have leaned towards the static view on time early on in his writings. Later on he would also show positive interest in Gödel's idea on time travel. However, for Einstein the *physicist*, the issue of time is not dealt with only by relativity. For Einstein the question of time is to be solved by relativity *and* microphysics – microphysics being the more fundamental of the two. For Einstein time is *physical* time, and human time does not portray or represent this kind of time.

Nevertheless, there are two ways of interpreting the “nature” of time if one wants to base ones ideas on Einstein's STR: a) as static, b) as dynamic. At this moment we have, however, to be content with the reason why it has been interpreted as supporting a “static”, or “block universe” view on time. This interpretation is a view that is claimed to give the static interpretation its strongest argument, namely that of “relativization of simultaneity”. The thing is that without an absolute all-encompassing NOW the objective distinction between past and present is held to loose its meaning.¹⁹⁹ This can be taken to show how STR has been used in the philosophical interest of determining the metaphysical nature of time. That is to say, it is widely assumed that science and scientific terminology alone can determine and describe the nature of time. Due to the *naturalistic* and *scientistic* atmosphere in the first half of the 20th Century, most of the philosophical/metaphysical interpretations of STR have gone in that direction.

5.3. The Status of Objectivity for the Concept of Time in STR

STR renders time “objective” only in a very restricted sense, namely as a theory-dependent epistemological concept that does not have a 1:1 correspondence in relation to ontological actuality. In STR we do not have a concept of time that is objective in the sense of having a clear and distinct identity between the “objective properties” and “reality”. I

¹⁹⁹ Ibid., p. 450.

therefore agree with the physicist Mendel Sachs when he states in his paper “On the Meaning of Space and Time”:²⁰⁰

I do not believe that there are objectively true meanings of space and time. They are indeed concepts that are part of the language that we construct in theoretical physics and philosophy in order to express the behavior of matter – from the domain of elementary particle physics to that of cosmology. Their truth values are strictly mathematical.²⁰¹

It must be emphasized that Sachs is referring to “language” as the “mathematical language of science” or to “science as a language”. However, I believe that we can grasp true or real time. Science as a language is not the same as an everyday language. That time is a structure in language does not in any sense mean that time is a *product* of language. On the contrary, language is a product of man interacting with nature – an interaction in which language gradually becomes more complex with meaning and thus also becomes instrumental in acquiring, developing and preserving knowledge. Time is *prior* to knowledge and language. Time is both an ontological and cognitive condition for that very same language. Language has, in its most primitive and pre-scientific distinctions, preserved the original meaning of time. That we then choose to elaborate “time” as *a concept within physics* is a quite different matter. I wish to hold the possibility open for man to have a cognitive access to real time through experience. After all, there are also other philosophies, other theoretical approaches in physics and in other branches of science that do not reject the *original* primitive experienceable properties of time. However, it should be unambiguously clear that these properties do not conform to the meaning given to time as it appears in STR.

Now we have to consider what kind of *objectivity* is needed for the concept of time in STR. According to Hans Reichenbach’s interpretation the concept of time in STR is neither “space” nor “time” nor is it a form of order which is necessary for the human mind.²⁰² Reichenbach understands the role of time in STR to be “relational”. Together with “space” *time* “constitute a relational system expressing certain general features of physical objects and are thus descriptive of

²⁰⁰ In Duffy & Wegener, eds., 2000, *Recent Advances in Relativity Theory*, vol. 1, pp. 170-176.

²⁰¹ Ibid. p. 170.

²⁰² H. Reichenbach, “The Philosophical Significance of the Theory of Relativity”, in Schilpp, ed., 1997, p. 302.

the physical world.”²⁰³ Reichenbach says that time (i.e. *space-time*), like all concepts, is understood by Einstein to be an *invention* of the human mind. And furthermore, that in Einstein’s opinion, as in many others’ opinions, not all *inventions* of the human mind are fit to describe the physical world.²⁰⁴ Thus, one can state, as Reichenbach does that “when we say that non-empty one-place predicates like ‘bear’ describe real objects, we must also say that non-empty many-place predicates like ‘father’ describe real relations... It is in this sense that the theory of relativity maintains the reality of space and time.”²⁰⁵ Time is a relation between solid bodies, light-rays and natural clocks. Furthermore, time, as a relation of this kind and joined with space as space-time, formulate physical laws of great generality and thus determine fundamental features of the physical world.²⁰⁶ “Space and time have as much reality as, say, the relation ‘father’ or the Newtonian forces of attraction.”²⁰⁷

However, let us not go too fast; let us recapitulate a little. In order to achieve an understanding of the objectivity status of time in STR, Sachs claims that we have to start with the “paradigm switch” concerning the views on space and time in relation to the new field concept prompted by Faraday and Maxwell. With this “switch” we get a change of the status of what a thing is and what its laws are. Thus, we have Einstein’s “continuous field” so that matter, that is *everywhere* and at *all times*, can be theoretically represented. With the introduction of the new concept of the field the appearance of a particle is not more than a “manifestation of the field.”²⁰⁸ This manifestation of a continuous field is, according to Sachs, not possible to localize anywhere in any discrete fashion. However, one may be able to specify where it points at from the reading of maximum amplitude, or by its interaction with other particles of the field. What is of importance, says Sachs, is that it does not cut off anywhere.²⁰⁹ As a manifestation of the continuous field the particle is, therefore, a non-local “entity”. As Sachs writes, “Just as one may not remove a ripple from a pond, as a separable thing, so one may not remove this manifestation of a continuous matter field as a ‘thing-in-itself’.”²¹⁰

²⁰³ Ibid.

²⁰⁴ Ibid.

²⁰⁵ Ibid.

²⁰⁶ Ibid.

²⁰⁷ Ibid.

²⁰⁸ Sachs in Duffy & Wegener, 2000, p. 171.

²⁰⁹ Ibid.

²¹⁰ Ibid.

The principle of co-variance is the basic assumption, or “axiom”, of STR, because the assumption implies that the laws of nature are in a 1:1 correspondence when they are transformed from one frame of space-time coordinate to any other frame.²¹¹ “The frames of reference in which the laws of nature are represented are, in terms of the language of space and time, assumed to be continuously distributed. Thus, the solutions of the laws of nature must be continuous functions of the space and time coordinates.”²¹² But the transformations between the frames that keep the laws co-variant must also be *analytical*. I will emphasize that “analytical” should in my context be understood as “theoretical” since a “field” and its “invariant laws” cannot be confirmed by experience, that is, the *existence* of the “field” and its “laws”, the way these notions are described by the theory, are theoretically context-dependent. This is necessary in order to ensure the incorporation of conservation laws, that is to say, what we derive from the space-time coordinates in one frame of reference must be the same for any other frame of reference. The assumption is that the laws of nature are mathematically continuous everywhere, says Sachs.

This theory of matter is based upon the field concept.²¹³ The essential idea with the theory of this field is that there are laws of matter which connect things together and that these kinds of relations are distributed “everywhere” and at “anytime”. Space and time, however, are merely coordinates and as such independent variables that the theorists use to “map the field relations.”²¹⁴ The *concepts* of “space and time” serve only to facilitate the expression of laws of matter within the context of the field; they are not, in themselves something “ontological” in the same sense that particles are within the “field” context. This means that “space-time” cannot be anything other than a context representing measurable relations in real space and time. Hence, it is implied that for *time* we cannot talk of a reality that is independent of what is assumed to be *real*, which is restricted to the context of the theory. Space and time are in themselves nothing else but “measures” represented in the mathematical language. Time is a measure that is preserved globally by the transformation from one frame of reference to another frame of reference. This transformation is in not a physical law itself; it is not something that discloses the cause- and effect-lawfulness of the relations between particles of matter. In this sense the transformation is a translation from one language to any other language, which is always a mathematical

²¹¹ See previous chapter 5.1.4. “Relative and Relativistic Time”.

²¹² Sachs in Duffy & Wegener, 2000, p. 171.

²¹³ Ibid.

²¹⁴ Ibid.

language where its meaning is preserved no matter which frame of reference the readings come from.²¹⁵

But how does the *objectivity* of these measures come about? The theoretical significance of time measures is not just to decide upon some convention of measurement, as there are several notions and assumptions involved together with the demands of physical theory itself. One should not forget that measuring is a practice that filters out or excludes otherwise important features of nature for the sake of ordering and controlling the rest. Therefore, we have to understand that the “going on” of time, the “passage” of time is only suggested and then forgotten. Measurement provides science with a mathematical metaphor for time. And the metaphor is a monolinear line that corresponds to nothing but the abstract assumptions of physical measurement. To represent time in this manner requires that one is able to deprive time of its “going-on” aspect.

What STR gained by introducing a concept of time as “something measured” can be seen in the nature of analysis. Every analysis is in need of an object. Thus we know that an analysis presupposes an objectifying act. And this objectifying act must yield a time representation that is not only a non-lapsing object but also a finite one. When the lapsing aspect of time is eliminated one may choose to represent time in terms of a segment. The only justification of the objectifying procedure is that of the need for measurement in physics. Therefore, let us take a closer look at some aspects that are involved in the measurement of time.²¹⁶

Accurate measurements rest upon how we can accurately communicate an interval of time, that is to say, as its rate of change. The objectivity in demand must yield a mean of measuring intervals, but it must also be a mean of measurement that shall be independent of subjectivity or individual eccentricities. Thus, there are three necessary objective conditions that must be fulfilled. *First* there must be single events in time, that is, discontinuous units, which, *secondly*, must be equal to each other. *Thirdly* it must be possible to repeat the same interval or segment of time in time.²¹⁷ Of these three

²¹⁵ Ibid. p. 172.

²¹⁶ In the following I will lean heavily on Mary F. Cleugh’s exposition of measurement of time found in her excellent book *Time*, Methuen & Co. LTD. London, 1937, pp. 38-71; G. J. Whitrow, 1980, *The Natural Philosophy of Time*, pp. 215-224; and K. G. Denbigh, 1981, *Three Concepts of Time*, pp. 23-26.

²¹⁷ According to Denbigh (1981:23) these rules can also be formulated in the sense that we:

- 1) “Need to satisfy a *condition of additivity*. Whitrow (1980:219) (here quoted from Denbigh) remarks that additivity ensures that physical laws can be formulated so as to be independent of the particular times at which events

requirements we see that the observer, the one who measures, must depend upon his sense perceptions. Without these perceptions the observer is unable to determine whether different measured segments of time are equal to one another. However, the measure must remain constant. That the clock, the thing that measures time, remains constant cannot be ascertained independently by the observer and his judgments based upon his sense perceptions. His or her primitive judgment of equality is the ultimate factor that determines the constancy of the measuring device. In fact it is on this primitive and direct perception of equality and inequality that the whole of measurement is based. Hence, we must understand that measurements are relative, since measurements only deal with relative proportions. The clock does not tell me *the* time of the event; it tells me the time relatively to the clock I am using to measure the event. But to measure time is complicated even furthermore by the essential character of time.

The essential character of time is its *transitivity*. The problem is that we cannot place measured segments of time side by side and compare their duration since they do not both exist at the same time. So here again we have to rely upon the subject, since past and present are continuous and past can be remembered. The essence of memory is to conserve the perceived raw materials of meaning from being erased by the “flow of time”. One cannot escape the usefulness of subjectivity. Thus, we can only appeal to introspection of this matter since we can only compare two measured segments of time that already have succeeded as “now” of our consciousness. Hence, we get an immediate and primitive perception of equality and inequality. But this does not mean that these perceptions of equality and inequality are subjective in the sense of being solipsistic or private. On the contrary they are “objective” in the sense that judgments – both your and my – agree. Without such an agreement we could not compare objectively any segment of time separated by its placement in time. The subjective or individual judgments become the test of accuracy.

And now we can proceed to the standard that one seeks in order to measure and render measurements objectively in a public way. The

occur; only the *differences* of the times of events need then to be taken as significant. Thus, Denbigh says that if the ending of a temporal interval *a* is simultaneous with the beginning of another interval, *b*, we require that the total interval from the beginning of *a* to the ending of *b* is the arithmetic sum of the intervals *a* and *b* separately.”

- 2) Furthermore, Denbigh says, “We also require a *rule of congruence* – i.e. a rule which specifies when temporal intervals are equal.”
- 3) Finally, Denbigh writes, “We need to choose a *unit of time*.”

best way to escape perceived variations is to choose a device that we already have described in Einstein's terms as a "periodically recurring closed system", in other words, the clock. But this is only a means to correlate "private" estimations based on, for instance, individually perceived astronomical phenomena. In order to understand this a little better we have to return shortly to the "philosophical relationship" between Einstein and Ernst Mach.

The reason why we return to this is that "abstraction" and "imagination" are important "subjective" acts in the operation of excluding temporal features from the realm of the "objective". As already mentioned, "instinct" and "intuition" play significant roles in the discovery of principles. In Mach's view this is closely connected to "abstraction" and "imagination". Mach writes:

*Abstraction and imagination play a major role in the discovery of new knowledge... The scientist looks for an enlightening idea. To start with he knows neither the idea nor the manner in which it can be found. But when the aim and the path to it have revealed themselves, the scientist is at first as surprised by his findings as a person who, having been lost in a wood, suddenly, on leaving the thicket gains an open view and sees everything lying clearly before him. Method can impose order and improve results only after the main thing has been found.*²¹⁸

To discover principles one has to involve observations, but more important it seems ingredients or some content, which the scientist adds on his own by using his own notions and ideas.

As we know by now, Einstein's analyses of time rest upon – and are guided – by his principles, principles that operate as fundamentals to his theory. However, by considering Einstein's emphasis on imagination on the one hand, and by considering the question of the nature of time on the other hand, we should be able to differentiate between the imagination that is working on idealizations and principles, and the imagination which is working with the content of experience. But such a differentiation is unobtainable from the reading of both Mach and Einstein. For both of them the important matter is always to transcend experience, of gaining upon what we already know. The epistemological importance of experience has become tuned down. Why, you ask. Because in this respect abstraction plays a "negative" role. Abstraction is a "negative" procedure. As is well known

²¹⁸ Quoted from P. Feyerabend, 1987, *Farewell to Reason*, p. 200.

already from the history of science and philosophy, real world properties like colors and the “going on” of time are *intentionally* omitted, since abstractions preserve what we wish to single out as important. According to Paul Feyerabend, this is, in the case of Mach, just the “side effect of *positive* and *constructive* work that is ‘added’ by the scientist and used by him to ‘rebuild’ facts.”²¹⁹ In contrast to Einstein, the notion Mach has of abstraction is that it is “a bold intellectual move”. However, “it can misfire”, says Feyerabend, but “*success* would justify it.”²²⁰ Thus, if we contemplate upon the *success* of Einstein’s STR we see that Einstein’s view on time seem to have achieved both the “misfiring” and the success. Time as a *physical* concept is a success, but the interpretation and hypostatization of this concept to the level of explaining the real nature of time is something that can best be described as a misfired ontological claim.

To describe this we have to return to the problem of singling out the fundamental principles of STR. There are several ways to discover principles. One discovers principles either by consulting experiments or by thought experiments and generalizations. In the case of Einstein it is the latter that is the case. With the principles we get a defined style of thinking that is different from the concrete thinking handling phenomenal and perceptual experience. This theoretical thinking abstracts from the elements which are not contained in experience. Then thinking goes on with the development of idealizations based on the abstractions. By “elements” we are here to understand sensations and psychological experiences – such as temporality. Furthermore, it should be clear that different principles – at least according to Mach – suggest different methods of abstraction, idealize facts in different fashions and even in contrary directions, and thus emphasize different and contradictory aspects of phenomena.

Even if both Einstein and Mach believed in an intimate relationship between science and common sense, we find that they also diverged fundamentally on this subject matter. Mach understood the world as one consisting of elements. Mach’s elements are sensations, and in the sense that sensations depend on the body, they are also physical objects – but in this sense – like sensations and physical objects these elements must be understood as psychological *facts*. Mach was of the opinion that we could grasp one single observation through the imagination – and thus we may change the meaning of the observation by subtracting from or adding to it. Einstein, however, was intent on analyzing the nature of everyday thinking and of *changing it*

²¹⁹ Ibid., p. 201.

²²⁰ Ibid.

where a change seemed necessary.²²¹ Thus it is not experience that constitutes the cognitive authority, but the fundamental principles and laws of physics.

In spite of Einstein's argumentation against abstraction as a principle of science²²² and his emphasis on the creative aspect of theory building, there is in fact no doubt that he was abstracting from experienced temporality. Einstein does not ask how these instinctive or intuitive aspects of time arise or what exactly is contained in them; what the source of their authority is. The answer to the last question would be that an intuition – as indeed our temporal experience is – in a fundamental way propels perceptions and that thought *presents itself* as being independent of our actions and beliefs. On the other hand a theoretical construct, which rests upon assumptions we have formed ourselves, would be more vulnerable to the import of our personal metaphysical convictions. Einstein did not consider why we should or could trust our temporal experience. One important reason why we can trust temporal intuitions is the fact that the intuition tells us something about *what* we experience in a positive sense. In addition, it also discloses a *negative* significance of the experienced content. The negative significance is simply that experienced temporality does not only tell us what must occur, *but indirectly also what cannot or does not occur*.

Although Einstein “eliminated” everything from *physics* that was distinctly “common sense-temporality”, he continued to believe that -- in the reading of the clocks -- the logical relation of “before” and “after” should be maintained. He managed to overcome the lapse of time – or the “heterogeneity of macroscopic phenomena”, by concentrating on time as serial or as a homogeneous non-lapsing continuum. Furthermore, as Reichenbach pointed out, the temporal order of “before” and “after” is reducible to the *causal order*. This means that in Einstein's *macroscopic* framework of relativity theory the cause is always earlier than the effect, a relation that experientially cannot be reversed. “Time” is still understood to be a relation between different events in addition to a continuum of instants. One can apply the order of McTaggart's B-series on all phenomena that are viewed as causally or connectable events. However, the theory of relativity gives in itself no criterion for the B-series' relation of “later than”.²²³

Even though Einstein's STR is about macroscopic phenomena the theory reveals, according to Reichenbach, a reversal of time order

²²¹ Ibid., p. 207.

²²² A. Einstein, 1954: 273.

²²³ K. G. Denbigh, 1981: 40.

for certain events.²²⁴ This result is known from the relativity of simultaneity. Reichenbach writes “since the speed of causal transmission is limited, there exist events of such kind that neither of them can be called earlier or later than the other.”²²⁵ And as such, time can be treated as a fourth dimension where events can be ordered as points on a line – thus again facilitating measurements and geometry. From this restricted point of view time is only a geometrical time, a time that can be applied by the physicist in his or her geometrical equations. This is not to be deplored. It is in fact a highly necessary device for precise correlation of spatio-temporal measurements. But it should not be overemphasized. It is nothing but a mathematical device that suppresses the property of becoming, or the evolvment and transitivity of the physical events.²²⁶

Can *real* time, that is, *actuality*, be measured at all? In this sense it is nonsense to say that we measure *it* – because what can be measured has – already by St. Agustin – been pointed out to be our *experience* with regard to its *order* in respect of time. “Time” as a measure, where transitivity and temporality has been eliminated, has an objectivity status that only refers to its theoretical and epistemological sense or usefulness; it would never be an issue without the relevant theoretical context in which it makes sense. Thus it must be stressed that our temporal experiences (our internal experiences) or the perceived processes in the world (our experiences of the external world) behave according to the apparent homogeneity of our measuring devices. In fact we are constantly confronted with what appears to our consciousness that contains inner as well as outer heterogeneous processes. For instance two persons who are both 80 years old will not necessarily have aged with the same rate. We know that aging is genetically and thus we would all have different rates of aging – some simply grow older faster than others. In this sense we do not measure one process with another when the two processes are in a 1:1 correspondence with each other. We measure a local heterogeneous process by a homogeneous process. That this is true can be seen from the fact that we constantly have to calibrate our clocks, because the heterogeneity of the world inevitably enters even the most perfect mechanical and electronic fabrications which we can make. Thus, it is not the external (aging) process or the internal (temporal ordering) process that is being measured at all, we are only making representations of these processes that can be communicated, that is,

²²⁴ This fact is illuminated by Denbigh, 1981: 43. Here he says: “...it is worth noting that nothing...is contrary to the possibility that the ‘events’ in question occur reversibly.”

²²⁵ H. Reichenbach in Schilpp, 1997: 304.

²²⁶ See E. E. Harris, 1988: 44.

that are global in its expression, that is, methodologically intersubjective. In reality *we do not* observe the external or internal process when we *measure*. What we observe is the *homogeneity* of the measurement.²²⁷

This strange possibility puts light to other peculiarities related to a static interpretation of time in STR. For instance the clocks and measuring rods and their assumed dilation and contraction effects: Are the changes in the measuring devices real changes or not? To be more specific: Are the dilation effects that J.C. Hafele and Richard Keating discovered by their cesium-beam clocks in 1971 not real dilations? Paul Davies, for one, is convinced that the changes are real.²²⁸

The experiments leave no shadow of doubt: clocks are affected by motion. But why do physicists insist on concluding that *time* is stretched? The simple answer is: time...is that which is measured by clocks. Of course, to be consistent, we must suppose that *all* clocks are affected by motion in exactly the same way; otherwise we would be more inclined to attribute the effect to the clocks rather than to time itself.²²⁹

Davis thinks that we measure *time* with clocks. The changes in question are real changes; they are changes of the clocks, that is, in the measuring devices alone, and for the observer who is doing the measurement it seems to be a considerable problem. We can only say that it is “time” as homogeneous *clock-time* that is “stretched” not time in itself. This only means that the measurement is *disturbed* by motion. But to say that real time is disturbed or “stretched” by motion is non-sense.

Mendel Sachs states clearly that there is no evidence of such cause-effect relations.²³⁰ But what is necessary for the physicist-observer is to be able to do the contraction of scales of time and space measures in order to preserve the forms of the laws of nature for all frames of reference. This means that the observer always has to calibrate his clocks in the moving frame with a scale that is different from the one applied in his own frame. We have to assume that the components and other mechanical parts that constitute the clock will

²²⁷ This point has been elaborated in my paper “Temporalitet og realisme” (Temporality and Realism), *Norsk Filosofisk Tidsskrift*, vol. 36, nr. 1-2, pp. 62-82, Universitetsforlaget, Oslo, 2001.

²²⁸ Paul Davies, 1996: 58.

²²⁹ Ibid.

²³⁰ M. Sachs, “The meaning of Space and Time”, in Duffy & Wegener, 2000: 173.

be the same before, during and after the observer perceived them.²³¹ The evident kinetic variable is an effect, not a cause.²³² It is the acceleration of a body which is the kinematic variable effect. The cause is a dynamical force applied to the body. Thus, one tends to confuse cause and effect, says Sachs, because one thinks that it is the acceleration of a body that causes something to happen to it.²³³ Hence Sachs' claims, that there is no evidence for the assumption that even the force that causes the body to accelerate should also cause the body to age slower than the stationary one, or make the hands on a clock slowing. Aging does not happen because of its motion relative to some other frame of reference or body. If this was the case then the physicist would have to find this law, to establish this force.²³⁴ However, as Sachs states, the Lorentz-transformations are not in any way a force to do this.²³⁵

This paradoxical nature of the understanding of the parameter “*t*” in physics is the result of confusing “*t*” – as a scale for the measurement of time – with a real physical duration. It is only an abstract parameter and cannot as such affect the spring of a clock. However, it is an objective concept. The “*t*” is an objective feature of STR. The “*t*” parameter has epistemological objectivity, but it cannot be taken as a representation of the nature of time, because it is restricted in its scope and meaning to Einstein's definition of reality as *physical* reality. The “*t*” is only meant to represent relations between physical entities that are kept invariant in any other physical frame of reference represented in a coordinate system. Einstein's reality is a physical reality, partly theoretical and partly empirical, where the experiential (empirical) aspect of time is erased. The only “empirical” content left is the clock readings, which are only meant to conform to the overall theoretical context. The “*t*” parameter is wholly dependent on its theoretical context to be something that one can take into consideration, and as such it is as an objective observable, connecting entities causally within Robb's light-cone in the Minkowski space-time diagram. Time is clock time, nothing else, and the clock in question here is itself theory. Thus Einstein writes:

Strictly speaking, measuring rods and clocks would have to be represented as solutions of the basic equations (objects

²³¹ Ibid. p. 172.

²³² Ibid.

²³³ Ibid.

²³⁴ Ibid. p. 173.

²³⁵ Ibid.

consisting of atomic configurations), not, as it were, as theoretically self-sufficient entities.²³⁶

Now, we should also say something about the *direction* of Einstein's time. In STR time is a symmetrical relation, thus time is also used to create a representation of a causal serial order. Time is not unidirectional. There are no manifestations in STR about time's irreversibility.²³⁷

As I have been arguing, philosophy and science have rather generally chosen to interpret real/physical/external time as "Parmenidean static" and have thereby concluded that the temporal properties found in human experience do not exist externally and are therefore not representable as properties of reality. Hence, we have to investigate the philosophical consequences that have surfaced in the currents of STR as a "paradigmatic" theory. STR has been philosophically influential, and thus it has also had bearing on the metaphysical question about the nature of time.

5.4. The Illusions of the Individual

To be able to operate with a concept of objective time we need to know *time*. What is time? Appearance? Or is time a measure and relation between physical properties of the world? According to modern physics time is both: It is a *psychic* phenomena and it is a relation between *physical* occurrences in space. Time is an "appearance" in the sense that we, when we perceive, are unable to distinguish between what is simultaneously seen and what is simultaneously happening. We cannot distinguish the light from a distant star from its destruction millions of years ago. We are supposed to be limited by our awareness of the world in the "here and now" of our consciousness. Thus, the claim is that our temporal experiences cannot correspond to what is really going on in the physical world. However, time is a real physical property of the world if it is seen as an independent relation with no subjective temporal features. The objective time of physics is taken to be an integral feature of physical nature because one cannot any longer make a theoretically legitimate separation between rigid bodies, space and time. These aspects constitute an interwoven unity, which nature

²³⁶ A. Einstein in Schilpp, ed., 1997.

²³⁷ Reichenbach in Schilpp, ed., 1997: 305.

would come out in the clear if we were to apply the fundamental laws of physics.

STR is a conception that sets up a *theoretical* limitation on time. The universal arrangement is based upon the assumed failure of subjective experience. Thus, we may say with a twist of Rescher²³⁸ that the objectivity of STR does not rest upon the findings of STR, but is due to a precommitment to the capacity of thought to transcend our subjective experiences. This can be seen in Einstein's assumptions about "true reality" as "non-temporal", and as re-presentable in the deterministic *formulation* of physical laws. As I have tried to show it was Einstein's strong belief in certain ideals of physics which were authoritative in motivating him. Once, Einstein was asked what he would have said if his theory had not been confirmed by Eddington's 1919 observations. He replied: "I would have had to pity our dear Lord. The theory is correct all the same."²³⁹ In Einstein's case we have to understand that objectivity is not always a product of inquiry; "We must precommit ourselves to it to make inquiry possible", as Rescher says.²⁴⁰ It is a necessary commitment to a norm of thought that we infer onto the "cognitive project". In Einstein's case his metaphysics was, for instance, his "realist-commitment" to be based on the fact that something is believed to be objective in the first place.

Einstein's commitment to something objective is also based on the belief that physical explanation can capture and disclose the reality that exists objectively. The foundations of objectivity in science can thus ultimately be said to rest upon pure thought in the sense that it has to precede and underlie all of science. We could say that the "true" objectivity of STR is based on Einstein's commitment to what he conceived as true and real features of physical reality.

The problem is *not* that one does not recognize the fundamental epistemological primacy of experienced time. The problem lies in the status conferred upon experienced temporality after having been weighted on the scales together with the rationale of physics. Poincaré, who found time to be a pre-existent and necessary "form" in our minds already, emphasized this. He says that into this "form" we have to put phenomena belonging to the consciousness of our own and others. Another aspect of this "form" is that it has to contain physical facts, whatever these may be since this matter never can be decided upon directly. However, says Poincaré, physical facts have to be fitted necessarily into the temporal form in human minds because without this "form" no science could exist. Poincaré acknowledges the necessity

²³⁸ Rescher, 1997: 110.

²³⁹ Quoted in Paul Davies, 1995: 51.

²⁴⁰ Rescher, 1997: 110.

of the time of mind because this particular “form” is needed in order to create scientific and physical time. Anyway, the problem remains, says Poincaré, since the newly created scientific time tends to become the dominating paradigm for how one is supposed to view time. Poincaré claims that there are at least two problems. The first problem concerns the development of scientific time, which is to say how can one proceed from a qualitative time and transform this time into a quantitative time? Secondly Poincaré questions the reductive procedure of science. This reduction is a reduction where all kinds of facts “that transpire in different worlds” are claimed to be fitted into one and the same measure. Poincaré does not seem to be very comfortable with this procedure.²⁴¹ Nevertheless, it is the reduction that leads to the claim for ontological truth that remains the key problem for scientific-minded philosophers who find this procedure attractive. Of course, their solutions are not going in the direction of acknowledging the time of mind, as Poincaré did, but to dismiss it completely as “irrelevant”. In order to be able to do this, one had to develop a strategy, which showed that the time of mind is mind-based and hence nothing but an illusion.

Thus, the most striking philosophical consequence of STR is the “mind dependence theory of time” that claims that “subjective time” and the “lapse of time” are *identical*. Gödel has given one of the most characteristic descriptions of this form of thinking when he argues that:

Change becomes possible only through the lapse of time. The existence of an objective lapse of time, however, means (or, at least, is equivalent to the fact) that reality consists of an infinity of layers of ‘now’, which comes into existence successively. But, if simultaneity is something relative in the sense just explained, reality cannot be split up into such layers in an objectively determined way. Each observer has his own set of ‘nows’, and none of these various systems of layers can claim the prerogative of representing the objective lapse of time.²⁴²

Gödel’s interpretation rests on the realization that temporal ordering simply is a matter of how things are viewed. This view has, in relation to STR, led some interpreters, like Gödel, to believe that it is the same for the experience-related notions of “becoming”, i.e., the “coming-into-being” and “passing-away” aspect that are perhaps most characteristic

²⁴¹ H. Poincaré, *The Measure of Time*, pp. 317-318.

²⁴² Gödel, “A remark about the relationship between relativity theory and idealistic philosophy, pp. 557-562.

of human temporal experience. Also the notions of the “flow of time”, “arrow of time” and the “lapse of time” are included in this. These intuitively direction pointing notions and the supposition that these qualities are merely features of the human mind – and not of the objective, physical order – are perhaps strengthened by the basic mathematical structure of the STR.²⁴³

However important Einstein’s time turned out to be, present discussions in philosophy point toward the fact that he did not, after all, unveil the mystery of time. The problem is of course that becoming cannot be “clocked”, if it could it would be identical to the time of STR.²⁴⁴ Fundamental to the notion of becoming is the direction of time toward the indeterminate “potentialities” of the *future*. Einstein’s time has no direction, and it certainly does not “flow”.

5.4.1. Illusions and STR

Scientific minded philosophers do not approve of the idea that time is a “world-immanent structure” that can be viewed as “the going-on of things”. Events and happenings that evolve in a unidirectional way in the world also imply this transience which can best be described symbolically as proceeding “from the past” “to the future”. Such a division between past, present and future is non-existent in the Minkowski world, since STR tells us that there is no unique universal set of events, which constitutes “now”. There are as many “nows” as there are frames of reference with each of its own unique set of time. What we really find is, on the one hand, that all spatial and temporal values are exchangeable with each other. That is to say that x_1 , x_2 , x_3 and x_4 among themselves have reference to no differences, so that x_1 , x_2 , x_3 , cannot be brought into a special group of “spatial” coordinates and contrasted with the time coordinate x_4 . Thus, they are all differences belonging to temporal and spatial apprehension in subjective consciousness which is set aside or omitted. On the other hand, we find that all inner differences of the temporal, of time – unavoidable of the subjective consciousness: All differences of temporal

²⁴³ See W. B. Jones, “Physics and Metaphysics”, in Griffin, (ed.), 1986: 278-288.

²⁴⁴ See Henri Bergson, 1999, *Duration and Simultaneity*, Clinamen Press, p. 34. He writes, “We are dividing the unfolded, not the unfolding”. His point being that we can only measure that which *is* and in a sense that which *has been* and *never* that which becomes.

direction, of past and of future – are cancelled. We find that past and future directions are separated by the same (+) and (–) that separates directions in space. Thus, we can say that with Minkowski’s transformation of geometry to ontology, or *world*, we get a physics that has *changed* the business of physics. Physics has changed from being concentrated in a subject that theorizes about time as a measure belonging to the theoretical ordering of causes and effects and of other processes in a three-dimensional world *into* becoming a field of investigation which deals with non-temporal *being* that is characterized as a “four-dimensional *world*”. Time is replaced as a variable magnitude by Robb’s light cone, or the imaginary “ray of light”; time is in fact re-defined as the measure of light-velocity in vacuum. This allows an interpretation of time for STR that identifies it with causality. The light that is propagated and that enables the observers to connect two or more events becomes an ordering principle within the theoretical context of relativity physics.

But to *identify* time with causality provides us with two serious defects. The first one is that it takes away the direction of time; it no longer has an arrow. Not even the restoration attempts to apply the idea that time can only be identified with the direction which proceeds from cause to effect and which has proven to have become a solution to the problem. Lestienne²⁴⁵ says that one cannot apply causality universally as Einstein assumed, since it only applies to macroscopic phenomena. However, Lestienne finds that this claim on causality does not apply to the elements of reality, which are “proven by”, as he states, “the properties of inseparability demonstrated by certain interactions between elementary particles.”²⁴⁶

How is this to be understood? First of all we have to see a relation between the concept of energy and the paradigm of causality – and that both ideas are closely related to the theoretically restricted concept of time. The idea of energy is related to time in the sense that it is a *principle of symmetry* that defines the understanding of the *laws of nature* to be *invariable* over the course of time. The principle, as well as the nature of these laws, collides with the idea of a world that develops unidirectionally in time. Therefore, one stumbles over the idea that perhaps the nature of time is not the issue at all. Time defined in its ontological unidirectional and irreversible essence is as such highly *irrelevant*. Time *shall* not matter when experiments are conducted, because energy is *conserved*, or so it is believed. Time is *irrelevant* as Emmy Noether claimed in 1860.

²⁴⁵ R. Lestienne, 1995, *The Children of Time*, p. 85.

²⁴⁶ *Ibid.*

The relationship between the *paradigm* of causality, *time* and the *idea of energy conservation* is also obvious. In the paradigm of causality one easily recognizes Laplace's great idea that knowledge of the conditions of one system at any given moment determines all future knowledge of the system. And in relativity this means that causes propagate at the speed of light, but not faster than that. Then comes the correction of proper or local time (time in the frame of reference of the observer). We order events differently in time and space. Therefore, one assumes that we do not have an objective basis for our experience of the "lapse of time"; these experiences are particularly observer and reference frame dependent. The only correction provided by relativity theory is the common law of the propagation of light, i.e. of propagated causality. And it is precisely in this way that the direction gets lost. If we look at the later STR, we find for instance that two different events in the geometry of space-time are or are not causally related. This depends on the situation they are given with the application of Robb's light-cone, which means that one has to decide whether one of the events is situated on the outside or on the inside of the cone. Interestingly, according to Lestienne, STR does not indicate any order between causally linked events; neither does STR determine events as either causes or effects.²⁴⁷

In STR time has no specified direction although it is concerned with macroscopic phenomena and their time variation relations. However, there are no time-reversed situations to be found, but the principle of causality opens up for a possible reversal of cause and effect that can be interpreted within the context of relativity. Absurd ideas of *time travel* have their origin in this misunderstanding, meaning that "time" must be something similar to space since we can travel through space. Time travel then means that one is traveling through time in time, which is absurd, because traveling through time, whether "backwards" or "forwards" takes time, that is, a *different* time. However, any reversal of time in the sense that time is identical to a reversal of cause and effect can only be conducted as a *theoretical* operation. This means that there is only a fictional "possibility" for such a reversal. This is a literary fiction that only in theory can claim to correspond to the deeper realms of *reality*. Events occur in spite of what distant observers might object to as their simultaneity or other signaling problems.²⁴⁸

An interpretation, contrary to my own view, a theory where time and causality is taken to be identical, tells us little of what nature we must ascribe to time. This is to say that these interpretations of

²⁴⁷ Ibid. p. 87.

²⁴⁸ K.G. Denbigh, 1981: 47.

time in light of scientific realism have little bearing upon the ontological question of time. In other words, the causalist interpretation “deprives” us of that necessary quality of time that enters as an inseparable factor into every corner and layer of all of our thoughts and experiences.²⁴⁹

Einstein’s STR does give expression to this style of realist thinking because time ends up as an idea which is nothing but a special aspect of mathematical and physical objectification. Thus, I believe that the physicist of today cannot stop the development since it has become the paradigmatic task of physics to translate everything enumerable into pure numbers, to transform quality to quantity, to make particularia fit the universal order of physical formalisms. It is perhaps in this context that we have to understand Einstein’s analysis of temporal experience, that – like with Kant – we have a form of “pure intuition” that plays the important part as a definite method of objectification. Interestingly enough this “method” does not coincide with the “subjective”. That is to say that the method does not coincide with our subjective experiences of time. The “subjectivity of time” in this sense is not identical to experience, but rather a “transcendental” subjectivity that conditions the possibility of an objectification of experiences. In this sense it makes sense why Einstein, at the same time, embraces the necessity of “time as we experience it”, and rejects or omits the fundamental characteristics of the experience even before he begins his investigation into STR by introducing his first principles. This is to say, “principles” that are to regulate our subjective experiences and at the same time function as conditioning or “transcendental” factors of our comprehension of physical things.

W.B. Jones points out a problem. Jones says that to dismiss relativity theory as such, by presenting a useful calculational scheme, is a mistake. The reason why this is a mistake, he says, is because today we are traveling in space due to STR, and we owe STR the *precision with which we calculate relations and distances between objects*. Jones says that the enormous amount of empirical support that has piled up over the years only confirms this aspect of STR.²⁵⁰ On the other hand; we have the view that the true character of time has been captured by the theory of relativity. This means that “time” is not in any way to be found in *fundamental* reality. This means that there is

²⁴⁹ Richard Gale, 1968, *The Language of Time*. New York: Humanities Press. See p. 5: “Time is indefinable...due to the fact that temporal notions are implicitly involved in all of the basic concepts by means of which we think and talk about the world.”

²⁵⁰ W.B. Jones, “Physics and Metaphysics: Henry Stapp on Time” in D. R. Griffin (ed.), 1986: 281.

something more fundamental than both space and time.²⁵¹ However, Jones describes STR to be a useful calculation scheme; he refers to its usefulness when we want to *calculate precise relations and distances between objects*.

5.4.2. Grünbaum's View

The general view of a temporal-realist minded philosopher is to commit to a position that embraces the idea of a non-temporal “Parmenidian” being on a *fundamental* level in nature. Secondly, he or she then wants to refute the *objectivity* of “becoming” by applying arguments from the “mind-dependence theory of temporal becoming” in order to prove that there is no transitivity or change in the world. Bertrand Russell,²⁵² for instance, argues that without human beings there would be no present, future or past, *only the relations of before and after, earlier and later*. The present, past and future, arise, he says, from the fact that we apply a time relation that is between subject and object, and not the real time relation that does exist between object and object – which is earlier and later. Problematic as this notion seems, we cannot find an explanation in Russell's thought that *relates* the earlier and later, that is, how “later” becomes something “after” that which is “earlier”, or how these relations are organized and by whom.

Adolf Grünbaum has, for instance, given the properties of experienced temporality the same status as the secondary sense qualities of colour, sound and taste. Grünbaum accepts the Minkowski *world-picture*. Storrs McCall²⁵³ writes that arguing against Grünbaum *within this particular context* is useless. McCall explains this as the time series A= “present”, “past” and “future”; and B= “earlier than”, “later than” and “simultaneous with”, cannot be singled out as a preferred time series either by space-time geometry or by irreversible physical processes. The claim is that such processes can only confer anisotropy, not a distinguished direction. This is perhaps why we, in order to determine some event as later-than or earlier-than, must demand the introduction of *human choice*. This means that even, and contrary to Russell, the time relation found in the B-series, and seen within the context of STR, cannot be a relation between object and

²⁵¹ Ibid.

²⁵² B. Russell, 1915, “On the Experience of Time”, *Monist*, 25: 212-33, (212).

²⁵³ Storrs McCall, 1996, *A Model of the Universe*, p. 27.

object without a sensuous observer existing at a specific time to choose which direction “later-than” or “earlier-than” lies in. Even in the B-series enters a so-called “mind-dependent” factor.

The “mind-dependent” aspect of temporality is perhaps more obvious if the “present” is contrasted with the “block universe” scheme that has become part of the physicists’ methodological thinking about time. The claim is that, among the infinity of differing instants on the time axis in the Minkowski coordinate system, there is no objective way of picking out the “now”. The singling out of a “now” can only be arbitrary because there is no anisotropy to base one’s determination upon, and as such any determination of a moment would, as the “now”, be highly subjective. As Storrs McCall points out there is nothing in the Minkowski world, or in the related theory of Grünbaum, or for that matter in Einstein’s STR, which corresponds to the present. Grünbaum’s theory exhibits experienced temporality only as something that lacks in the “real” world. Therefore his claim is that “becoming” is not a feature *of* the world.

Perhaps Grünbaum’s point is that the “present” lacks in the “world” of physical description and explanation. But then again physical theory is assumed by Grünbaum to disclose the reality *behind* appearances like experienced temporality. Grünbaum claims that the *physical* world is *identical* to the *objective* world in physical knowledge, and that this is a world taken to be *identical* with subject-independent *reality*. But then would not only the quantifiable physical or material features of the world be qualifying as the true reality behind the appearances? For Grünbaum reality is, strictly speaking, reduced to mean mathematical space-time theory, and as such it is similar to what Plato implied when he claimed that only the non-temporal World of Ideas is “real” since these Ideas never change. There seems to be very little qualification other than the regulative ideal of scientific explanation behind the claim that “becoming” is mind-dependent. The human experience of time is not taken into consideration in no other way than just being the base for the appearance of “becoming”.²⁵⁴ In contrast we can find illusions of sense perceptions. But these “illusions” are illusions that one has created and which are identical to particular illusions.²⁵⁵ To be able to sort out among the illusions we need the overall background of sensible perception and the means of a suitable empirical inquiry.²⁵⁶ The “illusion of the Now”, on the contrary, and

²⁵⁴ Massimo Pauri, 1997, “The Physical Worldview and the Reality of Becoming” in Faye, Scheffler, and Urchs (eds.), *Perspectives on Time*, BPS Vol. 189, Kluwer Academic Publishers, p. 287.

²⁵⁵ *Ibid.*, p. 286.

²⁵⁶ *Ibid.*

according to Massimo Pauri, “would be a peculiarly *unique* and *universal* illusion.”²⁵⁷ There is an enormous difference between *sense perceptions* of sounds and colors and *temporal experience* of change. We are not able to modify our *experience* of colors; we can only modify the colors and changes in the world by acting on it. The experience of “Now” is not to be confused with the *subjectivity* of particular *private* sensations like pain.

Temporal “becoming,” described as an “anthropocentric illusion,” does not, in any sense, portray human temporal reality. It rather describes the perplexity the theorist meets when the impact of his own temporal reality dawns on him as a necessity for his own being, and that it, at the same time, is contradicted by the theories he holds as the true physical representations of real time. Furthermore, the account about time is, as an “anthropomorphic prejudice”, hard to believe because human experience is kept on the “outside” of that which is believed to be reality itself. “Becoming”, rejected as a dynamic principle of reality but seen as an *essential* property of human experiencing, separates humans from reality in the sense that reality is being denied to the human primitive conception of time. This is especially characteristic of the perspectives of both metaphysical realism and materialistic realism that has become so essential to the grounding of temporal realism. Moreover, *this* is the *consequence* of Grünbaum’s thinking.

From a biological point of view, “becoming”, viewed as a dynamical property structuring the human mind, is *fundamental* for the *survival* of man. Survival, from the human perspective, depends upon man’s ability to coordinate different events happening in the immediate surroundings with his own being.²⁵⁸ However, here it could be interesting to confront Grünbaum’s thesis with another question. Are we to understand that these temporal “mind-dependent” properties are to exist *independently* of any physical aspect, for instance of our brain? If this is true Grünbaum’s thesis confronts us with the old classical Cartesian two-substantial dualism. Or are we rather to understand that experienced temporality or “mind-time” are due to some kind of “dependency” or “inter-dependency” with the physical realm? This would solve the problem of a dualistic world picture. However, we would be confronted with new problems if we tried to explain experienced temporality by a physical explanation because this

²⁵⁷ Ibid.

²⁵⁸ This issue will be further elaborated in Chapter 8. However, survival depends on how accurate we are able to anticipate an immediate danger, which signifies that we have to act on very little information, that is, we have to “fill in” by conjecture what is missing from the perceptions we have so far of the situation.

would mean that we tried to reduce something primitive to something less primitive. Nevertheless, must there not be some kind of relationship between the physical and spiritual realms of the world? But then again, if there is a “relationship”, how is this to be understood? As a physical process confined only to our brains or as an exclusive mind-process that perhaps runs parallel to some fundamental physical process of nature itself?

5.4.3. Time in Nature is the Time of Mind

Thought, which includes temporality in all its qualitative aspects, is commonly accepted to be a non-reducible feature of the conscious mind that is taken to be located in the physical brain. It seems a non-reducible qualitative mode of mind since the subject operates and develops its use by applying symbols and concepts to a reality that is *different* in the sense of being *something else* than its own self. Primitive *concepts* cannot be reduced to specific physical processes without creating a gap between reality and symbol. However, symbols create intelligible and necessary connections between that which shall be explained and that which explains. With our fundament in primitive *thinking*, we can develop thought to operate *with* concepts which we *construct* and of which we can *alter* or transform the original or primitive meaning in order to discover others, no matter of which framework. There is no “permanens of rule” or “categorical constancy” in thinking but what is given by thought itself in its interaction with perceptual or empirical reality. So what about the temporality of mind? Is temporality then part of the *flux* that characterizes thinking? Is time identical to the processes of thinking, that is, to the *change* of nuances and qualitative aspects so characteristic of our perceptions with which thought deals? Is time in itself an always-present property of the mind in the sense that it *is* categorical? To put it another way, can we for instance *alter* the experienced direction of time in the same manner that we alter the content of a concept when new facts are introduced convincingly? If we *cannot* change the direction of the temporal experiences it is because temporality is an irreducible property of the world and that perceptions and experiences mediate this. Indirectly, that is, in the contemplative mood we can actually recall how we have experienced the *flux* characterizing a world as changing alongside but not necessarily of being identical to our own “stream” of thoughtful awareness. We construct our everyday concepts of the world from this

particular local viewpoint, but on the other hand *we do not create* this point of view. Thus, experienced temporality intimately takes part in every thought, *it appears together with the act of thinking*, but is itself *not a product* of thought. We cannot possibly create what is the origin of our awareness of time. Ultimately our awareness of time must somehow be an element in that nature, which we are part of but which we try to distinguish ourselves from insofar as we are following our “realist commitments”.

Our awareness of time is *qualitative*, as are the experienced irreversible direction and other *dynamical aspects of time*. These are properties of experienced temporality that we cannot change. The aspects of a temporal mind must somehow have some “correspondence” to the “physical” world. However, such a “correspondence” can never be shown within the context of the Minkowski “world” or within any other non-temporal framework where events are reversible and exist in a non-transient fashion. The “block universe” explanatory frameworks exclude these qualitative temporal aspects as something which become properties of both an integrated “physical” and “psychological” reality. Perhaps one of the main metaphysical problems is that it has been taken for granted that symmetrical laws of nature are somehow fundamental to reality (and not merely to present physical thinking about reality), and that, from this peculiar framework, it has been attempted to explain time on the basis of this symmetry. Then one ultimately ends up with a “world” without a specified time direction. Nevertheless, these laws might apply to specific *isolated systems* in the laboratory and as such they might explain the reversal of processes of isolated systems as a “reversal of time”.

If we, for instance, turn to Reichenbach we cannot say that he managed to establish a connection between indeterminism and a dynamic view of time.²⁵⁹ But within his ontological and epistemological framework of positivism and verificationism, he did manage to give the issue of determinism versus indeterminism relevance by claiming that “becoming” is an attribute of the time of physical nature independently of human consciousness.²⁶⁰ It is interesting to note that in this paper we find that Reichenbach proposes a solution to the problem of the mind-dependence theory in relation to the concept of “becoming”. His claim is that there does not need to be any unique “now” for “becoming” in order to be an objective property of the world. That this might be the

²⁵⁹ H. Reichenbach, *The Direction of Time*, 1956, Los Angeles, and the “The Logical Foundations of Quantum Mechanics”, 1952 in his *Selected Writings, 1909-1953*, Dordrecht: Reidel, 1978.

²⁶⁰ Iain Martel to be found in a presentation to Philosophy of Time Society, 1999, in a paper calls this claim “Reichenbach on Indeterminism and Becoming”.

case is exemplified the fact that we can view thinking as a specific act, an event that occurs in time. It is obvious that our experiences always have a framework that is defined precisely for the subject as his or her “now”. Every experience has this necessary reference-point. This also means that every time I think, I simultaneously define my point of reference in time. To omit any reference to our “now” is in reality impossible because this involves a new act of thinking which again would define this particular “event” as being “now”.²⁶¹ Thus, we have the situation that this reference point also defines that the past is determined and that the future is undetermined since the locations in time are relative to the “now”. This expresses an *objective* connection, or as Reichenbach writes: “For it is a physical fact that, if A is the state defined by the act of speaking, then a state preceding A is determined with respect to A, while a state which follows is not.”²⁶²

That it is the “now” that divides past into *determined* and future into *undetermined* does not, in Reichenbach’s opinion, make the transition between the two temporal “locations”, or in other words “becoming”, any less *objective*. What is needed for “becoming” to be an objective or subject-independent property of reality “*an sich*”? For Grünbaum “becoming” is a meaningful notion only when we have realized that it is a “subjective effect” that was produced when a specific event was comprehended within the immediate awareness of the subject. For Reichenbach, on the other hand, “becoming” is based upon what is “*actual*” of a given time. And this rests upon what is knowable *at* a given time. This means that it is when an event becomes knowable or determinable *is* that it becomes “*actual*”.²⁶³ Thus, every event is marked by a “now” which is identical to the meaning that every event is “actual” when it is determinable because something is determinate always relative to a “now”.²⁶⁴ This view has reduced the metaphysical issue of the nature of time to a claim about the epistemological access that we have to past and future.

Nevertheless, there are problems connected to the understanding that sees a relationship between dynamic time as a subjective characteristic and as an objective characteristic of time. The most apparent problem is “reductionism”. The problem consists in the difficulty of locating properties within nature independently of man and which exhibits the typical characteristics of dynamic time. One suggestion is that the second law of thermodynamics is a fairly objective description of dynamical processes on a macroscopic level of

²⁶¹ Ibid.

²⁶² Reichenbach, 1952, p. 277, and here the quote is taken from Martel, 1999, p. 5.

²⁶³ Martel, 1999, p. 6.

²⁶⁴ Ibid.

nature. However, the irreversibility exposed by the increasing entropy of the environment is a physical concept. And the irreversibility in experienced temporality is something entirely different. They represent two quite different perspectives which include the application of concepts from different explanatory realms: The first is abstract and theoretical; the other is primitive and perceivable. Neither the thermodynamic time nor the experienced temporality can be successfully reduced to the other. The only thing we can claim is that our temporal experience is the most fundamental notion of the *nature* of time, which we have, as it is primitive or pre-scientific. Both, however, represent, so to speak, two intelligible poles of time that are restricted to the limits of real world truth. That is to say that one should perhaps not dismiss the concept of physical time altogether just because it cannot explain experienced time, as this was never intended in the first place. But then again one cannot dismiss the reality of temporal direction in experience either. Nor can one dismiss the reality of time in an external or subject-independent world. Thus, one is faced with different levels of nature and with different explanatory levels. As Eddington has said, *time* is given to us twice, and this *must be the same time*. In other words, this simply means that one “time” belongs to the spiritual side of our nature, the other to our physical. And the key metaphysical problem is to bridge the two temporal series without dismissing either of them. To do this one would have to have all kinds of different theories from all kinds of different disciplines that are all based on entropic theories, and that can explain all the macroscopic asymmetric phenomena of the world. This demands a study of entropic, or better, *irreversible* phenomena on all levels of nature, and this would include joint efforts from neuro-scientists, biologists, psychologists, physicists as well as philosophers.

However, what can be said *philosophically* about the *linkage* between external time (physical time) and the internal time of mind? It should be obvious that it is not reduction that one should seek but instead a synthesis of those natural phenomena, which have been divided into different epistemological explanatory levels in the science of nature. Thus a logical order would be common to all of them. In this sense we would see an ontology of time with a unified nature at all explanatory levels be implemented, but this does not mean the same as that the epistemological problem of time has been solved. The explanatory epistemologies may best be served with a plurality of times because time is made to fit the framework in which the intelligibility of the thing explained depends upon the peculiarity of the concepts with which it is explained. However, unification in ontology would yield an *objective* direction of time. The investigation of a relationship between experienced time-direction and entropy in physics

would necessarily need other theoretical sources than the experiential and the physical ones. Without the other fields of investigation connecting different explanatory levels there will never be a relation, but only the known gap, that fuels physical theories with the notion of the mind-dependency of becoming.

At least we know that the distinctions between “now”, “future” and “past” as well as the distinctions between “earlier” and “later” are of greatest importance to human cognition and comprehension of the world. We cannot imagine what things would look like without these temporal distinctions. Nor can we imagine what the *world* would look like without a time that is inherent in it? That is to say, what would the world look like *without* a time that is identifiable and determinable as a property of empirical nature? From a positive perspective this could mean that time is *identical* to that which differentiates among things and their processes of change and which occurs whether the changes are perceived or not, since things always seem to have changed *between* the moments of perception?

As in the case of measurement, relativity physics cannot escape the fact of subjectivity; neither can relativity physics escape the possibility of “becoming”, “passage” or “transitivity” as true characteristics of the temporal *world*.

STR sees, for instance, events as *successive*. An event has a duration that may be imagined as a “movement” along the axis of the space-time diagram. The duration of the event is in this case superimposed upon the four-dimensional world. This shows how difficult it may be to exclude any reference to the experience of transience imbedded in human experience, especially because we wish to describe the temporality, in which we intuitively “know” that the physical world evolves. The idea of a “movement” of light implicates transience and thus shows that the idea cannot be eliminated, it is re-introduced into the picture we already have of time. Making time a fourth dimension does not “eliminate” becoming and the passage of time from reality. It does not exclude unidirectional time. If no direction can be fixed, no description and explanation of events would be possible. Events cannot simply be in a static and crystallized universe of four dimensions, they must occur, or become, and they must somehow change. And then the direction of time is not “indifferent” to nature. There must be a “preference” of temporal direction in nature itself. Anyone who attempts a segregation of temporal aspects, especially where the “static” is preferable and the “dynamic” is dismissed, will end up in an absurd world where ones concepts of the “real” can, in no way, coincide with the concepts with which ones own life is being controlled. In the words of Lotze, “We

must either admit Becoming or else explain the becoming of an unreal appearance of Becoming.”²⁶⁵

Thus, in the next chapter we are going to focus on an interesting suggestion made by physicist Henry Stapp. He proceeds from the theoretical context of STR, but instead of repeating Einstein’s omissions, he looks for possible models of the world that might substitute the Minkowski “world”. Thus, he aims at a model of the world which includes the concepts of becoming and which is not observer dependent. The assumption is that if the theory is not “observer independent”, the theory cannot be defended against the mind-dependence theory of time. The claim is that by pursuing a line of argument which proposes that “becoming” and the “flow of time” is real properties of the world independent of any observer, this would not only underline but also establish the objective ground on which our temporal experiences stand. However, as we shall see later on this line of approach, attractive as it may seem, has severe problems attached to it.

Important to Stapp is *his* experience of the world. The experience tells him, as a physicist, that there is another time which is not identical to the time which is measured by clocks and that enters the equations of physics. In Stapp’s mind the time we have seen represented by relativity is not the only kind of time. There is more than one time, namely, a time inherent in all processes, that is, “process time”. With this idea Stapp has introduced what he finds the most significant characterization of this kind of process time, namely, “becoming”. But this kind of “becoming” is not as in the case of macroscopic events an observable kind of time. If it was it would be identical to the time of relativity theory, that is, it could be compared to other temporal processes and thus be defined as a moment along the time-parameter, that is, as “clock-time”. This could also be a “time” that would easily be identified as analogous to experienced temporality and thus be in danger to be rejected as an “anthropomorphic prejudice”. However, Stapp attempts to transcend both the ontological and the conventional epistemological restrictions based on the idea of what the nature of time is like and what is implicit in STR. Even physical time must be something more than just clocks, measurement and causality.

An interesting element in Stapp’s thinking is that he does not try to reduce experienced temporality. However, problems arise when he proceeds to account for becoming without including subjectivity. The reason for the problems is that when he wishes to turn a concept like

²⁶⁵ Quoted from G.J. Whitrow, 1980, *The Natural Philosophy of Time*, p. 370.

“becoming” into a physical concept, that is, by not mentioning the mind-part, he excludes the source of his own knowledge of that transience which he finds is characteristic of the world. This means that he has excluded the same “source” that gives meaning to the concept of transience and to becoming.

6

Becoming

We shall now return to the problems of the concept of “becoming”. I begin, as mentioned, with the “metaphysics of physics” by Henry Stapp, that is, with his views on physical time in relation to the concept of “becoming”. In order to understand thoroughly the concept of “becoming” we have to investigate several problems concerning the relation between time and human mind; between becoming, time in its various representations and human cognition of reality. The first aspect is “reversibility”; the second is “irreversibility”.

Another important aspect is, of course, the notion of inadequate human cognition known as “course-graining”. This is the view that when “time” *can* be described as “irreversible” it has become experienceable by human beings. This is to say that “irreversible time” has emerged and thus is nothing but a contingent feature of mind-dependent “reality”. In fact, this “emergent” kind of irreversible time is viewed as nothing less than subjectively based “mind-spinning”, as irreversible time emerges with the human observer.

To explain this view on time, mind and reality I will argue that the real issue here is the presupposed “disjunction”, or “division”, or an assumed ontologically based separation of *mind* and *matter*. In this ontology we have to assume that some kind of immanent principle exists, which somehow, in reality has a “priority” or “preference” for a “static time” that orders matter on the microscopic scale and eternal matters of fact in the realm of ideas. The “preference” is exemplified by many philosophers who argue “static” time is the objective kind of time. This is seen as the kind of time that is “underlying” temporal experience, a time to which one can reduce temporal experience if one wishes to, or simply takes it as a reason to eliminate it.

A further problem related to the thinking of those within physics, who would like to see “becoming” introduced, is represented by the view of Stapp: That the schemata of temporal order, usually being applied in order to explain the process, is the B-series’ relations. These B-series’ relations are the preferred series by every metaphysicist who has a preference for the block universe view. This brings in the broader scope of the philosophical discussion about nature of time on a representational level, namely the discussion about temporal orders in relation to a comprehensible concept of “becoming”, whether it is to be applied within physics or not.

To have a representation of true *time* we must have a co-representation of temporal orders. It is the view that both the A-series and the B-series are needed in a co-reporting of any event. This indicates that time has to be represented not only as “relational” but also as a “process”.

Furthermore, we have to address the issue of the unwarranted identification of “becoming” with “entropy”. Thus, I am against the view of Grünbaum that wants to reduce experienced temporality to entropy. Although there is a relation between the phenomena that are described by the laws of entropy and time, there are insurmountable problems contained in the oversimplified identification of entropy with time.

6.1. Stapp on Time

First we have to return to a previous argument. In our argument related to STR we saw that it became difficult to keep up any defense for a “static” view of time as a representation of real-world time, both for epistemological and ontological reasons.

The *epistemological* reason is that the dynamical aspect of temporal experience cannot be excluded because the presence of the observer is necessary. It is necessary since it is the content of observations that determines the meaning of time in physics. However, those who defend the idea of “static” time will not agree with me. It should be noted though we, of course, are referring to two different world-pictures, or perhaps that we are ultimately committed to different metaphysics, a difference that transcends any possibility for an epistemological solution. However, what kind of metaphysical foundation one commits to is always of importance. I will therefore give some further arguments to show that when only one non-temporal “time” series is preferred - where the other qualitative one is “eliminated” or “subsumed” – this can only be a *biased* view. However, its foundation is based upon a Platonism of sorts, that is, a kind of Platonism that has been bent into a type of dualistic *naturalism*. Thus, we also get the opportunity to see how Stapp’s philosophical position, concerning time on the representational level, can be interpreted in relation to the theoretical context of both dynamic and static time.

The *ontological* reason mentioned above, is the spreading of a light front in space as a dynamic process that takes time in the real world. It is the wave function of quantum theory and the propagation of light that Stapp has as his starting point, when he begins to explore the problematic S-matrix as a possible solution that opens up to an

understanding of “becoming” as a characteristic of the *physical* side of reality.

However, Stapp does not radically re-interpret the physical concept of time; he accepts its basic tenants but is of the opinion that the concept is in need of a new time-dimension in addition to the 3+1 dimensions of relativity.²⁶⁶ Thus, his aim is to establish a connection between what he calls “Einstein-time” and “process-time”. In Stapp’s opinion process time is the temporality which is characteristic of a process where a fixed and settled thing becomes, that is, *formed* by a gradual accumulation of new attributes’ properties and features. Einstein’s time is the time that is part of the geometry of space-time continuum of contemporary physics. It is concerned with the content of measurements.²⁶⁷

Stapp is rather critical about the limitations on time the way they are introduced into physics. It is because the “limitations” that are put on time become an *exclusion* of process and becoming. Einstein-time does not mention processes whatsoever. It does not say anything about what constitutes a process in Stapp’s opinion, namely that of the “before” and “after” relations. And here we are confronted with the first problem, and which I will return to shortly. However, the before and after (or earlier than and later than) are necessary constituents of every observation of events in space. Although Einstein introduced time through the observer he omitted any use of the “subjective” categories that relate events. Stapp says that one cannot determine whether or not the data from one observation comes before or after the data from another observation. There is no established connection between the two that ultimately would refer to specific “processes” taking place; whether it is between events or observations of different events. The time that is introduced with the content of observations does not reveal anything about the order in which they ought to appear, or “become fixed and settled”, as Stapp says.²⁶⁸ Therefore one cannot distinguish between the notion that everything becomes fixed and settled all at once or if there is some implicate order in which things occur in an ordered way. Einstein simply “banished” all talk of process from physical theory.

What facilitated such a development in Einstein’s thinking was his affection for the deterministic laws of nature, that is, for the *deterministically expressed* laws of nature. These laws are necessarily “symmetric” and “static” in the sense that to time there is *no preferred*

²⁶⁶ Stapp believes that it is possible to fathom a fifth dimension in the sense that becoming can be the fifth dimension “on top” of the four of relativity.

²⁶⁷ Henry P. Stapp, “Einstein Time and Process Time”, in D. Griffin, ed., 1986: 264.

²⁶⁸ *Ibid.*

direction and, more generally, that they exclude a *process* as such: Where these laws rule everything comes fixed and settled from the hands of the Creator. Therefore, the basic assumption is that there is no process taking place in the universe, and likewise no mentioning of process in Einstein's theory.

According to Stapp it was only when quantum theory introduced "indeterminism" that a theoretical physical *context* was established which opened up for the idea of process on the conceptual level.²⁶⁹ Whether this "inclusion of process" is legitimate or not in the quantum theoretical context hinges upon one's metaphysical/epistemological attitude towards quantum theory itself. Niels Bohr, for one, omitted process for some very particular reasons. First of all, because of his "very conditions"²⁷⁰ that he could only think of as belonging exclusively to the formalism of the theory and not in any aspect as being something that exists in reality. Secondly, because of the limitation on objectivity for a quantum description he abandoned realism and became, if not a nominalist,²⁷¹ then somebody, I believe, who could distinguish between reality on the one hand and theoretical constructions on the other. Thus, he was one who was perhaps able to fathom that theoretical formalism does not necessarily have to be something that is *real* even if it seems true on paper. So in Bohr's eyes a quantum-mechanical description was nothing but some specified rules whereby one could calculate and thus obtain some results about what one could expect to find if they were observed. Of course this epistemological attitude that Bohr adopted was a result of the controversy between him and Einstein, not to forget the EPR²⁷² critique of his Solvay paper about the measurement problem.²⁷³

Nevertheless, says Stapp, there is one characteristic feature that permits process to enter the arena of quantum mechanics, so that it "should be formulated as a theory of process."²⁷⁴ This is the "wave

²⁶⁹ Ibid.

²⁷⁰ "The very conditions which define the possible types of predictions regarding the future behavior of the system": N. Bohr, 1935, Can Quantum Mechanical Description of Physical Reality Be Considered Complete? *Physical Review*, 48:696-702.

²⁷¹ See Peder Voetmann Christiansen's paper "Peirce as Participant in the Bohr-Einstein Discussion", in *Charles S. Peirce and the Philosophy of Science*, Edward C. Moore, ed., 1993: 223-232.

²⁷² Einstein, Podolsky and Rosen's paper (1935) with the same title as Bohr's 1935 reply.

²⁷³ P. V. Christiansen (1993) says that the "idea of EPR is to show that quantum mechanics is incomplete because, for some special situations, it violates the principles of local realism (Einstein locality). Bohr, however, was not interested in replying to, or simply rejecting, the claim that one should conform to Einstein locality, on the other hand, what he did want to reject was Einstein's conception of realism."

²⁷⁴ Stapp, in Griffin, ed., 1986: 264.

function” of quantum theory. With the wave function one can interpret the theory as representing “tendencies” for actual events to occur. In this respect the wave function can be compared to the entropic trend, which is to say that irreversible processes in nature on all levels seem to be the thorough-going trend. But in order to arrive at a conception of quantum mechanics, as a theory of process, Stapp had to clear away many obstacles. The first one is, of course, the disjunction between the different levels of explanation. The disjunction is the one between the macro and micro levels in physics, the one between many atoms and molecules which goes on within one atom. The problem consists of a subjective element that has entered the explanatory level of microphysics. It seems impossible to describe any empirical content on this level without referring to an observer. The problem consisted in the belief that observational conditions, which were believed to belong solely to humans, were projected on the empirical content. This was believed to happen in such a way that the observer would not be able to see the “thing-in-itself”(noumenon) but only the “thing-as-only-he-sees-it”, that is, “phenomenally”, as something believed only to take place in the mind of the observer. So instead of describing empirical *givens* we describe the empirical content of *our observations*. However, this did not constitute a problem as long as one was able to believe that physics should only deal directly with “things” that human thinking could know. This rested, of course, upon the problem that one could not relate the 3 space dimensions of classical physics with the 3n dimensions of quantum structure, or vice versa.²⁷⁵

But a much more severe problem is that of the different approach to a direction of time. Stapp refers to the problem of a direction of time by saying that, “the identification of the “actual events” appeared to require the notion of irreversible processes, and this notion seemed ill defined on a fundamental level.”²⁷⁶ With this Stapp is referring to the debate within physics and the philosophy of physics. This was prompted by Sadi Carnot’s 1824 work *Réflexiones sur la puissance motrice du feu*. In this work we find a specific *principle*, which Rudolph Clausius restated as the concept of *entropy*. Along with entropy came the notion that, at a fundamental level in nature, there is a development that has only one direction along the time parameter, that these are irreversible processes. Since then the debate has become fierce, and today it is still one of the most important debates which

²⁷⁵ Ibid.

²⁷⁶ Ibid. p. 265.

concerns the issue of time not only in physics but time on all levels of *nature*.²⁷⁷

The problem is a classical philosophical problem and involves both metaphysical and epistemological components – one typical *joint* component being especially that of the *reversibility* or *irreversibility* of time.

6.1.1. Reversibility

We must start by clarifying how we shall understand the notion of reversibility in physics. First of all, the notion of time reversal has to do with symmetry, so what we are talking about is *time reversal symmetry*. This can be described – as L. Sklar does – in the following way:

If a system prepared in state $S(0)$ evolves under the dynamical laws to a system in state $S(t)$ at time t , then a system started in state $T(S(t))$, the “time reversed” final state of the original system, will, governed by the same dynamical laws, evolve in time t to a state, $T(S(0))$, the time reverse of the initial state of the original system.²⁷⁸

What we are talking about here is symmetry *in* time, not – as it is often claimed when the term “temporally symmetric” is used to describe the processes – a symmetry *of* time. This is to say, it is not time itself which is symmetric but only some very particular micro processes that behave symmetrically. An important factor here is that these particles behave symmetrically only if we understand them as a “closed system”, which does not *interact* with other particles and thus escapes real-world dissipation, for instance by friction. If they were to interact with other “systems”, which would mean that they were “open systems”, dissipation would have to occur and we would have a process that would be *irreversible*. Irreversibility is found in familiar processes, the ones for instance that we can experience. However, a physical “process” is time-symmetric, that is, in principle “reversible”, only in

²⁷⁷ Many books discuss the development of entropy and its relationship to time, to mention a few: G. J. Whitrow, 1980, *The Natural Philosophy of Time*; R. Lestienne, 1990, *The Children of Time*; L. Sklar, 1993, *Physics and Chance*; H. Price, 1996, *Time's Arrow and Archimedes' point*; I. Prigogine, 1997, *The End of Certainty*; I. Prigogine, 1980, *From Being To Becoming*.

²⁷⁸ Lawrence Sklar, 1998, *Physics and Chance*, Cambridge University Press, p. 247.

the sense that it is a mathematical formulation or an “equation of motion” that will remain unchanged if the mathematical component “ t ” was to be replaced with “ $-t$ ”. This is to say that if we could perform the theoretical operation of a “time reversal” we would either get a symmetric equation of motion or an asymmetric equation of motion. But the equation would be time-symmetric and reversible if it did not change when we exchanged the time parameter t by $-t$.²⁷⁹

How can we visualize this symmetry? Auyang has proposed the following:

Imagine seeing a brief segment of a movie of two billiard balls approaching each other, colliding, then separating. The process is temporally symmetric; if the movie is run backward; we see a similar process with the velocities of the balls reversed.”²⁸⁰

What we see are two balls that are approaching each other and colliding and separating. Then we run the film backwards and we see...two balls approaching each other and colliding and separating. This is what symmetry would be like if it was *imagined*. But how does this symmetry originate? Clearly not from our perception of temporal events or our experience of temporality? Imagination? Or perhaps some kind of empirical data that otherwise escapes our normal experience? Or is it perhaps a grand metaphysical idea that has proven useful to the development and application of mathematical science? What originates the idea of reversibility?

The problem, which we are facing, has many aspects. First we have the notion of different times. That there exists one mode of time that is described by statistical mechanics, a time that is identical to the “time reversal” of the theoretical “closed system processes”. Next we have the macroscopic world that we experience and that can be described as consisting of open and interacting systems where the processes are irreversible *in* time. Both explanations claim that what we are actually dealing with here is the reversible or irreversible character of time. The single atom regarded as a closed system is taken as more fundamental, and the argument therefore goes in the direction of which time has fundamentally no preferred direction. Ultimately, the claim concludes that irreversibility must be subjective.

However, one can look upon these different “strata of reality” as different representations of objective processes and see that time is

²⁷⁹ Sunny Y. Auyang, 1998, *Foundations of Complex-System Theories*, Cambridge University Press, p. 317.

²⁸⁰ *Ibid.*

inherent in the process itself. This view eliminates, of course, the possibility of a substantive time. Although the problem is that when time is *identified* with the process itself, time is made secondary to the process – it is made process dependent, and thus all talk about the nature of time becomes nonsense. We have a fundamental time, or times, with no preferred direction, and we have all the other processes in the world, including our temporal experiences, that have a preferred direction in time. The question is: How is this possible?

First of all one tends to regard the hypothetical structure of temporal symmetry, that is, the scientific mathematical representation, as *descriptive* of a level of *nature*. Something that in fact still is a hypothesis. However, the philosophical interpretations often put more reality into the hypothesis than they should. For instance this is apparent where the tendency of gasses to reach thermal equilibrium is regarded coincidental. Hence, it is regarded as nothing more than a mere *tendency* and thus cannot be an *exceptionalness* law.²⁸¹ In many a physicist and philosopher's eye, as in Price's case, the dynamic laws are not global or universal. Probabilistic tendencies cannot meet the demand for a strict universality that, alas, shall be able to yield true predictions about future events. Thus time, Price insists, cannot be anisotropic or asymmetric on a fundamental level since asymmetry is only connected to dynamics through the Second Law of Thermodynamics while the remaining laws are isotropic or symmetric. It is only the second law of thermodynamics, the only law expressing irreversibility in physics, which is assumed not to yield strict universality, only tendencies and probabilities. Of course this is the old discussion about the ontology of time. It is the old and familiar battle between opposing world-pictures and opposing metaphysical commitments. However, it is a problem if one denies entropy, like Huw Price does, because we cannot say that the entropy of the universe is not increasing, since local irreversible process causes such an increase.²⁸² Interestingly enough, Whitrow claims that these local tendencies are in fact the "objective temporal trend in the physical universe."²⁸³

If we consider the microscopic *scheme* we have no preferred direction of time, but we have a coexistence of different time directions. What in fact determines this view where time is *symmetrical* is the impact and fundamental status that the symmetrical laws of physics have within the diverse epistemological structures of physical theory-

²⁸¹ See Huw Price, 1998, "Chaos Theory and the Difference between Past and Future", in *Time, Order, Chaos, The Study of Time IX*, eds. Fraser, Soulsby, Argyros. pp. 157-159.

²⁸² Whitrow, 1980, *The Natural Philosophy of Time*, p. 7.

²⁸³ Ibid.

building. On a “fundamental” level there are only the “weak” short-range nuclear interactions that are believed to give some indication as to a preferred direction of time.²⁸⁴ Everything else only indicates that there is no preferred direction, only coexistence of directions. However, this idea hinges upon the hypothetical nature of scientific explanation; this is to say that there is nothing else to ground this idea of reversals than the *possibility* of such reversals. Thus, the reversals may or may not “exist”. The fact is that we can imagine such “reversals” and/or “coexistence of directions” that furthermore are corresponding to the theoretical structure of the symmetrical “laws” and that, given this symmetry, yield a universal structure in which we can describe things. It is a mere hypothetical “existence”. We cannot empirically observe any “reversal” of time. We cannot even observe *reversals* of processes, only *new* processes because they are structured accordingly in time. However, if it is still claimed that it is a *reversal of time* that we deal with as something taking place in reality, we can only refute it by claiming that it is nothing but a mere hypothetical possibility. It is a hypothesis that is justified by its usefulness in epistemology and by the metaphysical “reality”-status, which has become so characteristic of the asymmetrical laws of fundamental physics. It is thus difficult to grasp a meaning in statements where, for instance, a *reversal* of the order *in* time is to be identical with a reversal *of* time. It seems meaningless as we can only say that the “real-world order of time” is “symbolically identical”, or “perfectly analogous” to phenomena like “water always runs downhill” and to processes like “the heat is flowing from hot to cooler bodies”. However, the identification of time with processes is difficult, and even more so when we consider them to be part of a reversal *of* time.

This would also mean that the order of “before” and “after” would be reversed, and that the process taking place in time is not only understood to be “reversed”. If it would be a reversal of *all* the events taking place *in* time, then our *perception* should also be reversed, since our perception is not only structured in time but includes, as a fundamental order structure, an experience that is *of* time. If it only is one singular microscopic event, we can only *imagine* that it *reverses* in time, because “as the whole process occurs in the minutest fraction of a second, the time reversal would only be microscopic and would not be observable on the macroscopic scale.”²⁸⁵

The previous argument is intended to exemplify the difficulties involved in the empirical and cognitive act of spotting and thereafter describing exactly *what* is “reversed”. Is it *time* that is reversed or is it

²⁸⁴ See Whitrow, 1980: 355; Sunny Y. Auyang, 1998: 318; L. Sklar, 1988: 248.

²⁸⁵ E. E. Harris, 1988: 54.

the order of events taking place *in* time? If the latter -- only irreversibility of time remains. That is, if it is the order of events taking place in time that is only reversed, then it is not time that is reversed, *because when we reverse the order of events we do not reverse the order of time*. So in order to keep some soberness we should only state that on the microscopic level time direction is most probably irreversible but appears chaotic, and that asymmetrical time order arises at each moment because the longer-lived particles, like electrons and protons, preponderate.²⁸⁶ Thus, we have to admit that laws, intended to indicate the tendency of nature in regard to the fundamental forces and the behavior to “elementary” particles, cannot create the basis of the irreversible nature of time. Therefore, we should be aware of the metaphysical problems that arise when using a term such as “elementary” about particles. The term “elementary” suggests an independence from a context that cannot be true of real systems of particles, because the real context would not be an isolated system. The notion of “isolated system” is an idealization obtainable only within the given context of theoretical formalism. This confusion can, of course, lead to another and more serious confusion, namely, the one where one mistakenly identifies theoretical abstractions with the concrete *reality*, or simply accepts these idealizations as *concrete* reality. Nevertheless, in *physics* a “fundamental” basis can only be developed from an understanding of the behavior of observable “open-systems”, that is, from the necessary interaction (fluctuation and dissipation) in and between systems consisting of many particles.²⁸⁷ To consider many particle systems as the fundament in physics where one can base the idea of irreversible time means that we cannot escape the cognitive-temporal role of the observer.

Generally speaking, any observation is an irreversible process, as Brillouin has stated.²⁸⁸ When we perform an observation, that is, always when we interact with our world, an increase of entropy of the environment is the result. This is regarded as a *limitation* upon physical measurements. Nevertheless, since measurement involves an observer, one tends to assume that measurements cannot be employed to derive an intersubjective time sequence of phenomena.²⁸⁹ The truth is that one cannot derive time from measurements, what happens to be the case is that it is the local time of the observer, which always is the starting point of any investigation of time, which is extended to more general or global meanings. This is the only way to establish a global

²⁸⁶ Ibid.

²⁸⁷ Whitrow, 1980: 336. (*Italics added*).

²⁸⁸ L. Brillouin, 1962, *Science and Information Theory*, Academic Press Inc., p. 231.

²⁸⁹ Whitrow, 1980: 338.

direction for time. Nevertheless, the assumption that we cannot proceed in this manner is based upon the notion that it is us, the human beings in the world, who bring irreversibility on to the stage, in the sense that we re-create it for circumstances that in “reality” is devoid of properties like this. Every attempt, by which we claim “becoming” to be a real property of the world, or for that matter, of denying it, has always a *necessary* reference to our own temporality. To express “becoming”, or to express the static alternative and the denial of “becoming”, is impossible without the presupposition of the specific fundamental temporal structures of present, past and future *together* with the structures of being “earlier than”, “simultaneous with” or “later than” in time.

The idea of a “reversibility” of time can only be understood as a context-dependent *theoretical* device which facilitates physical calculations that follow the beliefs that “fundamental reality” cannot resemble anything of what we experience it to be. This means that its nature is often taken to be quite the opposite of what we experience, and as such it is believed to be more in accordance with the non-temporalism exposed in the deterministically expressed laws of physics.²⁹⁰ It is difficult to discover time on this level, especially a time that we cannot recognize. What *time* might have in common with these particle constituents of the atom, understood to be a “closed system”, is perhaps that we impose certain rules in order to coordinate statements about empirical metrical relations between events of everyday life and science.²⁹¹ On the “fundamental” level of reality we talk as if this peculiar “time” is part of the *content of the world*. We do this rather than keeping to the original reason why it was introduced, namely as a *metrical framework*.²⁹²

6.1.2. Irreversibility

How are we to understand the irreversibility in physical nature? We have seen that time reversal yields no difference of phenomena. If we play the film of the balls colliding and then play it in reverse, we will

²⁹⁰ The problem of non-temporalism in relation to deterministically *expressed* laws of nature will be discussed in Chapter 7.

²⁹¹ Wilfrid Sellars, “Time and the World Order”, in H. Feigl and G. Maxwell eds., 1962, *Scientific Explanation, Space, and Time. Minnesota Studies in the Philosophy of Science, vol. III*. University of Minnesota Press, Minneapolis, pp. 551-552.

²⁹² *Ibid.*

see the same sequence repeated exactly the same way in both cases. Irreversibility, on the other hand, changes this picture. Because if we try to reverse the phenomenon we would not see the same sequence repeated, but the original sequence played backwards, i.e. a cup of coffee that hits the floor and breaks. If we reverse this film we would see the cup put together of bits and pieces, flying up on to the table again. If we were to reverse the original sequence we would have two different sequences. We would not have identical sequences as in the case of symmetric phenomena. This means that asymmetry and irreversibility have a dynamic rule that *changes* under time reversal. This feature is clearly the one that we relate to *through* our everyday experience.

Irreversibility is characteristic of macroscopic phenomena. The difference of ontology between different physical explanations, that is, between phenomena that are *assumed* to behave symmetrically and phenomena that are *experienced* to behave asymmetrically, means that a breaking up of the understanding is unavoidable. Hence, a connection between time-reversal symmetric laws and thermodynamic processes is impossible, which again shows that one has to choose between ontologies.

As we saw in the example of the coffee cup, macroscopic rules, which govern the evolution of macrostates, are not symmetric under an imagined time *reversal*. However it is assumed that the definition of entropy connects macro- and microphysics. In the spirit of Planck's *Treatise on Thermodynamics* the definition can be understood in the sense that there exists in nature a "something", to which the subjective mind ascribes a quantity and which always changes in the same way in all natural processes.²⁹³ This suggests, however, a homogeneous type of change and not the heterogeneous one that is so typical of experience and real physical processes - like the one we know as *aging*. Having the same score of years does not mean the same as having aged equally. Aging is an objective process that is connected to *individuals*, which means that "aging" is a *local* process. To be 80 years old does not mean that all people at 80 have aged equally. We tend to forget that we interact with our surroundings and thus are exposed to "noise" like "illnesses" and so forth. This interaction is highly influential on the wearing down of our bodies and psyches. The homogenous rate of change that enables us to more or less "accurately" determinate the age of people is only apparent. It appears together with our notions of measurement. Change itself does not come as an even flow, but as an

²⁹³ See I. Prigogine, 1997, *The End of Certainty*, The Free Press, p. 25.

interrupted flow, a flowing that is uneven in its nature, that is, where leaps take place from one state of being to another state of being.

However, we have to express the distinction between the views that claim “reversibility” or “irreversibility” on the fundamental level of nature, and this can be achieved by taking a look at the scientific-philosophical work of Prigogine. But in order to appreciate Prigogine’s view on “time”, we first have to distinguish between two possible interpretations of Prigogine’s thinking. At the core of the interpretations is, of course, our theme, that is, the *chasm* between experienced temporality and “objective” time in physics.

The first interpretation gives us a viewpoint that refuses to deal with any “revision of the basic nature of natural science so as to allow it to include subjectivity among its data or to speak of any aspect of events that is not in principle observable.”²⁹⁴ Prigogine insists upon the significance of irreversible time at all levels of reality. It is from this basis that he sets off to develop a “post-classical” science. Time is central to Prigogine’s idea of a “post-classical” science. He says that there exist two cultures that treat time differently: a) the humanities and social sciences that are time oriented, and b) the classical science of nature that is *non-temporal*. Thus, we find that there is a cleavage between the humanities and natural sciences. And natural science is naturally taken to mean physics. Classical physics constitutes a set of views that can be taken together as expressions of one specific type of ontology and that is constitutive for any understanding of time that takes physics as the ultimate explanation of nature.²⁹⁵ But we also find, says Prigogine, that there has been established an anti-scientific metaphysics within the humanities and social sciences as a reaction to the view on time and the universe we find there.²⁹⁶

²⁹⁴ Griffin, 1986: 16.

²⁹⁵ In this respect we find that Prigogine is in agreement with Edmund Husserl, *The Crisis of European Sciences*, which describes this trend within science as “Galilean science”. Galilean science means a science that believes that reality is mathematical and that the mathematization of the world through the implementation of mathematics in physics has lead to a disclosing of the real nature of the universe. Included in this type of ontology we find relativity theory and even quantum mechanics. The style of thought presented here thinks of the world as separated between our perceptions, i.e. our common sense experiences, and the world as it is in scientific truth. This style of thought have a tendency to downgrade every non-scientific experience that is particular and characteristic of human everyday experience.

²⁹⁶ Herbert Marcuse in his critic of Husserl’s *Crisis* has also pointed this out. See Herbert Marcuse, “On Science and Phenomenology”, Cohen and Wartofsky, eds., 1965, *Boston Studies in the Philosophy of Science, Vol. II*. Humanities Press. Pp. 279-290. This does not mean that Husserl in any way is dismissing natural science; he merely wants to point out some very significant problems inherent in the scientific approach to the world, which

Nevertheless, the *non-temporal* universe that is described by the “Galilean science” is a universe that is in fact dead, where nothing becomes, a science that emphasizes deterministic processes and time-independent laws – the grand “tautology”.²⁹⁷ So the only solution to overcome this dualism is to establish a “post-classical” science, which is an enlarged science. Essential to such an enlarged science is the implementation of a new concept of time, but also a new concept of matter - a concept of “matter” that emphasizes the active and self-organizing tendency in nature. And thus we see that physical science can be about non-deterministic processes with intrinsic randomness. Thus, we find that Prigogine stresses that such randomness is not due to our coarse grained solutions, to our subjective ignorance of deterministic causes – for, in his view, only non-deterministic processes can be irreversible.²⁹⁸ Prigogine’s view is that the distinction between a microscopic physical level and a macroscopic physical level is not something that should be granted more importance than any other analytic compartmentalization of ontology. On a microscopic level there should also be irreversibility, at least to such an extent that the irreversibility on the macroscopic level becomes intelligible. Irreversibility cannot emerge from reversible processes.²⁹⁹ Thus, it is clear that Prigogine attempts to give scientific content and precision to philosophical speculation and human experience. And this is the base for Griffin’s first interpretation. The crucial question is as follows: Can human experience, as such, be used in order to establish the fundamental meaning and nature of time?³⁰⁰ Whitehead, Bergson and C.S. Pierce would say “yes”. Because the irreversibility we experience as part of a nature independent of mankind is accounted for by the postulate that processes that are analogous to human experiential processes compose it.

However, indications reveal that Prigogine thinks a post-classical science can grasp time and nature in the same manner as classical physics. That is to say, to gather knowledge about time and nature independently of the subjective mind – because subjectivity lies outside the domains of physical science. For example, he seems to explain³⁰¹ *our* experience of time from the fact that we are examples of highly unstable dynamic systems in which randomness and irreversibility

constitutes a problem about defining reality. Time is certainly a most important aspect that concerns this issue.

²⁹⁷ Griffin, 1986: 16.

²⁹⁸ *Ibid.*, p. 17.

²⁹⁹ *Ibid.* See also Prigogine, 1984: 16, 232, 258, 285, 288, 289 and 298.

³⁰⁰ Griffin, 1986: 17.

³⁰¹ I. Prigogine, “Irreversibility and Space-Time Structure”, in Griffin, ed., 1986: 232-250.

arise. And since time requires a minimum complexity he sometimes regards this as contingent rather than as a universal or global feature of the physical world.³⁰² His view also expresses that the unidirectionality of processes only is a tendency, and not a certified fact. Then, if the above interpretation of Prigogine's position is correct, he should be of the opinion that far-from-equilibrium processes provide the basis for a definition of temporality and time. If this is the case his position will suffer from the same paradoxes, which occur every time someone tries to define time in terms of physical processes.

However, the second interpretation is quite different, and I would state perhaps more in tune with how Prigogine himself looks upon the matter of physical time as contrasted with experienced temporality.³⁰³ Griffin says that this interpretation is based on Prigogine's statement that "the distinction between past and future is a primitive, i.e., prescientific, concept, which science must simply presuppose."³⁰⁴ *In this view it is not the task of science to provide a concept of time, however, it is science that has to become consistent with our primitive experience of time.*³⁰⁵ Then we see that irreversibility in nature must be consistent with the irreversibility in human nature and that physical theory must be directed towards this consistency. Thus, we also find that the move towards "becoming" would not be physical, but conceptual, and that it avoids making *time* and *irreversibility* in their synthesis *contingent*. The conceptual move signifies that we are not confined to a physical theory any longer in which simple, reversible systems have an autonomous and basic status within complicated systems. Instead we now have "a theory in which they become singular limiting cases of an asymmetrical model."³⁰⁶

Prigogine's view is that the laws of physics, as formulated in the traditional symmetric way, describe an *idealized*, stable world that is quite different from the unstable, evolving world in which we live. He claims that irreversibility has become discredited by those who emphasize entropy as the *increasing of disorder*. In his view, entropy is as much a source of order as of disorder. As R. Lestienne points out in this connection, the idea of identification between the irreversibility of increasing entropy and disorder is fairly recent. Lestienne writes: "Schrödinger proposed taking the inverse of the thermodynamic

³⁰² Prigogine, 1984: 16, 239, 251, 298, 301.

³⁰³ According to Griffin, 1986: 42, note 39, this is the interpretation that Isabelle Stengers claims is the correct one in a letter to Griffin. And so we should understand Prigogine's project in this way.

³⁰⁴ Griffin, 1986: 19. Prigogine, 1980, *From Being to Becoming*, p. 213.

³⁰⁵ Griffin, 1986: 19.

³⁰⁶ *Ibid.*

probability, or the opposite of entropy, as a measure of disorder. But parallelism is not identity; the identification of entropy and disorder was not acceptable.”³⁰⁷ Of these irreversible processes in nature, like in the case of evolution, we are not the creators but rather its children. Transient, unidirectional and irreversible time is a source of order. To exemplify this Prigogine directs our attention to the rather simple experiments of thermal diffusion where the difference in temperature between two containers shows a difference of the distribution of fast and slow molecules inside the two containers. Thus, we find that irreversible processes that are associated with unidirectional time are *real*. Furthermore, irreversible processes play a fundamental constructive role in nature.³⁰⁸ Nevertheless, it is not Prigogine’s intention to eliminate the notion of reversible processes from physics.³⁰⁹ That this cannot and should not be done is obvious from the fact that the application of existing dynamics has proven to be successful – as in the case of the hydrogen atom in quantum mechanics.³¹⁰ But this also has to include the irreversible processes, like heat conditions, where the asymmetry between past and future is obvious. Time is a *real* factor in *natural* processes. On the other hand, “time” is also a constructed factor in the theoretical schemata of physics. Time is therefore “something” which is primarily experienced but which is also “something” that is *found* in the differentiation of matter and in the distribution of matter. It is thus that we have to understand that our use of the irreversible time concept helps us to comprehend how nature achieves its most delicate and complex structures. Life could never exist in a static and equilibrium universe – a universe that in fact is dead.³¹¹

Perhaps the biggest epistemological problem that physics is faced with today is the gap between the dynamical description of quantum mechanics and the type of irreversible and evolutionary descriptions

³⁰⁷ Remy Lestienne, 1995: 120.

³⁰⁸ Prigogine, 1980: 213.

³⁰⁹ However, it should be made very clear that “reversibility is based in highly artificial, simplified situations”, as Griffin says about this aspect in Prigogine’s thought. Griffin continues, “Nature in the raw is not simple even at the most fundamental level, and in nature irreversibility is the rule, not the exception.” (Griffin, 1986: 18.), (I. Prigogine, 1984: 8, 9, 10f, 215f.) By “artificial” we should understand “abstract”. Hence, there is no true reversibility, not even in artificial, isolated conditions. This means that “artificial” systems are those systems that are “conceptually simplified to make them conform to the conceptual tools of a reversible dynamics.” (Griffin: 19.)

³¹⁰ This means that it is not “time” that is being reversed, but something else, as I have stated earlier on in this dissertation.

³¹¹ Prigogine, 1997: 26.

that are seen in relation with entropy.³¹² Why is that? The basic quantity is, as Stapp mentions, the wave function.³¹³ The Schrödinger equation describes the time evolution of the wave function, as a transformation of the wave function to another time. The fundamental idea, which operates in Schrödinger's construction of the equation, is to see "determinism" and "reversible time" as *realities* indirectly given to the physicist. It is the same confusion of "objectivity", "real" and "reality" which includes the negative of objective reality, namely "subjectivity", a confusion that is being repeated over and over again. This confusion is perhaps even clearer when Schrödinger ends up with a mixture of *two* wave functions, known as the famous "collapse" of the wave function. The problem, as Prigogine sees it, is that we have to move from potentialities described by the wave function to *actualities* that can be measured.³¹⁴ This would be the move from potentiality to actuality. The point being made here is for us to find the mechanisms that pinpoint the transition from potentiality to actuality. However, this is problematic if compared to the paradox that materializes in Schrödinger's *time-concept*, that is, where time is "reversible" and still "becomes". Strangely enough, the situation that Schrödinger's result became a "paradox" could also be attributed to *subjectivity*; that is, it was attributed to, or blamed on the inescapable "contingent" nature of human temporality. This is to say, that only the *transitive* aspect, the "becoming", is determined as "subjective", which certainly – and by some miracle, it does not include the highly abstracted and idealized "deterministic" and "time reversible" concepts constituted by the ontological context for the measurements. Why is it that nature is deterministic and symmetric on this level and only *become* asymmetric when we measure and observe the "phenomena"? It is therefore important *again* to consider the notions we find in physics and related philosophy of the *role* that subjectivity is said to *play* in the interface between matter and mind.

6.1.3. Coarse-graining

Indeed, as I have stressed from the beginning, time is experience-dependent. But it is also prior to experience. Time is the "object" of our

³¹² Ibid., p. 47.

³¹³ Ibid. See also H.P. Stapp, "Einstein Time and Process Time", D.R. Griffin (ed.), 1986: 264-265.

³¹⁴ Prigogine, 1997: 47.

experience. Hence, time cannot be a “fiction-like” *construction* in a fundamental sense. This is to say that all our *talk* of events that occur in time has its fundament in our experience *of* time that presupposes “something” that we intersubjectively can identify as *time*. Furthermore, everything *actual* consists of parts or units of experience. A plurality of such actualities exists necessarily, therefore time exists necessarily. Time is not a contingent emergent. This view is quite the opposite of those who defend a static view of the universe where “reality” is understood to be *non-temporal*. However, this static ontology has its basis in the before-mentioned metaphysics of reductionistic dualism. According to this latter view, experience, as far as it discloses a temporal order, is nothing but an illusion that magically appears at some point. The account for the emergence of temporality in scientific explanation of fundamental non-temporal reality is called “coarse-graining”.

These solutions are not created to give us an explanation of, or a justification for, the *real non-temporal nature of matter*. They are made up so that we can describe the experienced irreversibility of the familiar world as an *illusion*, as nothing but mere mind-spinning. Remarkably enough, it is not the assumed *hidden* non-temporal reality of the universe that one sets out to explain, but the fact that our experience runs contrary to this assumption! What then is this “coarse-graining” that is considered a “solution” to the paradox of emerging temporality in the measurement of non-temporal matter in physics? And what is “common sense” in this context? And is our experience of time part of this “common sense”?

To begin with the last question: What goes wrong between time and common sense? Well, we all know what Einstein thought, namely that “common sense is merely the deposit of prejudices laid down in the human mind before the age of eighteen.” But as I have been arguing from the beginning it is not that simple to ascribe time as such to our “common sense notions”, because it does not *originate* in our “common sense notions” even if it becomes a common sense “notion,” or better, a “primitive” time. The reason for this is very simple.

First of all, “common sense” is a cultural conditioning of certain opinions we have about the world. The “opinions” are a collection of notions and ideas that are essential in the sense that they constitute the cultural ideological framework of morality, history and worldview, which children are brought up to believe in; they are as such essential components of education. Time, on the other hand, does not belong to these ideas or notions. Time is part of what can be said to be the *sensus communis* of humanity and what we all inevitably presuppose in practice. The experienced asymmetry is thus not an invention of the human creativity, but is the relation of the present to the past that is

categorically different from its relation to the future. Therefore, time is a condition for any common sense notion as it is a condition for whatever idea our creativity is able to come up with. However, the “classical” notion that time merely is a subjective phenomenon, that it is confined to our minds and not of something that is in nature as well, is a well established notion within physical science. Take Gibbs and Feynman as examples. Gibbs thought that if we put some blue ink into a cup of water the medium would gradually become what appears to be homogeneous light blue. And this would apparently be an irreversible process. However, Gibbs, like Feynman, thought that if we could see each molecule in the medium we would recognize that the individual molecule kept its identity that in this microscopic “world”, the system remained heterogeneous as a whole.³¹⁵ This means that, according to Gibbs, our *sense organs* are the cause of the illusion of perceived irreversibility.³¹⁶ However, it is this “perceptual illusion” that Gibbs tries to tie to “coarse-graining”. It is our lack of knowledge or incomplete observation that causes us to see the world as moving in an irreversible direction. The problem of “coarse-graining” is related to a particular idea concerning the *role* of the observer. As long as there are observers, we have to consider subjective results. The observational *content* is believed to be *subjective*, not objective, because ultimately it does not conform to the fundamental deterministic and symmetrical laws of physics. Irreversibility is *not* believed to be *in nature*, but *in human beings*. Thus, the necessity of removing or reducing the subjective element associated with the observer. Perhaps this is not necessary.

First the obvious, namely that the fundamental laws of physics do not tell us everything about the world. This is especially important in relation to the content of observations of the observer. Without doubt these laws can be taken to be more real than our perceptions and thoughts. For, as Whitrow states, “in order to apply the laws to a given physical system, we must impose certain constraints. Laws indicate what is possible but not what actually occurs.”³¹⁷ Laws are hypothetical. Thus, we can again state that laws are, strictly speaking, theoretical entities, because laws are of a general nature and are thus applicable to many different systems. Laws are only made applicable to

³¹⁵ See for instance I. Prigogine, 1980: 12. See also the Feynman-quote in R. Lestienne, *The Children of Time*, p. 118.

³¹⁶ Gibbs seems to believe that sense organs can make judgements and determinations about what we perceive. A notion that clearly is wrong in the first place. What actually makes the judgement about the irreversibility, is exactly the same faculty as Gibbs uses in order to make the judgement about the heterogeneous nature of the microscopic mixture.

³¹⁷ Whitrow, 1980: 339.

a specific system when we know of the system's boundary conditions. Therefore, we can, with good reason, say that the non-temporal nature of the fundamental laws is merely a theoretical idealization without any tie to real-world reality, though its ties may be with possible or hypothetical realities, theoretically speaking.

The coarse-graining "solution" is not satisfactory because it implies that the universe is "dead", that it is a "place" where nothing happens, where there is no real becoming or transition, only the magic of the mind. As Wolfgang Pauli once wrote, "something only really happens when an observation is made, and in conjunction with that...entropy necessarily increases."³¹⁸ And yet Prigogine states, "between observations nothing at all happens. Still, the paper on which we write ages and becomes yellow, whether or not we observe it."³¹⁹ Perhaps we do not have to look for time in matter; maybe the time of mind will suffice, thus ignoring the Cartesian dualism that seems to prevail in those who want to reduce or eliminate the time of mind.

6.2. Problematic Becoming

Let us now return to the metaphysics of time illuminated in the before mentioned paper by the physicist Henry Stapp.³²⁰

As things stand I will not even try to go into the difficult matter of *quantum mechanics*. However I shall try to give some general characteristics of its different interpretations and thus include Stapp's definition of process on this basis, since it involves temporal notions of importance for the concept of irreversibility and dynamical time.

First, Stapp says that the S-matrix viewpoint excludes "any possibility of developing a quantum theory of process".³²¹ The reason for this is that quantum transitions from states in the past to states in the future omit the description of the process that is going on in between the two states of past and future.

Nevertheless, this S-matrix viewpoint has a further problem called the "infrared catastrophe". A technical formulation exists which says that the S-matrix only is well defined mathematically when light is ignored. The problem is that we really cannot ignore light in the

³¹⁸ Quoted from Prigogine, 1997: 49.

³¹⁹ Ibid.

³²⁰ H.P. Stapp, "Einstein Time and Process Time", in D.R. Griffin (ed.), 1986.

³²¹ Ibid., p. 266.

description of the world. Light enters observations and is even responsible for the binding together of the observational objects themselves.³²²

However, according to Stapp, one can find a solution to this problem. Furthermore, the solution provides Stapp with the basis for a formulation of process in quantum theory. The solution is that a well-defined classical part exists when one considers the emission of light by matter. And the classical part is a function defined by the four-dimensional space-time continuum. It is here that light is brought into the S-matrix formulation, and furthermore, light brings into the S-matrix as “an *exact* classical level of description coordinated to the ordinary four-dimensional space-time continuum of the theory of relativity.”³²³ And then Stapp formulates his process idea: “Process is considered to consist of a well-ordered sequence of actual events.”³²⁴ However, I will omit the technicalities and go straight to the core of interest. Because now Stapp says that:

The process formulation of quantum theory contains no explicit dependence on human observers: it allows quantum theory to be regarded as a theory describing the actual unfolding or development of the universe itself, rather than merely a tool by which scientists can, under special conditions, form expectations about their observations.³²⁵

Stapp obviously believes that he is giving an account of a time that is objectively real, that is, ontologically, so in a sense that “objectivity” means a description of existing entities, which are independent of human cognition and perception, i.e., without “the dependence of human observers”. Thus, he coins his notion of objectivity to that of Einstein and does not see that he claims a peculiar kind of objectivity that only has a restricted epistemological sense. We should notice that Stapp believes time -- in the physical *description* -- is *independent* of human perception and *cognition*. Stapp believes that he has omitted subjectivity, which he of course had not. To strengthen his distance to subjectivity Stapp introduces his idea of “becoming as a fifth dimension”. The four other ones are the three space coordinates and the one time coordinate of relativity theory. Stapp writes: “We have, therefore, neither becoming in three-dimensional space nor being in the

³²² Ibid.

³²³ Ibid.

³²⁴ Ibid.

³²⁵ Ibid., p. 267.

four-dimensional world, but rather becoming in the four-dimensional world”.³²⁶ Stapp’s notion of becoming as a fifth-dimension is taken to signify a formation of a sequence of before and after that is utterly distinct from the before and after of physical time.³²⁷ Miller writes: “Stapp’s interpretation of quantum theory posits a single sequence of events in a well-ordered process time or order of becoming”.³²⁸ This indicates that each process event (event in the fifth-dimension) restricts the tendencies of all space-time, which is to say that it does not respect the spatiotemporal contiguity and from minus to plus infinity in physical time. However, the process event determines the actual properties of a particular bounded region of space-time. This means that the order of actualization need not observe a one-way flow in physical time.³²⁹ Miller writes: “If event *B* is later than event *A* in physical time, it might nevertheless be the case that in the order of becoming or process time, *A* was actual later than *B*.”³³⁰

Now we have to consider some of the notions connected to certain philosophical aspects of time, which Stapp operates with in his exposition of quantum processes. First we have to consider Einstein’s STR – some possible interpretations of it in relationship to Stapp’s thinking.

A *philosophical* interpretation of Einstein’s *physical* work is not a straightforward task for anyone to embark upon. It does not make the task any simpler that Einstein made many ambiguous statements about the philosophical implications of his theory on the issue of the nature of time. As scientists and philosophers, we all have our beliefs, notions and opinions, which we form into assumptions about what it is that constitutes the world. These assumptions are, in some cases, more or less *reasoned* beliefs that temporarily qualify as knowledge in some specific scientific context. Others are “primitive” in the sense of being intuitive or they could simply be more *speculative*. Nevertheless, both the “primitive” and “speculative” ones are fundamental to our orientation and endeavor to achieve knowledge about the world. We find our *concepts* as an integral property of this realm of orientation, as products of the interactive operations of the primitive and the speculative. The concepts are elements of experience; that is, they function as guidelines for thought. The concepts are of course the familiar “time”, “causality”, “subjectivity”, “objectivity”, “body” and so forth. For Einstein “causality”, which for the physicist is a fundamental

³²⁶ Ibid., p. 267.

³²⁷ Peter Miller, “On ‘Becoming’ as a Fifth Dimension”, in Griffin, ed., 1986: 291.

³²⁸ Ibid.

³²⁹ Ibid.

³³⁰ Ibid.

concept, *and* “subjectivity”, which for the *physicist* consists of notions that are based upon “common sense”, was, as we already have seen, incorporated into STR.

Considering interpretations that only deal with the physical content of STR, we find contradictory opinions. For instance Milic Capek writes that, “nothing in relativistic physics supports this view (Grünbaum’s view that the present is real insofar as it is regarded as a subjective “coming into consciousness”) on the contrary, at any particular moment, future events are intrinsically unobservable by any conceivable observer.” And that “relativity theory strengthened rather than weakened the objective status of becoming.”³³¹

The latter interpretation seems reasonable when we realize that Einstein’s STR is not the ultimate answer to question of what *nature* of time is. Nevertheless, an interpretation of STR includes what Einstein himself thought was of philosophical significance. Hence, there seems to be many scientists and philosophers who also take into consideration the huge amount of popular and philosophical writing by the hand of Einstein in the aftermath of STR. This gives a direction of how *he* conceived of time, subjectivity, and causality. One of these thinkers was Arthur Eddington,³³² which after thirty years of progress following the advent of STR and quantum theory, thought of STR as a “broom” that was expected to sweep all subjectivity it found over board. A general feeling among physicists was, according to Eddington, that the boast of relativity theory was to penetrate beyond the subjective or relative aspect of phenomena and to deal with the “absolute”. For example, in STR Einstein *wanted* to show that our usual separation of space and time is subjective, being dependent on the observer’s motion. Space and time were therefore substituted by a four-dimensional space-time continuum independent of any observer.

Likewise, prior to wave mechanics there was no mention of probability as something that is subjective, in the sense that it is relative to the knowledge that we happen to possess. The latter means that STR held other influences of subjectivity that were not detected and that Einstein therefore did not eliminate or could not eliminate. The form of subjectivity, which Einstein subjected to the intellectual process of “elimination”, arises from the sensory and intellectual equipment of the observer. What Einstein was eager to detect was variations that originated from different positions, velocities and accelerations. Such variations produce subjective changes in the

³³¹ M. Capek, 1975, “Relativity and the Status of Becoming”, *Foundations of Physics* 5: 607-17.

³³² A. Eddington, 1939, *The Philosophy of Physical Science*, Cambridge University Press, pp. 85-88.

appearance of the world. STR removes the subjective effects of these private characteristics of the observer. However, Einstein did not go into the troubled issue of subjectivity as such. Had he done this he would have seen that he also attempted to remove the subjective effects of necessary generic characteristics common to all observers – being “subjective” as they are. As I have already been arguing, *temporality* is one of the extremely important and necessary generic characteristics, and as such it can neither be “removed” nor “erased”. One can only *pretend* that it is. According to Einstein, the present, the “now”, is, for the physicist, an illusion and thus has no place in physics. Einstein’s own opinion about his achievement went in the direction of “space-time” being a “static continuum” and that “becoming” belonged solely to the observer. He could not eliminate the observer, but by pretending to have eliminated the subjective effects (including the *generic*) he firmly believed that temporality, *as we experience it*, was eliminated from the framework of theoretical relativity physics. There is no trace of “becoming” in STR; no one was ever intended.

When we bring Einstein’s intellectual universe into the discussion, we unveil or disclose his *speculative* assumptions and intentions operating in the background of his theorizing. These assumptions, I believe, are incorporated into his STR. However, one does not have to take the assumptions seriously interpreting the concept of time in light of STR. STR may be interpreted in Capek’s sense,³³³ that process indeed can be part of the continuum.

Stapp takes the opposite view on “Einstein time” to Capek’s. Stapp reveals that he considers Einstein’s physical considerations about “time” to have more in common with a “static” interpretation of time; more in common in the sense that a “static” interpretation is similar to the way the physicist approaches the issue of time. Those “static” interpretations are *physicalistic*. As far as relativity theory is *about* time and thus is claimed to represent a static vision of time, Stapp is opposed to this approach to time. Stapp *rejects* static realms of clock readings and the spatialization of time by *emphasizing actual time*, which arises from or is coextensive with more fundamental “sequences of actual becomings.”

Nevertheless, it is important to understand that in locating these events as independent of the observers, Stapp does not imply that the measurement of the events should not be based on experience. As Eastman says contemporary physics deal with observational contents that all have information about various temporal and spatial intervals,

³³³ See Milic Capek, “The Myth of Frozen Passage: The Status of Becoming in the Physical World”, R.S. Cohen & M.W. Wartofsky, eds., 1965, *BSPS, Vol. II: In Honor of Philipp Frank*. Humanities Press Inc. Pp. 441-463.

and that these observations refer to the process of observation that itself refers to events and processes.³³⁴ But what facilitates and legitimates such an interpretation? According to Stapp two major philosophical shifts result from attempting to give viable interpretations of quantum theory. The first is the shift from deterministic to probabilistic theory, and the second is a change of ontological basis from the external world of geometric forms to the experiential world of observations.³³⁵ However, Stapp does not begin with an analysis of observation and what is contained in the process of observation. Instead he begins his theorizing about time with the physical realm and thus adds a new dimension to the four existing ones.

Hence, it is not a *physical* theory about time that Stapp provides but a *metaphysical* one. Essential to his idea is the concept of “becoming” that is “coming-into-being”, “becoming-actual” rather than just potential. This type of “physical becoming” does not explicitly refer to an observable process; it cannot be “clocked” like other temporal processes. This form of becoming is to be understood as a fundamental principle of the universe since events in the four-dimensional space-time continuum must have come into existence in a serial order – and not all at once. Even in this latter sense they would have to “become”. “Becoming” is thus the ontological basis for every event happening in the universe. We are here at the crucial point, which constitutes the order of time or becoming in Stapp’s opinion. We are to understand that the processes have a transitory quality that is descriptive for the transformation of one state of affairs: Where we can say that a number of possible outcomes or effects may change *into* a situation where only one of these possible effects occurs or actualizes. It is precisely this transitory quality that transforms a plurality of possibilities into one actualization which provides the basis for the serial order that Stapp finds as the most descriptive one for his idea of “becoming”, namely, that of the sense of “before and after”. Stapp’s fundamental metaphysical category shows that actualization as a final state emerging from a transitive transformation excludes other possible outcomes represented in the order of “before and after”.³³⁶

³³⁴ Ibid.

³³⁵ Ibid. Eastman writes further that “developments in dissipative structures (Prigogine), classical systems exhibiting strong trajectory instability (Misra and Prigogine), as well as the quantum theory of measurement all suggest that the shift to probabilistic theory is linked to a fundamental time asymmetry in physical systems. This conclusion is not clearly independent of the formalism, although alternatives that attempt to deny an ‘open’ future tend to be *ad hoc* and not coherent with human experience or with the overall framework of modern physical theory.”

³³⁶ W.B. Jones, 1986, “Physics and Metaphysics”, in Griffin ed., 1986: 284-285.

However, we are presented with some immediate difficulties as to how we are to understand the relationship between the “before-and-after” relations and the concept of “transience” or “becoming”. Before we attempt any discussion of this problem, we have to take a look at another problem or enigma that Stapp presents us with. Namely, how are we to understand the relation of “before-and-after” in relationship with “becoming” *and* the “S-matrix” of quantum theory? I believe that Prigogine’s “A Short Comment on Henry Stapp’s Contribution” sheds some light upon this enigma:³³⁷

S-matrix theory, as usually understood, corresponds to a unitary transformation and to a symmetrical treatment of past and future. I am therefore somewhat at a loss to understand the difference between what Stapp calls “Einstein time” and “process time” on the basis of S-matrix alone.

Clearly, S-matrix theory alone cannot make a distinction between different *conceptualizations* of time. There should be some sort of *conceptual* basis other than those we find in physical theories. The conceptual basis would have to enable us to carve out the distinction. The “before-and-after” relations, we were faced with in Stapp’s “fifth dimension”, are supposedly meant to give us a conceptual tool to identify “becoming”, which is utterly distinct from the “before” and “after” of a physicalistic *causal* interpretation of time (Einstein time).

Peter Miller has also commented on Stapp’s metaphysics of becoming.³³⁸ Miller says that in Stapp’s interpretation of quantum theory we only find a *single sequence* of events that is to be located in an order of becoming. Thus, Stapp escapes the multiple independent sequences of becoming in a contemporary world. This is not something we can possibly observe. This single sequence of events, says Miller, means, “*each* process event narrows or restricts the tendencies of *all* space-time without regard to spatiotemporal contiguity and from minus to plus infinity in physical time, while and as it fully determines the actual properties of a bounded region of space-time.”³³⁹

Furthermore, Miller points to a very important and *decisive* aspect of Stapp’s thinking, which may untie the enigmatic knot of the before-and-after relation in his theory. This refers to the fact, which Stapp has allowed earlier on, that the order of actualization of the bounded spatiotemporal regions do not need to observe a one-way flow

³³⁷ Prigogine in Griffin ed., 1986: 293.

³³⁸ P. Miller, 1986, “On ‘Becoming’ as a Fifth Dimension”, in Griffin ed., 1986: 291.

³³⁹ Ibid.

in physical time. That is, says Miller, “if event *B* is later than event *A* in physical time, it might nevertheless be the case that in the order of becoming or process time, *A* was actually later than *B*.”³⁴⁰ For Stapp this is “becoming in four dimensions”. It clearly presents us with new problems.

First of all we find that the transience that Stapp wants to include the physical understanding of time does not correspond to the experiential conditions of any observer. One fundamental characteristic condition of experience is in fact that “becoming” or “transience” becomes an order of specific events in a one-way direction – in the future there will never be a reversal of those events we have *experienced*.

Secondly, we find that by introducing the notion of a “reversal” of the order of events Stapp is not referring to the experiential conditions or temporal experiences of human beings. What is he then referring to? Clearly some hybrid notion, first of all the transience he wants to capture is only intelligible when the reference is to temporal experience, and so we *need* observers. Stapp must collect his idea of transience from “somewhere”. Without doubt this “somewhere” is *his experience*. At the same time he omits the most fundamental characteristic of this experience, namely the one-way development which events are presented by. Why, may we ask? I believe that Stapp has not managed to cut away his thinking from that “long time, naturalistic, physicalist metaphysics” that, within physics, understands a “fundamental” level of reality to be governed by non-temporal deterministic laws, and that furthermore *fuels* the peculiar notion that time is “reversible” and “symmetrical”. In this sense, Stapp can be interpreted to advocate temporal dualism and, strictly speaking, a symmetrical non-temporalism in which the temporal order becomes a contingent feature of the theory and human temporal experiences become illusions. Which, however, brings us back to the question about what the difference is between the “before-and-after” relations related to “becoming” and the before and after of *physical* theory.

Before we enter the difficult matter of temporal *relations*, *becoming* and *transience*, we have to say something about the *physicist’s* use of “before” and “after”. “Before” and “after” signify a *temporal sequence*. In the primitive spatiotemporal structure we do not find the idea of sequences – but it should not be a problem of introducing it into this structure.³⁴¹ This is done mathematically by letting a parametric curve represent a sequence. Mapping a segment of the real line into the manifold can do this. Auyang writes, “The

³⁴⁰ Ibid.

³⁴¹ Sunny Y. Auyang, 1995, *How Is Quantum Field Theory Possible?* p. 171.

numbers constituting the real line bring out the idea of sequences.”³⁴² However, in this notion about lines and curves we do not easily find the represented sequences as *temporal* sequences. To make these sequences temporal we need, in addition, a causal concept. By now one can separate between timelike curves and spacelike curves. According to Auyang we see that the numbers that are parametrizing a curve, like points on a line, constitute the domain of the *time parameter* in the former and the *space parameter* in the latter. However, all mentioning of *change* has no relation to “notions” about “becoming” or “transience” – it only means *variation* with respect to the time parameter.³⁴³ Nevertheless, “change” has to be defined. Primarily one needs to identify what changes and thereafter to differentiate between similarity and difference. Thus, we concentrate on the entity that changes and at the same time discriminate between the differences. Which again demands the idea of endurance; changing things remain identical as an entity despite superficial differences.³⁴⁴

When time changes it is the value of the time parameter “*t*” that changes. Events are thought to constitute an enduring thing and thus, when the thing changes, it is the thing that is different at different times. The notion of change depends on the time parameter, because “if the successive events that constitute an enduring thing have different qualities, we say the enduring thing represented by the curve *changes* or *alters*.”³⁴⁵ Thus we find that the “subjective” notion of endurance and the formalization of the familiar and primitive notion of the “running of time” -- that is the “*t*” -- underlie all the other notions of “sequences”, “succession” and “change” that one applies in physics.

Although there is no doubt about the subjective *origin* of the *distinctions* of before and after, the distinctions are only formalizations that *theoretically* have been “divorced” from their origin. Let us therefore take a closer look at the problems that arise when Stapp identifies “time”, “change”, “process” and “becoming” – with the hypothesized idealizations of theoretical physics and related philosophy.

6.2.1. The Problem of Temporal Orders

³⁴² Ibid.

³⁴³ Ibid.

³⁴⁴ Ibid., p. 172.

³⁴⁵ Ibid.

Why did Einstein choose the concepts he did, when he began his analysis on time in STR? The “before and after” relations are *asymmetrical*, only the concept of simultaneity is symmetrical. Simultaneity is symmetric because it refers to the instantaneous no-time-at-all aspect of locality. Why then did he concentrate on the symmetrical aspect? There are obvious reasons and there are reasons that do not seem obvious. One obvious reason is that an analysis of the asymmetrical relations would not bring about anything new; that these relations could not be treated in any other way. But perhaps a better way of understanding the relations would emerge if one could begin with an analysis of the local symmetric aspect of observations. After all, time enters physics only through the content of local observations. So if we were to analyze time we would have to start with an analysis of the local content of observations. Thus, it is the linear continuum of instants constructed from overlapping durations that were associated with the locally experienced time of the individual observer. Furthermore, the interval of clock time depends on specific external phenomena and has been looked upon as a measure that applies globally. The correlation between these two different kinds of time was based on the principle of simultaneity.³⁴⁶ Thus, we apply these measures, as causal relations since measures are something to be observed. Hence, it is evident that our belief in any causal relation is itself based upon observation; the one type of event which is regularly observed to precede the other. Therefore, our knowledge of causality has its roots in the time sequences observed by us.³⁴⁷

Our whole procedure is hypothetical in the sense that we have to assume that the objective order of events is identical with the subjective sequence of our corresponding perceptions.³⁴⁸ We keep our belief in this hypothesis alive until it conflicts with our whole body of accepted knowledge. According to Whitrow, when a conflict arises we appeal to the hypothesis that the objective order of two given associated events must be coherent with the previously known order of similarly associated events. But we also appeal to the further hypothesis that any difference between this order and the perceived order can be correlated with some difference in the connections between the respective objects and percepts.³⁴⁹ However, one has to confront two problems. A) How can we choose a standard pair of events so that we can compare the events in question? B) To what differences of connection are we to ascribe any differences between the time

³⁴⁶ G.J. Whitrow, 1980: 224.

³⁴⁷ *Ibid.*, p. 225.

³⁴⁸ *Ibid.*

³⁴⁹ *Ibid.*

relations of our percepts of the particular events and of the standard pair?³⁵⁰ With the first problem we have to choose events that are “simultaneous” with the percepts to which they give rise. As Whitrow states, “fundamental in this analysis is the concept of simultaneity in the individual time directly associated with the observer’s percepts, the correlation of these percepts with epochs in ‘one line of time’ being presupposed.”³⁵¹

One has to distinguish between the kind of *experienced* simultaneity and the *instant* in mathematical time. Einstein realized that by using the above method we could only arrive at the assignment of a subjective, not an objective, time to an external event.³⁵² Einstein saw that it was a hypothesis to assume that, if they calculate correctly, all observers must determine the same time to any given event. However, Einstein also argued why this hypothesis should be rejected. Anyway, measurement of time depends on the idea of simultaneity, and thus Einstein’s theory was based on the assumption that there are no instantaneous connections between external events and the observer.³⁵³

Einstein did “prove” that we cannot have perceptions of simultaneous events from a global perspective, that is, from two different perspectives or more at the same time: That they are in relative motion to each other – and that they *correspond* with each other. However, we can perceive, and are thus able to measure, simultaneous events from a local perspective. Nevertheless, in my opinion, Einstein also “proved” that reality in fact is asymmetrically or heterogeneously temporally structured. How did he *prove* this? Einstein showed that on a global scale it is impossible for us to operate with a concept of simultaneity. Even with the use of light speed and all the fancy measuring devices and definitions of the ideal clocks, one cannot determine any simultaneous events that are too far away from each other to be causally linked. Neither is it possible to have an absolutely *exact* determination of the simultaneity of causally connective events. We only have *more or less* accurate measurements. Why is this so? Because friction in measuring devices, together with other unforeseeable conditions, are phenomena characteristic of our world. The real world is very different from any ideal world. “Temporal symmetry” or homogeneity is nowhere to be found in the real world.

³⁵⁰ Ibid.

³⁵¹ Ibid., p. 226.

³⁵² Ibid.

³⁵³ Ibid.

And the reason for this total absence of *real* homogeneity and temporal symmetry *cannot* be due to our imperfect perceptions.³⁵⁴

In fact Einstein operates with two types of symmetry. One type of symmetry is found within the concept of simultaneity: As such it is descriptive of a temporal ordering that belongs to perceptions, to the perceptions of the real world. The other one is the ideal, perfect symmetry. And in the real world of perceptions there are no perfect simultaneity, no symmetry, only approximate measurements that can be transformed into a global formulation.³⁵⁵ In fact, STR tells us that time is asymmetric in the real world of perceptions. So let us focus upon this real world of perceptions and its temporal orders with respect to its *asymmetric* temporal nature. By this I mean that time has a *preferred* direction. By this I also mean that time is *transience* as opposed to a “static” non-temporal ordering of events. Lastly, I believe that “becoming” is real.

6.2.2. Temporal Order

First, we have to start with the “static” view. We have to clarify the various opinions contained within the “static” non-temporalism about “transience”, the “A series”, “B series”, and what they assume about the nature of asymmetric time as an undeniable part of human reality.

Although I feel that the “static” view of time is by now something well known, I still find it necessary to exemplify certain “static” opinions in order to determine *how we have to handle the question of time and becoming*.

When reading about the B-theoretical viewpoint³⁵⁶ what strikes me as odd is the “existence” of an apparently “unbridgeable” gulf

³⁵⁴ We have homogeneous processes represented but these are “man made” inventions like the clock. The clock is not a perfect homogeneous process. It will eventually wear down; that is, heterogeneous reality will eventually intervene and claim its right. This means that the clock will eventually lose its character of being a measure that portrays processes in an even flowing manner, which means that the clock itself will become part of that heterogeneity which leaps and runs uneven. As such it will portray the characteristics of real processes. Even this piece of human ingenuity will eventually stop at a certain point.

³⁵⁵ From the viewpoint of physics, this kind of symmetry between events and simultaneity between events would not be accurate enough from a measurement point of view.

³⁵⁶ A-series and B-series originate from McTaggart’s analysis of time in 1908. The A-series are the qualitative and immediate temporal series whereby we distinguish between something that exists “now” as opposed to something that has been (past) and “something” that we do not know quite yet if it will be (future). The B-series are the

between the “A-series” and the “B-series”. It is “odd” because *both* series must be said to be necessary constituents of the temporal-conceptual apparatus of the *observer*. A general B-theoretical point of view states that:

There are no objective transitory properties of the physical world, and that our awareness of events issues in our beliefs about their positions in the A series.³⁵⁷

And, as Faye continues with respect to H.H. Price, “it is just incoherent to imagine that a mental event that occurs now can be *causally* dependent on physical going-ons that *occur tenselessly at B series moments*.”³⁵⁸

There *is* something *odd* about this statement. First of all we are presented with an ontology of the objective and the subjective that does not find a reason to include the human mind as an integral part of that which is objective. This is an ontology that draws up with a thick line, the separating borderline between “subjective” and “objective”, where the subjective is the “mental” and “psychological” and the “objective” is the physical. This is to say that measurable things are to be converted into measurable “facts” where the measure confusedly becomes the “fact”. This means that in Faye’s statement we are also presented with two distinct and different “things”; first we have the psychical events and then the physical events. The first one is that of “becoming” and the other one is about events that just *are*. The odd thing about this is, as Faye points out, that H.H. Price did not make a distinction as to the difference between the question of “becoming” as such and our language that exhibits tensed and non-tensed aspects. This means that “becoming” is part of our psychology and is expressed through our language as tensed “talk” about the world, whereas tenseless sentences express tenseless facts about the world.

Furthermore, Faye holds that the A-series are as *series* objectively grounded, since they exist in our minds they must be said to “*be*” in an objective sense. As we have already seen, the A-series are claimed not to be able to disclose any of the objective temporal

contemplative order that we use to describe the occurrence of events as “before” event *A*, or “after” event *A*, or as “simultaneous with” event *A*. In our language the A-series are recognizable as “tensed language” and our “now” is just an indexical. In the B-series there is no tensed talk, only a tenseless reporting of “facts”, at least this is the assumption that certain B-theorists share.

³⁵⁷ Jan Faye, 1989, *The reality of the future*, p. 133. With this statement Faye is referring to the view of H.H. Price, 1937, “The Philosophical Implications of Precognition” in *Proceedings of Aristotelian Society*, 16, pp. 211-228.

³⁵⁸ *Ibid.*, my italics.

properties of the world. The “properties” are, however, disclosed by the tenseless B-series. And we must keep in mind that “becoming” is assumed to be nothing but a “mere” illusion of the individual. Then, we return to the “odd” section again. Becoming is an “illusion” because it is transition, and transition is characteristic of “A-time”. It is an illusion because it is subjective.

But then the problems arise of how we are to understand “objectivity” in this context. The A-series are “objective” because one cannot deny their *existence*. But then again they are subjective and can therefore only yield *illusions*. The A-series are therefore something *real* that yield *illusions* at the same time! If Faye was to keep to a logically strict formulation of the B-theoretical standpoint, he should have denied the existence of experienced temporality. He should probably have said that A-series do not exist. But since it is absurd to claim anything like that the inevitable consequence is the confusing use of the concept of objectivity. The result is that with a position like Faye’s we would end up with a relativization of the concepts of subjectivity and objectivity -- implying that we can apply these concepts as we wish, or *ad hoc* in order to save the theory from non-sense. All of this nonsense starts with the strict separation of the “realms” of the subjective and the objective, between qualities and quantities, between mind and body, and between “A-series” and “B-series”. There is, as I have shown, a direct link between the sets of dualities and a naturalist-physicalist “realistic” attitude, which is manifested to the commitment of explaining the real content of reality in a very peculiar manner. In this sense Faye is representative of the modern B-theoretical viewpoint on time. But let us contemplate in some detail on the aspects involved in the composition of the “static” view.

According to McTaggart,³⁵⁹ genuine change is only possible if the temporal properties of events change, that is, only if their A-series’ positions change in addition to the corresponding external properties. This means that change is possible only if the facts change. The A-series’ view is that the facts that change are the transient properties of events – the transition or “re-location” from one point of the A-series to another. The B-theorist, however, gives quite a different account. For the B-theorist, *events cannot be said to change meaningfully*. They claim that “things” or the “observer” change. *Events simply happen or fail to happen*, again according to Faye.³⁶⁰

³⁵⁹ McTaggart, “The Unreality of Time” in C.M. Sherover, ed., 1975, *The Human Experience of Time. The Development of its Philosophic Meaning*. New York University Press, pp. 278-296.

³⁶⁰ Faye, 1989: 143.

Thus, with respect to physics we find that there are two general doctrines. The first doctrine holds that events become; it consists of an objective observer-independent distinction between “before” and “after”, or “earlier than” and “later than”. The other doctrine emphasizes the structural difference between types of physical processes of which we define and determine the direction of time. The difference between the two is removed by the doctrine of the occurrence of irreversible processes, because the direction of time is an objective property, and therefore time in itself is asymmetric.³⁶¹ Faye and others are keen to argue that the direction of time cannot be defined or determined on the basis of statistical thermodynamics or by any other theory of irreversible processes. Because, as the argument goes, both within and between open systems we find that there is a constant exchange of energy. Thus, there is no need to ascribe such systems with a certain value of entropy. In this particular setting time has no preferred direction. What Faye leaves out from his account are the crucial aspects of “dissipation” and “fluctuation” in the interaction of systems, something that raises the value of entropy and thus also renders the process irreversible. However, Faye is correct in stating that it is wrong to *define* the direction of time on a thermodynamic fundament. However, something must be applied as the absolute foundation for the definition of temporal direction or order. The B-theorists have their convictions about this matter: Time consists in a series of instances or moments ordered by the asymmetric ordering relation *later than* or *earlier than* and by the symmetric relation *simultaneous with*. The same goes for events, which, since they occur at definite moments, may be ordered by the same relations.³⁶² However, these relations are assumed to have nothing to do with transitory time, and furthermore, all such relations that describe transience are by some people believed to be *reducible* to the tenselessness of the B-series. Can we then say that we have some kind of definition as to the direction of time or to the nature of time in itself? I believe not; something crucial is missing in order to render the concept of time *comprehensibly*. Such “comprehensibility” is essential to every observer and therefore, for this reason alone, what is missing cannot be a contingent feature but must be a real property of the world – and in such a fashion that it can *constitute* the basis needed to define the nature of time.

³⁶¹ Ibid., p. 195.

³⁶² Ibid., p. 197.

6.2.3. Properties and Facts

One such property believed to belong to the world is perhaps the *unidirectionality* characteristic of those transforming things and processes that we experience. It is not that only experience is unidirectional but it must be so because everything externally perceived is irreversible in time. It is not that we see the change-in-itself when it takes place in the “thing”, we can only see the change as something that has occurred between perceptions of the “thing”. Therefore, change is a subject-independent property of the world.

However, if we consider the “non-temporal” view there is no direction to be found in the relations of “earlier than” and “later than” when viewed as “objective statements” about non-temporal facts. Because, with respect to the observer, these facts may just as well have occurred in a reversed sequence. To reduce tensed statements to the B-series is to “eliminate” the experience of the observer, that is, to exchange tensed statements with statements that are about so called “non-temporal facts”. To “eliminate” means only that the subject is made invisible. This is, however, impossible since there will, at least implicitly, be referred to some kind of intelligible frame of reference. A frame of reference is necessary and the only necessary frame of reference is the observer, that is, a human being that has an intuitive knowledge of time. If a temporal relation between external events is needed, it is the measure of duration that is used to make the relation into something that can be communicated. But still there is something else missing, namely our “now” as the necessary point where the interval is set. That is, as Gale has shown us with his co-reporting thesis, when time means “clocked-time” “now” must mean “this time”. Any attempt at excluding “now” will ultimately bring about a certain sense of no sense since time and events in time are kept on the outside of the observational context, which will always include all of the temporal aspects or series of the observer, including the A-series. It is the metaphysical scheme of distinguishing between differences in ontology, a difference that is projected onto the temporal series, that is dubious. This “distinguishing” between “different” series is only an analytical distinction, not an ontological determination. It is the same fact presented twice, that is, first as “presented actuality” and secondly, as “re-presented reality”, or as an “order of perception”, that is, as *experience*. Thus, it might be said that the B-series are founded upon differences in A-characteristics of the related terms.

The problem of a meaningful concept of “becoming” within *physics* consists perhaps in, as C.D. Broad wrote, “we are trying and failing to force temporal facts into the mold of non-temporal facts about *abstract* objects such as numbers.”³⁶³ By this is meant that we think about temporal relations between external things and events by analogy with abstract objects, which are not situated in space and time at all since these “objects” are theoretical objects and as such they can be said to be “*timeless* abstract objects”. Or we can think about these temporal relations and events by analogy to mathematical points on a spatially drawn line from left to right, and so they can be thought of as “simultaneous persistent particulars”, as Broad has pointed out.³⁶⁴

The problem that Henry Stapp is confronted with is that his selective concentration on the B-series, as the only means of temporal representation, does not enable him to render the concept of “becoming” to be *meaningful*. By applying the B-series alone he is not able to capture the transient and unidirectional properties of time. The properties of time that the realist-inclined philosophers of science and time have objected to are by their transitional and unidirectional aspects.

In the “realist” account there is no necessary relationship between the *transience* in the concept of “becoming” and the tenseless reporting of timeless abstract facts in the B-series. That is to say, there is no relationship as far as one keeps insisting on that the difference between the A-series and the B-series is “more than an analytical distinction”. This means that one keeps insisting on that the “difference” between the two series must be ontologically grounded since it gives two different accounts of “real” nature as being either “temporal” or “non-temporal”. To keep to this analytical *distinction of ontology*, and furthermore to concentrate on the B-series’ relations as the only valid means of “time-reporting” or representation indicates that the “transience” (i.e. in Stapp’s sense an actualization of potentialities) that characterizes “becoming” is lost. The B-series regarded, as an independent and consistent time-series, does not indicate either unidirectional properties or transience. Nevertheless, there is a necessary relationship between the A-series and the B-series. As implied earlier, we have to draw attention to the importance of individual subjectivity and temporality.

We use the “B-series” to *contemplate* a sequence of events *in* time. The B-series, with its *relational* characteristics of “earlier than”, “later than” and “simultaneous with”, order events in a manner

³⁶³ C.D. Broad, “Ostensible Temporality”, in Gale, R.M. ed., 1968, *The Philosophy of Time*, p. 137. My Italics.

³⁶⁴ Ibid.

analogous to numerical ordering that can be compatible with the idea of a static world that does not “move” in time or of a “time”, that does not move the world. This rests upon the confusion that “change” or “transformation” of things and events in the world are thought of as a “movement” *in* time instead of stating it the correct way, which is a “movement *of* time”. All kinds of “worldly change” are a “movement *of* time”. The analogy of “movement” is mistaken as a movement along something else, namely the time parameter. It is only the use of this “parameter” that qualifies the usage of statements that say that things develop *in* time (which is in fact implying a *substantial* time). Furthermore, it is only the B-series that are referred to in physics and other sciences when the time dimension is being considered.

On the other hand, when we *experience* time we have the characteristic “representation” which is known, to at least all analytically oriented philosophers, as the “A-series”. To put things straight, the A-series are said to represent properties of temporal experience through our language. Thus, we can say that it is through the “A-series” considered as a subtle network of interrelated distinctions pertaining to the perceived “whole”, that is, of “past”, “present” and “future”, that we *actually experience events*. The distinction is, of course, that the A-series are already represented. The temporal experience is an actualization, a *presence* of temporally related events. The actualization indicates that the experience happens before the verbalization and the distinctions of the B-series. The experiences we have prior to a verbalization are, therefore, elements and aspects being represented by the A-series. However, the A-series are always a series where the temporal aspects change according to the transience of the world in perception. As such the A-series are a series of changing perceptions and experiences that are related or not but held together within the unchanging identity of the “now” of the perceiver. It is the transience and unidirectionality of the surrounding world that are perceived and not a “moving now”. Thus, as a series of *transience* it is the series that give meaning to the concept of “becoming” or “occurrence”. It leads us to make statements that are not permanent truths, perhaps only logical truth is “permanent truth” when the A-series are “a series” of different but interrelated temporal determinations that always will be re-determined within the framework of real-world perceptions.

It is obvious that this has caused perplexity, debate and misunderstandings. The problem is at the root of McTaggart’s *denial* of the *reality* of time. For temporality requires *change*, without it time would be inconceivable. Change involves the A-series, and without these series of past, present and future there would be no B-series, no succession of events related as before and after, or earlier than and

later than, relations that do not change. The contradiction that McTaggart spotted is that in each event we attribute all three mutually exclusive relational qualities (A-series) to each and every event, even though we cannot identify events as past, present or future by any assignable mark. Therefore, in the final analysis, the contradiction cannot be resolved and time is an illusion. The confusion that sticks to the separation between these series consists of mistaking fact to indicate identity between data in both series. That A-series are a changing series has to do with them being actual and fundamental for the *establishment* of data. The B-series are a later ordering of the same events in the database, which we call our experience or memory. When ordered into memory experienced data are no longer *actual* and are therefore products of cognitive ordering, and as such they do not change anymore – they are established “facts” about the world. And, as I have mentioned earlier, the A-series mark the content of our experience with the characteristically irreversible transience that gives these determinations a nature of being non-permanent truths about the world. Only the B-series can be applied within the a-temporal framework of logic where one can operate with truths as something that might be “permanent”. McTaggart confused the distinction of real-world truth and permanent logical truth. The permanent truth found in tenseless logic was given an ontological status as “real” and which led to the contradiction. The result was, as mentioned earlier, that we were given two contradictory worlds and times.

Nevertheless, B-theorists who go along with the denial of any objective existence of transitional temporal properties in the world do not admit to McTaggart’s claim that time is not real. Instead they say that it is just that tenses do not tell us *anything* about the objective properties of events. *Tenses* are not “real”, only a tenseless B-series can present us with facts as they are in themselves. The English philosopher D.H. Mellor is in the forefront claiming this kind of view and thus he is also responsible of having offered new life to McTaggart’s proof.³⁶⁵ To this category of thinkers we also find Jan Faye. Characteristically he writes that:

McTaggart’s proof...successfully demonstrates that there are no objective tenses or no tensed facts about the world. The realist will, therefore, be inclined to regard McTaggart’s proof favorably (though naturally as showing the unreality of tenses, not of time).³⁶⁶

³⁶⁵ D.H. Mellor, 1981, *Real Time*, Cambridge University Press. See also Jan Faye, 1989: 139.

³⁶⁶ Faye, 1989: 138.

The mistake of denying reality to time is, according to Faye and Mellor, to be located in the belief held by many philosophers, namely that time cannot exist without change, and that the A-series are logically and epistemologically prior to the B-series. They claim that this *cannot* be the case. Hence, the claim is that A-series are only a possibility if facts do change. However, according to Mellor and Faye, facts do not happen or change – facts are facts – facts are as they always are, that is, *contained in the same way always by its tenseless representation*. But then again, can the reality of time be determined upon such an obviously false ontology that is unable to see that these “facts” are products of human cognition? That these “facts” in fact are logical truths and not real-world truths? Is the *preservation* of “facts” everything we have to consider in the determination of a *nature* of objective (real-world) time?

The “facts” that Faye and Mellor are talking about are, with other words, analogous to Plato’s eternal and transcendent ideas, to his ideal of permanent “forms”. Only if we understand “facts” within this “Platonic ontology” can we comprehend what is meant by “facts contained in the same way always by their tenseless representation”. These “facts” are frozen in perfect equilibrium; they are not changeable, even though they are *representations*, that is, opinions or judgment about a world, which contradictory to what is being stated *is* changing.

It does not seem to bother either Mellor or Faye that all the time they are contemplating the nature of “facts” they have to presuppose the A-series. For without the A-series they would never be able to determine a kind of frozen “factual nature”, nor communicate it, which means that they also have to presuppose the necessary existence of the A-series in other human beings as well. We have to question this idea of the nature of facts. For instance, are processes parts of the kind of phenomena that can be determined and named as “facts”?

A process takes part in or it evolves over time. This takes time, and as such it does not occur at one specified moment along the time-parameter. Its fact would be a “stretch” of such “time” – from its actualization to its termination as an actuality. However, Mellor and Faye’s “facts” are specific moments or a measured causal relation between two different states or events. These kinds of “facts” cannot contain the evolutionary character of processes. Are not the constituents in a process, those generative properties, which constitute the temporal or transitive characteristic of concrete processes a “fact”? We could be permitted to call it a scientific “fact” in Faye’s sense if we could freeze the development and concentrate on its different segments or phases. But then if the generative or evolving character would not be part of the description, it would have to be inferred by the individual

since it already was being presupposed in its every act of understanding. In a sense we are in our scientific endeavor to describe processes dealing with the problem of how to understand the overlapping of and interrelation of “phases” or “stages”. What is this “phase” or “stage” actually?

According to Storres McCall³⁶⁷, referring to W.V. Quine³⁶⁸ “processes” as “facts” are only possible if conceived as determinations of “stages” and “phases”. McCall exemplifies this by referring to the famous example of Heraclitus, which he compares to the modern logic of Quine. McCall writes that, “Heraclitus could step twice into the same river, but not twice into the same water, or into what Quine calls a river-stage.”³⁶⁹ Quine understands the river as a process *through* time. The river-stage is one of its momentary parts “in the same style, a rabbit-stage is not a rabbit, but a brief temporal segment of a rabbit.”³⁷⁰ The river-stages and rabbit-stages take us from the three-dimensional to the four-dimensional world.³⁷¹ McCall explains this as:

Either a rabbit-stage may be instantaneous, in which case it is a “rabbit-slice”, a four-dimensional object with zero extension in the time direction, or it may be a four-dimensional object with small but non-zero temporal extension. In either case it differs from a three-dimensional object, since even though a rabbit-slice has zero temporal extension it has a precise temporal location. A three-dimensional rabbit, on the other hand, is not tied to any particular temporal location or date.³⁷²

Thus, we have “stages” we can “look at” in the development, but not the development as such represented, because only the “cause” and the “effect” have been contemplated, and not what gradually takes place in between the cause and the effect. The actual development never rests, and one process is only identical to itself as to its “when” and “where” of “stages”. Its transitional *expression* is, however, universal. The B-series taken alone cannot capture the transient change inherent in any process; the B-series cannot describe the process itself, and therefore cannot classify the process *qua* process as a fact. It can only refer to the

³⁶⁷ Storres McCall, 1994, *A Model of the Universe: Space-Time, Probability, and Decision*, Clarendon Library of Logic and Philosophy, p. 209.

³⁶⁸ W.V. Quine, 1953, *From a Logical Point of View*. Cambridge, Mass., pp. 65-67.

³⁶⁹ McCall, *ibid.*

³⁷⁰ *Ibid.*

³⁷¹ *Ibid.*

³⁷² *Ibid.*

process as frozen segments along a time-parameter, which enables the scientist to confuse the process as being *in* time, and not an “expression” of time. And therefore we have segments or “slices” of reality represented *in* time as *permanent* facts. These are “facts” because they are statements that will be identifiable as specific “facts” as they are determined at a specified moment of time. To these facts, then, the logical and metaphysical idea of a permanent truth is added, since a specific fact will, logically speaking, always be the same fact.

6.2.4. Events and Intersecting Time Series

For Mellor and Faye *events* do not change, only things and persons change. Events happen, or fail to happen. But *what* happens? As Whitrow writes³⁷³ it is “the essence of McTaggart’s argument that the happening, or occurrence, of an event is regarded as if it was a form of qualitative change.” We have to refuse this because we cannot accept that time is itself a process in time. The happening or occurrence of an event is not itself a further event. Events happen, and that is it. Events exist only as happenings. When awareness meets changing things we have the happening of an event. The theory of relativity did not provide us with a complete picture or account of time; neither do Mellor or Faye’s theories. Despite what Mellor or Faye says their theories are not *incompatible* with the happening of events. Neither was Einstein’s theory of relativity. For instance, Whitrow explains that, “at a given instant *E* on the world line of an observer *A*... all the events from which *A* can have received signals lie within the backwards-directed light cone with its vertex at *E*... Signals from these events can only reach *A* after the events *E*, and when they do reach *A* they will then lay within *A*’s backwards directed light cone at that instant. The passage of time corresponds to the continual advance of this light cone.”³⁷⁴ We can either consider the set of all these light cones or the continual transition from one to another, and hence the theory does *not* invalidate the concept of temporal transition.³⁷⁵

However, from a physicalist point of view, which is concerned only with relevance to physics or physicists, there should be a limit of how to understand the relevance of the “now”. The “now” is applied in

³⁷³ Whitrow, 1980: 347.

³⁷⁴ *Ibid.*, p. 348.

³⁷⁵ *Ibid.*

the sense that the “now” does not extend *beyond* the human observer. It is not part of the outer realm of reality; it is what confines the observer to the “here”. The only present event is what is happening where it occurs. Elsewhere, everything is absolutely past, or absolutely future. The term “here” is a relative term for different observers. “Here” is never fixed. It is only relatively assignable, and it is not a criterion to define the “now”.

Henry Stapp wanted to capture the essential “transitional” aspect of time by using the “before” and “after” relations together with the S-matrix of quantum mechanics. The view that the transitional aspect of time is supported by quantum mechanics is not new. Before Stapp, physicists and philosophers like Bondi and Reichenbach have presented similar claims. The reason, why one chooses to apply quantum mechanics in this pursuit, might have to do with the “indeterminism” of quantum theory. The history of a given system cannot determine its future but it can state something about the *probability distribution* of possible futures.³⁷⁶ No matter how many observations we have as our empirical foundation it will never be enough information about the past of any system in order to determine its future. Any “future” is a construction, a theoretical possibility; it is a logical and mathematical conjecture that will have to be changed by an observation. Consequently, we find that the A-series of past, present and future have a place in the picture. The past is what has been determined; the present is *when* anything “becomes”, and when events are determined. However, any event, when it occurs, is “present” irrespective of us being aware of it. The future is undetermined. And as I have been stating many times already, the “now” cannot be defined without the reference to “experience”, since temporal aspects or phases in our experience can only be determined in this fashion when they occur. This does not commit us to the philosophical position that views the past, present or future as mind dependent.

Furthermore, a concept of physical time that omits and rejects the transitional nature of time and instead focuses its interest on the static relations of “before”, “after” and “simultaneous with” is a concept that has been reduced according to a methodical plan. It has been reduced so that it does not *complicate* the theoretical account by comprising all what is involved in the occurrence of events. It is reduced so those elements are left out that cannot be formalized by the proper formalisms. This point can be taken even further by emphasizing the difficulties we would stumble upon if “past”, “present” and “future” did not apply to physical occurrences but only to

³⁷⁶ Ibid.

psychological events. The real problem is how we shall understand the *interaction* of these kinds of events? As we have seen the belief is that physical events just *are*, they do not become or cease to be. On the other hand we have events and occurrences that become and cease to be because they are mental events and as such, in our experience, they have a beginning and an end. But what are the consequences for cause and effect? Here Whitrow has an interesting point of view: namely, that in physical causation the effect would not be *produced* by its cause because it would merely be further on in time.³⁷⁷ And surely the absurdity becomes evident if we consider a mental cause and a physical effect, that is, mental causation of a physical event. This would be, for instance, if I would decide to throw a stone into a pond. The cause here is my decision to throw the stone. Here, it is the cause, which suddenly comes into being, that becomes. However, the nature of the effect is of quite another world. Because here in the realm of physical being there is no becoming and therefore the effect does not become a splash when the stone hits the water in the pond. The effect would just be.³⁷⁸

This problem of *interaction* is again a remainder of Platonism and Cartesianism. In Platonism “real time” is not to be found among the qualitative intuitions and experiences of the human mind because of their similarities with sensuous qualities. The rationalism of Platonism holds that only reason, never the senses, can discover reality. Reality has to do with “facts” and facts are eternal and not “transitory or contingent aspects” – like the sensuous qualities. Key words are knowledge and change. According to Plato, reality is immutable; since anything existing in space and time changes, what is real does not exist in space and time. Not even “real time” changes and the true nature of time can only become acquired knowledge by transcending experience and thus by discovering the world of unchanging objects.

The interaction problem is even more obvious the way it is introduced by the Cartesian “two-substance theory of reality”. In this framework it is evident that we have to view mind and matter as two separate and entirely different substances. The two worlds do not interfere with each other. This distinction is both exhaustive and obviously exclusive. Nevertheless, the model shows us the general nature of all two-substance models. It shows us that it becomes “impossible” to comprehend how two “hostile” substances (the mental and the physical, or experienced time and physical time) can interact, because one has constructed two “hostile” substances, or in other words, an artificial separation between a mental world and a physical

³⁷⁷ Ibid.

³⁷⁸ Ibid.

world. The relationship between the Cartesian model and the block universe view of time is that the problems of interaction concern that the mental world can somehow connect with or comprehend the material world. The model also *identifies* the “mental” with what is “inner”, the “inner” with what is “private” (that is, with what is *directly accessible to the proprietor of a particular mind*), and the private with what others cannot “see”. The model thus suggests that each human being will be trapped behind the bars of their own ideas (solipsism). Everything becomes mental. Again we have the contradiction that *reality* is not the “mental” but the physical, that which is *external* to us. How can we access the external world, since all that we have directly access to is our subjectivity? What reason could one imagine for anyone to suppose that there is a reality external to one’s private ideas? And how can we suppose to have accurate information about this external reality when we have denied our direct access to its directly accessible data on grounds of being “merely mental”? The conception in connection to time and more than any other conception entails the threats of skepticism and solipsism. The unreasonable aspect here is not the experiential properties of time such as “transition” and “becoming” but the ideas that are applied in the defense of the view of a *static realm* of physical non-temporal existence of which only the B-series are supposed to be the correct representations.

However, the view that there is no relationship between the A-series and the B-series is in the first place utterly wrong. This has been thoroughly demonstrated by Wilfrid Sellars in his “Time and the World Order”.³⁷⁹ Sellars states, “The earlier-later-than relation has its primary mode of being as earlier-later in the context of a specific past-present-future.”³⁸⁰ The concepts used in the B-series are not independent of the A-series, on the contrary, Sellars continues, they are *bound up* with them. Therefore, “the idea of a tenseless existence of events related by *earlier than*, has a flavor of absurdity, if not of self-contradiction.”³⁸¹ The A-series represent primary pictures of the world that are tensed and that are the basis for detensed pictures, which are constructions of a more abstract pattern of the events. That is to say, a pattern that is of a more abstract character than the events *as we actually experience them*, but which are based, nevertheless, upon these experiences.³⁸² Sadly, many scientist both regard – and neglect -- that the B-series consist of a network of permanent relationships between

³⁷⁹ This paper is printed in H. Feigl and G. Maxwell (eds.), 1962, *Scientific Explanation, Space and Time*, pp. 527-616. University of Minnesota Press, Minneapolis.

³⁸⁰ *Ibid.*, p. 574.

³⁸¹ *Ibid.*, p. 560.

³⁸² *Ibid.*

the epochs we assign to events, whereas the A-series concerns the actual events or occurrences themselves.³⁸³ The actual relationship between the two time series is blurred by space analogies. That is to say, it is the understanding, and thus also the status, of *becoming* that is blurred and that becomes fuzzy. Sellars says that the typical argument, which is responsible for generating puzzles with respect to the status of “becoming”, claims that the fundamental individuals of the time-context are events. Events are regarded as the domain of a purely objective relation of *earlier than* and *later than*. “Now”, on the other hand, is a token-reflexive expression. However, token-reflexive expressions like “now” or “here” occur in the system of events, they express – and have as an essential part of their sense – their location in the system. Sellars continues by saying that the distinction between *now* and *then* exists only with respect to linguistic events of the system.³⁸⁴ Thus, we are supposed to understand that the objective status of any event as a temporal order is independent of the distinction between *now* and *then*.

Indeed, the temporal order is prior to and embraces the perspectival facts which are constituted by the occurrence of token-reflexive linguistic events. The temporal order exists in a sense which is independent of, and prior to, any use of token-reflexive expressions. Statements to the effect that such and such events *exist* are *tenseless* statements. To say that a certain event *will exist* is to say that it *exists* (in a tenseless sense) *and is later than now*.³⁸⁵

In Sellars’ opinion this type of argument is exactly what generates these puzzles for us in our contemplation on time. This is why tenseless existence is an absurd notion and even a self-contradicting notion. It is to be against the idea to view the status of *now* and *then* as a matter of the presence in a tenselessly existing relational order of tokens of “now” and “then”. Hence, to say of two events that one is earlier than the other, *is to use* and not merely to *mention* a temporal token-reflexive expression.³⁸⁶ Thus, it should be evident that the B-series are not logically independent of the A-series but *inextricably bound up with them*. Consequently, any temporal picture of the world is one in which we have to *use* and not only mention the term “now”. Every temporal picture of the world is fundamentally tensed, because it originates in a

³⁸³ Whitrow, 1980: 351.

³⁸⁴ Sellars, W., Feigl, H. and Maxwell, G., eds., 1962: 560.

³⁸⁵ Ibid.

³⁸⁶ Ibid., p. 560-561.

primary picture that always is tensed; it is a framework with a *now*. It follows that an “objective” construction of time exists only as an abstraction common to a class of “subjective” (perspectival) *temporal* pictures. Sellars writes, “Only a primary picture with its explicit now makes clear the nonfictional character of the statement, its rootedness in the real-life activities of observation and inference.”³⁸⁷ As we perhaps see, this view is consistent with the “co-reporting thesis” elaborated by Richard Gale and which we have explored earlier in this dissertation.³⁸⁸

6.2.5. The Grounding of Order

The previous example is of course not evident if seen from the perspective of speculations concerning time in physics. How can we make this point more clear? The B-series – as they are allied with the metric of physics – can be said to represent the metrical frame in which a serial order of events can be determinably fixed. But, as we have been touching upon in relation to Einstein’s conception of time, we cannot claim that space-time interval, or dated events of the B-series, are “more real” than lapses of time. The space-time intervals are only “more real” in the sense that the interval between two events is an invariant quantity with respect to the Lorentz-transformations. This means that “more real” only implies that the relations between – that is, the interval – are invariant with respect to all quantifications into a temporal (serial) ordering of spatially related events.³⁸⁹ This is analogous to the fact that the *earlier than* relation is unchangeable no matter where the now happens to be located relative to it. But this does not mean that events standing in an earlier-later relation are “more real” than events ordered as past, present, or future.³⁹⁰ Sellars writes that it is important that we get the fact that space-time events are not concrete events but simply abstract characteristics that all metrical pictures of the world have in common.³⁹¹

Although we tend to, we should not forget that metrical accounts of “events” are based in pre-metrical *tensed* thinking and experiencing

³⁸⁷ Ibid., p. 592.

³⁸⁸ See R. Gale’s papers: “Disanalogies Between Space and Time”; “Time, Temporality and Paradox”; “An Identity Theory of the *A*- and *B*-series”. For my critique of Gale, see chapter 3.

³⁸⁹ Sellars, Feigl and Maxwell, 1962: 571.

³⁹⁰ Ibid.

³⁹¹ Ibid., p. 573.

of actual events of our locality. The objective in the sense of being “real” is not to be identified with global metrical frames that are *invariant*. “Real” and “invariant” are two different things; therefore the *real* is not to be identified with the unchangeable aspect of the metrical world-picture. With respect to ontology the primary object is clearly the temporal experiences of the individuals concerned; not the secondary metrical invariances that merely are abstract possibilities (hypothesis and laws referred to as “facts”) about things that in reality *change*. Furthermore, one should also be aware that ontological frameworks displaying abstract metrics are “histories”. These histories are the abstract topological facts about changing things. Therefore, one should not, at least according to Sellars, identify changing things with their histories. Especially, we might add, when these histories go contrary to fundamental experiences, when we consider the question: If physical events *are not* subject to the fundamental distinctions we experience and explain as past, present and future, *why do we have the illusion that they are?*³⁹²

Why do we have these temporal experiences? Because our minds have adapted to the world we live in, a world that is constantly changing. It is not the world that looks as if it is changing because we have these experiences *a priori*. Instead we experience the world as changing because it does change and – by necessity, we adapt to the world *a posteriori* and have thus achieved the faculty of temporal awareness of successive phases of sensory experience leading us to regard time as transitional. From the fields of paleoneurology we can claim to have evidence of this.³⁹³

Time has to do with the enlargement of the brain; for instance, in progressive tertiary mammals the enlargement of the brain may be associated with the evolution of visual systems modeled after the mammalian auditory and olfactory systems of that time. As such, there would be one important feature of the newly evolved visual system due to the fact that it would be a corticalized rather than a retinal system. The important feature, which is of interest, is a significant temporal element to visual experience, since the contribution of time is a major difference between auditory and retinal-visual information processing. Duration as well as extent would label visual information – but there would also be a requirement for temporal integration – memory – if smells were to be used as an accurate distance sense.³⁹⁴

³⁹² Whitrow, 1980: 370.

³⁹³ Harry J. Jerison, 1973, *Evolution of the Brain and Intelligence*. Academic Press.

³⁹⁴ *Ibid.*, p. 415; see also p. 269.

Furthermore, plasticity or modifiability, make a fundamental capacity of nervous systems.³⁹⁵ Jerison claims that, “in the construction of a complex ‘real’ world, in which each sense modality contributes to the cognitive image, it would be difficult to imagine a prewired central nervous system that was prepared, readymade, for all the capacities.”³⁹⁶ Thus, we gain the capacity for imagery and imagination, the capacity to re-create and reconstruct. Then we also have the ability to perceive of ourselves, a development of our capacity for creating “objects” in a “real” world. The idea is that individuals who can put together several sensory “pictures” of the perceivable, real world may become able to construct, on a higher intellectual level, a reality that has the character of being of *fundamental reality*. This is a *reality* that transcends the sensory world-pictures which are mediated by the senses. Jerison writes, “the capacity for imagery, in which one manipulates a possible real world in one’s imagination, must early have led the hominids...to reach an appreciation of a past prior to one’s lifetime and a sense of a future after one’s death”.³⁹⁷ Although this must be understood to be in accordance with experience, since the implicit transience and unidirectionality are not something we merely come across in the course of our experience -- but are *presupposed* in every experience of the world; it is an inherent temporal property of the world.

There is no transience in temporal experience without the presupposition of a transient time as its origin. The reason for this is that the capacity for abstraction is inherent in the process of construction of such a reality as a synthesis of information from many sources. And, we might add, this becomes clear if we remember Benjamin Libet’s controversial experiment discussed earlier on in this dissertation. Libet found that the human brain adds (fills in) to the given information, that it creates a serial development beyond what is given to the person. The brain invents an order which includes a conjecture about the outcome. The explanation is that from an evolutionary point of view we simply do not have time to sit around and wait for what is going to happen, because we might end up dead. Our survival depends on a capacity to make “fictions” about reality. To save our lives we depend on our capacity to encode information about events at a distance, to comprehend the relation between events of the surrounding area, all the possible consequences, and eventually on what influence all these aspects will have for our actions. The “fictions” are based on an “auditory” analysis that results in a temporal encoding

³⁹⁵ Ibid., p. 428.

³⁹⁶ Ibid.

³⁹⁷ Ibid., p. 429.

of information about the objects that are of interest to us within the environment.³⁹⁸ However, these are not ordinary “fictions”. Even if they do not correspond with what is actually given to our sensory system, they do, however, correspond with the inherent transience and unidirectionality that characterize every event that takes place in the real world.

Furthermore, the reality we construct is not only modeled visually or tactilely, but since language is the media of communication we also model the world vocally. The general character of our temporal construct is evident in communication since different human brains essentially construct the same reality. Therefore the ultimate significance of time is to be found in its transitional nature.³⁹⁹

Most physicists believe that our experience of time is based upon an objective physical time understood to be an external factor that provides timing for our physiological processes. This idea of an external factor is problematic; indeed, it attempts to reduce our awareness of temporality to this “external factor” which has failed so far. The reason is that we have nothing more fundamental than our *concept* of time to confront, that is, as a *conceptualization* that is based upon our cognitively *fundamentals*, that is, “transient” and “unidirectional”, temporal *experiences*. The healthy part of the idea that there is an external source of time is that there are some corresponding properties in external nature that provide us with a clue as to the reality or truth of our own experiences. That is, in the negative, that the distinctions between past, present and future are not merely peculiarities of the way in which our minds happen to work. Instead we can say that what we are experiencing are actual parts of the external world, that is, that what we are experiencing *now* is true of the external world. Thus, we have far from finished with the concept of “becoming”.

6.3. Becoming, Dissipation and the Temporal Mind

The fundamental characteristic of *becoming* is transience. In the process of actualization of potentialities to a particular thing there is not one *moment* that can be singled out as the representative moment in this process, a moment that thus would be more real than the process itself. All the “moments” that pass by are but “phases” or “fleeting” images of this something as it is changing continuously. From

³⁹⁸ Ibid.

³⁹⁹ Whitrow, 1980: 370.

the observer's point of view the present moment *presents* the real, since the process has evolved only so far as the very moment when it is being perceived as appearing *now*. All the other phases of this something have been leading up to this present "moment", yet development does not halt, and it will always take place in a moment that in principle is present to someone. "Phases" and "stages" have succeeded each other, or followed straight after another, yet the substance in question retains its identity over time. The obvious time direction here is primitive, yet it is assumed "it has some unknown causal source". What can this unknown source be? The answer that many scientists have given to this question is "entropy".

However, the problems of reducing our experience of, say, *direction*, to the entropy gradient do not establish a link between the internal time and the external time; between the time of mind and physical time. The kind of reduction that we should object to is that we do not access the direction of time outside our immediate experience of it. That is, that it is not by "awareness of entropic or other causal processes that we know of events in our immediate experience what their time order is."⁴⁰⁰ But because we have an immediate experience which is temporally structured we also have a direct access to the temporal *direction*. The reduction that is wanted by those who wish to establish a link between physical time and temporal experience by *reducing temporal experience* to a conceptual construct, such as entropic order, that is less fundamental than the temporal experience itself, is what Sklar calls for a "scientific reductionism".⁴⁰¹ The claim is, according to Sklar, that we do not determine temporal order and direction by knowing about how the entropic order is working, but that

⁴⁰⁰ L. Sklar, "Time in experience and in theoretical description of the world." In Savitt, ed., 1995, *Time's Arrows Today*, p. 218.

⁴⁰¹ *Ibid.*, p. 219. We are thus fighting against tradition and the habits of thought that have become second nature to *most scientifically trained* persons of our time. The mathematization of secondary qualities marks the turning point in our thinking about reality in the sense that it defines how to define nature as an object of science. This new way of thinking about reality and how to get correct scientific knowledge about it can be called "the program of the scientific objectification of the experienced and non-experienced domains". The "program" emphasizes the faculty of abstraction. Thus, it removes "the phenomenal precept"; it suspends "every *experiencing subject* and, simultaneously, of any transient modality of time experience", as it is expressed by the physicist Massimo Pauri. ("The Physical Worldview and the Reality of Becoming", in Faye, J.; Scheffler, U.; and Urchs, M. eds., 1997, *Perspectives on Time. BSPS Vol. 189*: Kluwer Academic Publishers. P. 280.) Pauri continues by stating "this epochal transformation of the very conception of *subjectivity* soon became stabilized and shaped many general features of modern thinking."(*Ibid.*)

we instead discover that temporal order is identical to entropic order.
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I believe, like both L. Sklar⁴⁰³ and P.V.C. Davies⁴⁰⁴, Sir Arthur Eddington's⁴⁰⁵ illumination of this problem is to the point. As Sklar says, "there is something about time that makes a treatment of its relation to entropic asymmetry...implausible."⁴⁰⁶ What is implausible is not that entropy has an ordering of events that must obey the order of time, but that time has been "reduced" to signify entropic order. Here we are again faced with a theoretical domain and its relation to human temporal experience. For Eddington it is evident that when we are talking about real *time* we have to differentiate between theory and experience. That is, meaning comes out differently for terms in the sense that in one aspect meaning is secured through identification through experience and in another aspect by location in theoretical structure, and these are two separate things. Time seems to be a feature that we wish to attribute both to the realm of perception, or experience, and to the realm of the theoretically inferred. However, as Sklar points out "it is just a confusion to think that the spatial relations' visual percepts bear to one another are the same sort of relations that physical objects bear to one another."⁴⁰⁷ First of all, we know from our experience what the former relation is like, secondly, we can only talk about knowledge about the latter relations from what our theoretical structures say about them.⁴⁰⁸ But does this mean that we can dismiss entropic order as merely theoretic and not in any way as part of reality? This is to take things too far. Eddington was of the opinion that time is given to us twice, once in our immediate experience and secondly in our theoretical reflection about the irreversibility of external processes. It is the same time that is given in both of the modes. However, we shall not confuse them.⁴⁰⁹

We are, not seeking to *replace* the entropic order by experienced order, or the reduction of experienced order to entropic order. Rather we are trying to see how the two spheres are attached to the same time. Furthermore, we will have to face the fundamental role of temporal experience in the sense that it is our starting point in any theoretical construction of the world. In this sense it is important to admit that we

⁴⁰² Ibid.

⁴⁰³ See Savitt, 1995.

⁴⁰⁴ P. V. C. Davies, 1995.

⁴⁰⁵ A. Eddington, 1946, *The Nature of the Physical World*. Cambridge. Pp. 87-110.

⁴⁰⁶ L. Sklar, 1995, "Time in experience and in theoretical description of the world", p. 223.

⁴⁰⁷ Ibid., p. 224.

⁴⁰⁸ Ibid.

⁴⁰⁹ See also p. 226 in Sklar, 1995.

have direct epistemic access to the relation of temporal succession of the world. Because, on the other hand, what happens if we “radically distinguish” between time in experience and time of physics? The problem of *not* having any relation between the “time-spheres” is equally as bad as the reductionistic claims pointed out above. *This would mean that we do not have any grasp on the nature of the physical world itself.* Because in the claim that separates physical and psychical domains too radically there is absolutely no correspondence between the way we perceive of things and the nature of the objects as physical entities. “We are left with merely the ‘instrumental’ understanding of theory in that posits about nature bring with them predicted structural constraints upon the known world of experience,” as Sklar writes.⁴¹⁰ Furthermore, if we omit consciousness and experienced temporality as a necessary point of reference and instead attempt to render an objective (external) time that is *mathematical* we will perhaps end up with infinite regress.

But to see this we need to study Eddington’s thinking about time a little closer, since he is able to find time in the symbolic world of physics. He presents us with an idea suggesting that there is a necessary linkage of physical time to the world of experience.

Why is it, Eddington asks, that we cannot immediately identify the “becoming” of temporal experience with the increasing “disorder” of the universe called entropy? Entropy is a *concept* about *unidirectional physical processes*. And as such it could also be symbolizing a type of “unidirectionality” as the one we know of – that is, the temporal, or transient one-way ordering of our experiences. There are, nevertheless, fundamental differences between the two approaches to the question of the nature of time, which have to be given some thought. The reason for this, Eddington states, is that a symbol is something (well, in this case at least) that only “exists”- that is, where this “existence” is given its sole meaning - *through a theory*.⁴¹¹ It is, as Eddington writes, “an elaborate mathematical construct”.⁴¹² Furthermore, when we want to locate becoming within nature a symbol is simply not good enough. What we would like to have is something of significance, something that is recognition of a deep dynamical quality in nature that the symbol of the metrical type cannot disclose. We do not create sense by stipulating that one end is more chaotic; we need, according to

⁴¹⁰ Ibid.

⁴¹¹ As in all cases where physics are trying to explore the “ultimate significance of time” solely within the framework of physical theory, and where this particular framework is taken to be more fundamental – since it is *physics?* – than experience and primitive concepts are developed from real-life situations.

⁴¹² A. Eddington, 1946, *The Nature of the Physical World*, p. 88.

Eddington, “a genuine significance of ‘becoming’... not an artificial symbolic substitute.”⁴¹³

But how do we proceed in order to come up with this genuine dynamical significance? Eddington agrees with our view, that our most fundamental and primitive concept of time is identical to that time that is the most descriptive of all empirically accessible natural processes. He describes it as an ontological acknowledgement of primitive experience in the sense that, “we must regard the feeling of becoming as a true mental insight into the physical condition which determines it.”⁴¹⁴

Eddington writes that “insight into the physical condition determines it”, and it dictates that “insight”, of the subjective mind into a objective condition, cannot only be an “external” condition but must somehow also be an “internal” property, a condition of mind. That is to say, a condition equally integrated into the mind as it is integrated into the rest of nature. Why should the human mind conceive of temporality in a form that is totally apart from the time of nature? Our conception of time that is based upon our experience is as close as we get to a conceptualization of the physical condition that determines it. We simply lose hold of the connection between the “physical” element and mental statement of the temporal element in the sense that we do not “see” the physical element at all, but only the mental expression of it. Thus, we never have a grip on the physical aspect at all; we only infer it from the fact that our temporal experience is so fundamental that we cannot ourselves be the source of this breathtaking perspective of time. In other words, when we contemplate our temporal experience or our experiences that include perceptual external qualities at some point have to let go of the physical entities where they take on a different form that transcends our ability to experience them. However, as Eddington claims, we will always be able to recognize “becoming” because it is not “image-building”, but *insight*. It is *insight* because our elaborate nerve-mechanisms do not intervene. “That which consciousness is reading off when it feels the passing moments lies just outside its door.”⁴¹⁵

So then, we must simply come to terms with the idea that the mental insight into the time of physical nature is fundamental for any *conceptualization* about the *objective nature* of time. The realism of the objective concept of time depends on the mental insight into the flux that appears to us in experience; we simply “see” it *as it is*, that is, in its “pre-conceptualized purity”. However, this experience also brings

⁴¹³ Ibid.

⁴¹⁴ Ibid., p. 89.

⁴¹⁵ Ibid.

with it the realization of the significance of the experience, that is; for example, we cannot reverse what appears in transience. In this sense we also have an “insight” into time’s nature as “a kind of one-way texture involved fundamentally in the structure of nature.”⁴¹⁶ We can know about this “texture” as we can also know about other properties of the external or physical world. We conceive of this transience as the passing of time, says Eddington, and furthermore, this is a “fairly correct appreciation of its actual nature.”⁴¹⁷ Thus, we have one way in which we experience time *directly*. However, in order to “bridge the domains of experience belonging to the spiritual and physical sides of our nature,” that is to say, that this temporal experience shall also assimilate what is going on in the external world, we need access to the world through our sense organs. Thus, we gain access to the temporal properties of external processes. We are able, through our sense organs, to relate time to other entities in the physical world. Eddington calls this “time’s dual entry into our consciousness”.⁴¹⁸

Nevertheless, “becoming” – with its transitory properties – will not easily fit into the overall scheme of nomological explanation that characterizes physics. Even if our starting point, that is, our local point of view is characterized by being transient. We remember that physical time, at least as claimed by Einstein in STR, cannot be transient. In STR local time is necessarily represented in “non-transient” modality as soon as it is objectified within the space-time description of physics. The transitory property of time soon gets lost when the nomological structure of physical explanation is applied to the matter. It is interesting to note, however, that entropy – as the only physical symbol – gives us a specified direction to external processes that no other physical theory is able too. The Second Law of Thermodynamics is a “law” that in fact presupposes transitory properties of external nature, that is, that transience is an actual part of objective (external) time. That this is a presupposition hidden in the structure of this law does not make it any less physical than the other and more causal (deterministic) laws that “presuppose” other non-empirical *non-temporal* “properties”. Quite the opposite, the relatedness to experienced properties characteristic of time give the law an empirical basis that no other law can claim. However, we shall be careful not to claim too much.

We should state that, as Eddington writes, “entropy had secured a firm place in physics before it was discovered that it was a measure of the

⁴¹⁶ Ibid., p. 90.

⁴¹⁷ Ibid.

⁴¹⁸ Ibid., p. 91.

random element in arrangement.”⁴¹⁹ Without it we are faced with a physical world that is, as Eddington says, “upside down”. It simply does not give any sense to our understanding of time to have our complete inventory of concepts discarded just because they do not correspond to those in physics. As Eddington says, “for that reason I am interested in entropy not only because it shortens calculations which can be made by other methods, but *because it determines an orientation which cannot be found by other methods.*”⁴²⁰ Still it does not establish any *identity* between “becoming” (experienced time order) and entropy. But it can be used as an indicator of *orientation* in external nature that corresponds symbolically with both the macroscopic perceived “order” of things and events as well as with the direction in our temporal experience. In order to *experience* nature’s processes *as asymmetrical and irreversible in time*, asymmetrical processes and human observers must presuppose both the objective anisotropy and direction of time. Therefore, in order to retain some “realism” to the temporal framework that will always accompany questions about time’s role in nature, in such a way that we truly are talking about a *synthetic* time, we always have to start with the foundation. This foundation is the experience of time as

6.3.1. A Comparison of Time and Entropy

“I grasp the notion of becoming because I myself become.”⁴²¹ What is fundamentally involved in this expression of becoming? Clearly one aspect is that I have a body. In one aspect we are acting in a world that is constantly changing, and thus corresponding to the flux of sense-experiences. In another aspect, I realize sadly that I myself am gradually becoming older. Hence, in my activity I produce “something” that just as well can be called “entropy”.⁴²² However, “entropy” is as a *concept* a construction due to the contemplation of the perceived facts that we have a world which different “things” change irreversibly. If I had a twin who traveled through space with high velocity, he would not travel in time but only through space. I would have aged considerably on

⁴¹⁹ Eddington, 1946: 104.

⁴²⁰ *Ibid.*, p. 109, Italics added.

⁴²¹ *Ibid.*, p. 96.

⁴²² The following points of argument have been put forward by the Danish physicist Peder Voetmann Christiansen in two papers: 1) “Har universet en tid?”, *Paradigma* 1. Årgang nr. 2, april 1987; and 2) “Absolut og relativ tid”, *Profil*, nr. 3, 1988. My attempt is here to interpret Christiansen’s thoughts.

his return 20 years later. On the other hand, my twin brother would not have had the time to produce so much entropy as I would have; he would not have aged as much as I would have. Hence, I have – through my activity in the world I live in – brought time out in the open through my activity. This time is local and irreversible. However, that I *produce entropy* through my activity and following spend my energy, is an *objective measure for the transition of time*. An *objective* time has to transform the local time to consist of a dual access to time as proposed by Eddington:

- a) The experience of the irreversible direction after which other experiences are ordered;
- b) The sense-experiences containing information of the external world, i.e., of things changing, coming and going, of births and deaths, of fires and floods, of conversations and studies, of our own aging, and of our expectations about life that are realized or not, through our actions. The time measured by the clock makes sense only because our experience of the world gives *direction* to the measure.

However, time in this respect is *local*, and to achieve objectivity we need a “field of simultaneity”, something stretching beyond the here and now of my actual experience. In an important sense we already possess such a field, as Christiansen has pointed out, in the facilities of modern media technology, i.e., the Internet, all kinds of phones, television, radio, etc. However, what we could wish is for time in the local point of view to be related to other frames of reference. Einstein did create an opportunity for invariant transformation of data. But what is actually the relationship between local time and invariant data? First of all, the local time, as a property of experience of external processes, yield asymmetry and unidirectionality. Unidirectionality and asymmetry are a fact about every local point of view, so it is not these universal aspects about time that need to be transformed. What need to be transformed are the measurements, or relations, that is, the data about the external events obtained in the local point of view. The reason *why* is that also the measurement apparatus, the clock and the measuring rod, as pointed out earlier on, undergo changes locally. Hence, the *behavior* of clocks and measuring rods corresponds to the presupposed asymmetric and unidirectional nature of what is being measured, but is itself a local “behavior” since it is not coordinated with the behavior of what is being measured. These aspects are local *particulars*, since the *behavior* of the measuring devices points out in which direction in time one is conducting one’s measuring. Nevertheless, the opinion is that accurate measurements depend on the

flawlessness of the measuring devices. In relation to our sense of the nature of real time this is clearly wrong because the best of clocks are inaccurate. This is a fact because even if the known process like friction, which is energy that becomes chaotic or random, is eliminated as far as humanly possible, there will inevitably be heterogenic interruptions of the wanted homogeneity. This also means, as Eddington has pointed out, that, “the more perfect the instrument is as a measurer of time, the more completely does it conceal time’s arrow.”⁴²³

Einstein’s many definitions of the clock show a gradual stronger emphasis on the *ideal* “non-friction”, which is a “massless” clock where nothing should be left that could indicate the asymmetry and unidirectionality of real objects and things in the real world.⁴²⁴ It is difficult to see what was to be obtained by this, except for a formulation of a pure theoretical entity, that is, as an ideally and perfectly *accurate* time measure. From the point of view of theoretical physics one might assume that real world clocks are imperfect. However, from the point of view of the real world they are actually *perfect*. Hence, any global time is an expansion of local time through a communication of the results, data and methods of obtaining the data. In the case of time the transformations applied and the invariance achieved are not the objective aspects. Only the universal characteristics involved in every local point of view indicate or point to an *objective* foundation of time.

Nevertheless, this “objective” foundation is what necessarily is “excluded” or “omitted” or “eliminated” in global transformations where measurement data are invariant with respect to any local point of view. However, here we have obtained epistemological objectivity of the measurements – they are invariant with respect to any local point of reference. The data are not *about* time; they are about whatever is *intended* to be measured. We cannot measure *time*, on the other hand, “time”, in the sense physics use it, is the *measure* and not what is being measured. But since the measure has lost its direction – because as a *measure* it has become a “particular” of some specific theoretical framework – one could, in order to account for its *objective grounding in reality*, introduce into the theoretical framework, as an explanation and justification of the measure and its real empirical context, the experiential characteristics of direction pertaining to what is being measured. To obtain such directional data one can implement the experience of the human observer, and in addition supplement it with

⁴²³ Eddington, 1946: 99.

⁴²⁴ See Ludwik Kostro, “What Is This: A Clock In Relativity Theory?”, in Duffy & Wegener, eds., 2000: 88-89.

external devices, such as, say, a thermometer.⁴²⁵ Consciousness has no problem of establishing an arrow since it is itself directed in its awareness of changing perceptions that appear ordered and irreversibly. One wishes an arrow in the world -- for the sake of having something external to the mind that can indicate the same irreversibility. This arrow, which has to be found in the world, must be a local phenomenon and analogous to the unidirectional arrow of the mind. The arrow will be found because it is an inextricable part of all external processes on the perceivable macroscopic level of reality. It is hidden in the “messages from the outside”, as Eddington says, but never in the messages from clocks. It is, however, found “in messages from thermometers and the like, instruments, which do not ordinarily pretend to measure time”.⁴²⁶

Global time is an extension of our local time perspective. As we understand it today, physical time, as the sole time concept within physics that symbolizes the irreversibility of processes in time, is in fact an extension of locally experienced irreversibility to the global or objective perspective on external matter.

Normally one thinks that objectivity is achieved when we remove ourselves from what is going to be explained. Like when we ask ourselves: “What would it look like if I was not present, if there were *no* people around to experience the phenomena in question?” The normal procedure is then to contemplate about what we bring into the picture, and about those aspects, which, perhaps, do not belong to it in the sense of being *subjective* aspects, which is brought in with experience. It is, as argued, here – within the domain of “subjectivity” that the mistakes come about, that is, we overemphasize the “subjective character”⁴²⁷ of what we bring into the picture of the world. In fact, in the context of traditional deterministic physics, epistemology and metaphysics have issued the view that *irreversibility* is something “subjective”. The evolution of this new trend within philosophy and science in particular, “gave rise to a subtle transference of ideas from ‘randomness’ to ‘lack of knowledge’ and from there to ‘subjectivity’.”⁴²⁸

⁴²⁵ As suggested by Eddington, 1946: 100.

⁴²⁶ Ibid.

⁴²⁷ In the sense of being something “private” either individually or as part of the cognitive apparatus of human beings.

⁴²⁸ Denbigh & Denbigh (1985, *Entropy in relation to incomplete knowledge*, CUP) write that “there developed a marked tendency among the 19th Century scientists to attribute any apparent randomness in natural phenomena to a lack of sufficient knowledge about those phenomena rather than to any real chance element in nature. And there remains at the present time a strongly entrenched view to the effect that entropy is a subjective concept precisely because it is taken as a measure of ‘missing information’ – information which

This line of thought is highly biased, since the determination of what is to count as subjective or not has to be based on highly “theory-laden” assumptions. These are assumptions that are always based on notions that play in the background when human thinking is at work and is, for instance, of metaphysical character. In this case the background is the ontological framework of *classical* physics. The point made here is that we do not know what the world would look like without the locally situated *experiencing* observer. We only know what it looks like if we *add* our local point of view.

There is nothing that points out *locality* as something fundamentally flawed or “wrong”, i.e. that our experiences should *not* be in accordance with reality. Time’s irreversibility and unidirectionality are objective in the sense that we can all agree upon these properties as aspects of the world at large. Time cannot be a solipsistic phenomenon. Neither can time have properties that cannot be experienced, or else we cannot talk about time at all. Hence, the objectivity of time is not that it is independent of us human beings, but that we experience, internally and externally, certain properties that we all agree upon as being properties of *time*.

So to omit unidirectionality and transitivity from a global symbol of time does not make time anymore “objective”, it only becomes simpler, easier to handle. Instead, one is hiding the only *source that can confirm time’s objectivity* behind the formal symbol-language of science. A *realist*, that is, an *externalist* account of time, cannot be an account of how time *is* in its independence of minds. The pure externalist account is a fabrication since the validity of this type of account hinges upon the claim that other worlds may exist and that these worlds may have their things ordered differently. This means that we imagine what the world would look like if the real order of events were, for instance, reversed.

The true “realist” would be one that can give an account of time from the fact that we access *temporal reality* through temporal experiences *and* sense-experiences of external phenomena of the world. Time’s irreversibility must be explained both from “within” and from “without”. We begin with experience and proceed to the concept and then to the formalized symbol. But even this course of experience is partly conditioned by our presentness, that is, our present awareness of the world and the continuous “production” of memory. Memory can only be produced by a subject that experiences things, objects, relations and phenomena, all which are “objects” that are themselves under transformation by the “fluctuation” and “dissipation” of the world. As

we *might* use but don’t, due to thermodynamic systems being incompletely specified.” (Ibid.)

experiencing subjects we are thus confronted with the visible traces of increasing entropy (increasing order and disorder) that somehow are “descriptive” for the *flux* presented to our senses. These traces are local changes, i.e., these are changes we experience; they are transformations of the external world, of the experienceable phenomena, as well as of the observer himself as an organism. However, this local “entropy”, these experienced changes that take place externally, is our opportunity to extend our viewpoint from the internal to the external, though it is still a local perspective.

Physical time as such, that is, the concepts of time within physics, is in some instant a product that has its reference to the experiencing subject. Furthermore, physics represent a form of conceptualizing or symbolizing things that dismembers “head” from “body” in regard to the phenomenon of time. Still the concepts of time are within physics in reality mere *extensions* of the unavoidable local viewpoint on time. From the subjective point of view the process of extending the applicability of time begins with the experience of time and continues with the intellectual strive towards still greater external applicability for the experience. The imaginative mind strives *outwards*, that is, towards “physical space” in an attempt to define an even more universal, global applicability of the conceptualization it has of time as an external aspect to itself.

6.3.2. The Extension of Local Temporality without Rejection of Subjectivity

Now we have to consider something about clocks and measurement of the *operational* process of *extending* the local perspective on time to a global one that does not deny its linkage to subjectivity. Now if we consider local time characteristics (for instance ones own body), one has, together with other irreversible processes, an instrument for considering the amount of time lapsed. For example Galilei had to resort to his own pulse beatings as a clock when he discovered the laws which explained about falling objects.⁴²⁹ Other processes are possibly

⁴²⁹ P.V. Christiansen, 1987: 38.

more up to the task, for instance the diffusion when we add some color to a liquid starting $t = 0$ and observe the diffusive spreading of the added color.⁴³⁰ However, other phenomena that are based upon constant dissipation are easier to apply in this respect, for instance, a clock that applies water (clepsydrae) or sand (sandglass). Indeed, all our mechanical clocks are also of this type. All clocks use or spend energy and thus produce or increase the entropy. But it is a hidden process, in itself there is no trace of “before” and “after”, of what is past.⁴³¹ This type of timekeepers are called diffusion clocks, and the time these timepieces measure is, by Norbert Wiener, called Bergson-time as opposed to Newton-time in classical mechanics.⁴³² The linkage between diffusion time and experienced time is obvious. The phenomena are conditioned by the same conditions that we are conditioned by. The phenomena are in specific aspects perceptual phenomena that are natural elements in everyday (macroscopic) experience of the world. All these types of phenomena represent the kind of time that is local.

The linkage between phenomenology and physics – as *in the linkage between processes ordered by temporal experience and processes studied and explained by thermodynamics* – is in fact a lucid viewpoint on the question on time in physics, which has been stated most diligently by the physicist Peder Voetmann Christiansen.⁴³³ It is never a question of reducing the temporal awareness to something less fundamental, say; as originating in the processes explained by the *concept* of entropy as it is stated in the second law of thermodynamics. Instead of reduction it is an attempt to see a more profound identity between the ways we experience and how macroscopic nature behaves.

In 1905 Einstein discovered the Brownian movements.⁴³⁴ In this theory a connection between diffusion and dissipation was established. Later Callen and Welton named the connection “the fluctuation-dissipation theorem”.⁴³⁵ Christiansen explains that the purpose of the theorem is to secure the “same time” whether we are using a diffusion clock or some other mechanism that dissipates. The connection expresses that random “forces” or “conditions” or some “influence” – that are responsible for the diffusion and the Brownian movements of *small* particles – are the same as those that are responsible for the

⁴³⁰ Ibid.

⁴³¹ For readers interested in the *development* of timekeeping, clocks and the measurement of time, see Gerhard Dohrn van Rossum, 1947, *History of the Hour, Clocks and Modern Temporal Orders*, The University of Chicago Press.

⁴³² P.V. Christiansen, 1987: 38.

⁴³³ Ibid. In the following I will try to give an account of Christiansen’s thoughts.

⁴³⁴ A. Einstein, 1956, *Investigations on the Theory of the Brownian Movement*. Dover Publications, Inc.

⁴³⁵ P.V. Christiansen, 1987: 38.

dissipation or friction of *macroscopic* movements. There will always be some degree of “noise” involved in irreversible processes. However, the “noise” is not something that we – in practice – have to considerate, since our surroundings and we are not in a state of thermodynamic equilibrium. For instance, if the dissipate forces “makes” a macroscopic body, say, a pendulum, to stop, i.e., to reach equilibrium, it will not be at absolute peace but perform Brownian movements about the position for equilibrium.⁴³⁶ According to Christiansen, the energy of these movements is at normal temperature approximately 4×10^{-21} joule. This is so little that it almost disappears in comparison to the energies we have available in the far-from-equilibrium condition of the universe when we start the movement of the pendulum at, say, 1 joule.⁴³⁷ However, we can imagine that these Brownian movements, in themselves, could with time have enough energy produced to cause the pendulum to begin swing “on its own accord”, or rather *spontaneously* at 1 joule. This is improbable. Therefore, for a pendulum to begin its movements at the point where the energy of 1 joule is reached, we must conclude with certainty, says Christiansen, that someone *pushed* it in the *past* and that it will again stop in the *future*, *unless someone pushes it again*. This is a *retarded response* in macroscopic physical systems: these systems are *retarded* since the activity *always is caused by past stimuli* – never by future stimuli. And in this sense we *find* irreversibility as the most characteristic aspect in our surroundings.

This “irreversibility” is to a very important degree a *presupposition* for our particular form of perceptions, cognition and thus for the experience of the world itself. It is so significant that without it we would lose our feeling of continuity; we would lose the “wholeness” we find in our own world picture and thus we would lose our minds. Therefore, all talk of “advanced response” is idle talk.⁴³⁸ Because what in reality forbids all talks of advanced response is precisely our local point of view, that is, our temporal experiences and the “thermodynamics” of our perceptual surroundings.

Christiansen correctly states that if we are to talk about stimuli and response we have to refer to memory, which is the only instance that *secures* that the system was undisturbed in the past, that is, before we introduced our “stimulus”. Therefore we can state that – as Christiansen does – memory is a *presupposition* for *physical*

⁴³⁶ Ibid.

⁴³⁷ Ibid.

⁴³⁸ Ibid. *Advanced response* is connected to the notion of *time-reversible processes*, processes that are – in the metaphysical cosmology of static time -- “caused” by *future* events. What comes first in experience is illusion because “in reality” it is -- so it goes -- only the effect.

irreversibility in the sense that it leads us to the selection of the retarded response-functions and the rejection of “advanced” ones.⁴³⁹ On the other hand, we have to state that *irreversibility* must be understood to be a *presupposition* for memory.⁴⁴⁰ Memory depends on the fact that external processes leave behind some traces and evidence of what have been taking place in the past, that there is a “differentiation” or “transformation” taking place in nature, which result in visible aspects, traces of past processes. Eddington said that we are not ignorant of the nature of organization in the external world. And this goes for the concept of “becoming” as well. The quality of the external world is “so welded into our consciousness that a moving on of time is a condition of consciousness.”⁴⁴¹

The next step on the route to a global time is to accept that “thermodynamic”, irreversible time, which is measured by local processes, is the fundamental *perspective* on time. And if this is so, then there should be no problem to proceed to the mechanical time and from there on to the astronomical.⁴⁴² This means that we have to proceed from our use of sandglasses and other diffusion clocks to the application of mechanical clocks that – although they dissipate – are more “precise”.⁴⁴³ This again means that we have already secured a fundamental identity for time in external nature in nature’s *irreversible* and *unidirectional* “processes”. Furthermore, we have used

⁴³⁹ Ibid.

⁴⁴⁰ Ibid., pp. 38-39. It is as I have stated before: Our experience of time must itself presuppose *time*.

⁴⁴¹ Eddington, 1946: 97.

⁴⁴² P. V. Christiansen, 1987: 39.

⁴⁴³ Ferdinand Gonseth, has asked the following important question in his paper “From the Measurement of Time to the Method of Research”, in Jiri Zeman (ed.), 1971, *Time in Science and Philosophy*, Elsevier Publishing Company, pp. 277-305 (277), “Are we quite certain of what is exactly meant by the words *time* and *measurement* before a timepiece is constructed?” And his answer is as simple as it gets: “Generally speaking, a *clock* is simply a very observable phenomenon, the temporal law of which is known.” However, this does not state that a “clock” that measures real (heterogeneous) time is less precise because it is not a mechanical clock. This is to say; it does not measure the time or processes *homogeneously* (in this sense precise) as the mechanical clock do, because it corresponds with the rhythm of the process itself. Thus, Gonseth states that any kind of observable “clock” or process will do as long as one agrees upon the use and application of it as a measure, that is, as a “temporal law” of that which is perceived. Thus, we have to differentiate between 1) ontological “precision”, that is correspondence between the applied measurement and device and the heterogeneous rhythm of external process, and 2) scientific precision that aims at a result that is in all aspects homogeneous as a measure. The “homogeneous” measure does not and cannot “copy” the rhythm of the external process that is measured. Needless to say, it is this last measure – understood as a piece of information gained by applying, say, a mechanical clock – that is the type of measure-convention that we have become accustomed to for the sake of quantifiable precision.

these characteristics to establish a linkage⁴⁴⁴ to the characteristic irreversibility and unidirectionality that is the essential characteristics of human temporal experience. It is from this point onwards that we have to worry about how we should go about in order to create a measure that yields global invariant precision. It is as Richard Schlegel writes, “Our concept of time is based on two kinds of natural processes: those with progressive, non-cyclic change and those which undergo cyclic change. The former define a directed, increasing property of time, the latter the quantified measure of time.”⁴⁴⁵ However, it should be noted that cyclic *change* is still *irreversible* change, that is, as a process it does not repeat itself because each time a new process develops – each process has its own uniqueness. There is nothing homogeneous about these “cyclic” processes. Homogeneity is only obtained by abstracting from the differences in the processes and by isolating a generalized pattern of cycles.

All kinds of clocks need some kind of energy in order to tick. Clocks are either wound or driven by batteries or some other source of energy in order to function, and this specific function of clocks will again eventually create heat generated by friction or dissipation in the mechanical parts of the clock. The fundamental point to be made by this is that the time parameter t has to be defined by the fundamental irreversible time measure. Thus, it should not be a problem to apply mechanical clocks for precision.

The reason for this is that fundamental time is not *precise*, that is, from a strict mathematical point of view. Our fundamental time is never “precise”, definitely not in the same sense as in the *function* of the “time” that we *derive* from it. The sole purpose of the derived “time” concept is “*precision*”. Thus, the *precision* of the symbolic time-measure is not something that can be found as a constituent property of the objective (external) world, but stems from the local point of view – as has been argued earlier. It stems from our local viewpoint because it is intimately connected to the *interpretation* and thus with *subjectivity* in its *contemplative* mode. Hence, it should be obvious that mechanical time is secondary; something that merely is *derived* from its primary, that is, it’s more *objective* source. The objectivity of time measurements

⁴⁴⁴ First by some “analogy” based on experience, but also – perhaps more so - by the necessity of experience to be (somehow) grounded in nature, at least adapted to the characteristics of external nature perhaps through evolution. Just consider John Cohen’s opening claim in his paper “Time in Psychology”, in Jirí Zeman, ed., 1971: 153-164. Cohen writes: “A scientific world picture with pretensions to comprehensiveness cannot refuse to reckon with human experience, which is itself part of nature, and, in particular, with the experience of time.” (P. 153). This is exactly what I have stated.

⁴⁴⁵ R. Schlegel, “Time and Entropy”, in Jirí Zeman, ed., 1971: 27.

is testified, according to Gonseth, only by “the practical exploitation of the temporal solidarity of the phenomena.”⁴⁴⁶ However, still according to Gonseth, this approach only presents us with one particular point of view. Because, he writes, “from a certain level of technical capacity onward, this first aspect is apparently disguised and cloaked by another aspect, that of precision.”⁴⁴⁷

That precision and objectivity are “connected” to each other stems from the demand found in our need to communicate and to make every little thought public. When time is concerned we cannot do without the ideals to which we strive to adapt our practical-technical reality of time-measurement.⁴⁴⁸

In this sense one almost becomes suspicious of science and human intellectual striving in relation to the significance a fundamental reality as time has to us humans. The suspicion is that science and abstract thinking are not a disclosure of the mystery of time. However, human interaction and communication emphasize “precision” in several aspects, like for instance precision in speech, in fact *it all comes down to inter-subjectivity*. Thus, in some aspects, for the sake of precision and inter-subjectivity we sacrifice essential aspects of reality. No one doubts that technology and natural science have secured considerable “gain” for us.

The role of experiential time and derived time has changed places in the ontological scheme of things. The absurdity goes even further in that it is demanded that since temporal experience is not precise – in the manner time is presented on our clocks, it must be an illusion. But one should not, at least in ontology, *exchange* the temporal reality, which must be presupposed in whatever epistemological context, *with* the demand for global invariance in universally applicable formalisms. This “invariance” only secures for us some kind of pragmatic utility. Or it gives something *external* to our related ideas

⁴⁴⁶ F. Gonseth in J. Zeman, 1971: 284.

⁴⁴⁷ Ibid.

⁴⁴⁸ Gonseth writes (p. 287): “Of course, to certain and possibly essential extent, the progress of clock-making technology has been inspired and oriented by a theoretical ideal, by the abstract model of the isochronic oscillator. The word *abstract* should mean here that it is a question of a model of a mathematical character, conceived according to the principles of so-called rational mechanics. The efforts of technicians and practitioners have long tended, and still tend, to realize this model as perfectly as possible...all research was oriented...towards the realization of conditions, which, in the ideal model, ensured the correct functioning of the isochronous oscillator. The improvements and discoveries to be made on the technical level seemed to answer the need for a *guiding principle: that of seeking an ever-greater approximation of the theoretical model*”. To be more *precise*, the ideal in clock-making industry is that of *sustained isochronic oscillation*, (Zeman, ed., 1971: 289).

of epistemological “objectivity” for the concept. However, we are thus made to believe that we can state sane things about the “real” nature of time simply by replacing the local with global “invariance”. Or we could state the contrary that it is one of the great mistakes that one simply has confused and made a Gordian knot of the issues of subjective and objective time.

The present is a *characteristic* of the observer (I am not stating that the present only belongs to the perceiver). Thus, the *now* of the observer can never be taken as something that can be *isolated from its experiential context*, that is, isolated from its necessary interconnectedness to the past. It is the *wholeness or the totality of experience* that yields something temporal that we can recognize as corresponding to the temporality of the world at large, that is, the characteristic temporal properties related to real processes such as *irreversibility, transience* and *unidirectionality*. That these properties of time cannot be part of any existing physical theory does not mean that they are not global (real, objective), ontic features of time. Even if these properties cannot be “measured”, they are, nevertheless, global properties in the sense that they belong to every local frame of reference with or without an observer present. The characteristics are global *through* the local, since “globality” is strictly speaking a theoretical term that refers to a theoretical/epistemological context based upon the necessity of “inter-subjectivity” for the sake of communication. Whereas locality refers to *actual* experiences of correspondence between experience and external properties *and the “inter-subjectivity” presupposed of these connections*.

The “reality” of time is intertwined with cosmological notions. Both common sense and scientific ideas are full of metaphysical background theory, which indirectly operate upon our cognitions of the world, as they manifest themselves as commitments in our interpretations. What is this “background” that plays such a major role in committing the scientists and philosophers to views that become structures of their scientific theories? To understand how time is “something” that is imbedded deeply into this world we also have to have some idea about how the world is working. Thus, it is evident that the further away our commitments about reality are from our experiences of it, the more indebted are our commitments to ideas and theories that claim to disclose reality without the aid of experience. These ideas and theories function not only to convince the protagonist of the legitimacy of his own endeavors, they also make him want to convince others of their truth. These ideas also function in the sense that they serve to give *justification* to these commitments. And concerning *time*, that is, when the issue consists of the *theoretical* problem of deciding which time is the *real* time, it is naturalism and

determinism that have played the significant role of forging a background to the scientist and philosopher.

7

Determinism, Laws of Nature and Time

Now I continue with something that I have only touched upon in previous chapters, and especially in connection with Einstein's view on the "nature" of real time. I believe it will be important for our revised understanding of "objective time" that we now look at the metaphysical ideas that have been infused into the anatomy of the "objective time". I will therefore proceed by discussing the following question: What is the connection or conceptual relationship between "laws of nature", "a deterministic world", "universality", "symmetry", "a fundamental nature" and *time*? These are metaphysical-epistemological elements that are deeply rooted in the scientific investigation of nature. Furthermore, these elements constitute the most important elements of what we will refer to as the "naturalistic doctrine".

In the present chapter I will give a short history of the kind of *rationality* that is characteristic of a thinking that ventures into a description of "existence", "reality" and "the world" in terms a naturalistic, and/or scientific framework. "Determinism" and "universal laws of nature" are key terms in this doctrine, terms that are assumed to be necessary for the scientist in order to understand correctly the essential ideas and concepts not only of mind-independent nature, but also of time, mind and matter as well.

First I will give an account of the assumed "nature" which is generally descriptive for most classical laws of nature. I will end the discussion by bringing up close the interrelated problem of "fundamentalism" in science.⁴⁴⁹ "Fundamentalism" is, in relationship to our context about the "nature" of time, in reality about an *ideal* that connects the realm of deterministic thinking to the belief that symmetrical laws of nature disclose, through their explanation of macro levels of matter, immanently hidden levels of non-temporal reality. To be more precise, fundamentalism is the belief in a reality existing on a micro level within matter, which constitutes the real reality of the entity of which it is a part. Thus, "fundamentalism" is also intimately connected to "reductionism".

⁴⁴⁹ I have taken the term "fundamentalism" from Nancy Cartwright, 1999, *The Dappled World*, Cambridge University Press. See especially pp. 24-28.

In my opinion there is a metaphysical conceptual relationship between such ideas as “*determinism*”, “*symmetry that defines the universality of the laws of nature*”, “*laws of nature*”, “*fundamentalism*”, “*reductionism*” and “*objectivity*”, and which entails the doctrine of “*metaphysical realism*”. However, we will have to distinguish between forms of “*determinism*” since prediction with a short time-interval between the predicted event and the event itself is fairly valid, that is, epistemologically speaking. I will, however, be rejecting any kind of ontological determinism. Likewise, I will reject any kind of hypostatization of abstracts that does not reckon with experienceable temporal properties of reality.

7.1. A Brief Historical Outlining of the Rationale behind the Ideal of Symmetrical, Fundamental and Deterministic Laws

The ideas of the Eleatics and of Plato constitute the ideological core of modern natural science. The “core” consists of a set of beliefs that is crucial to a form, or style, of scientific thinking that we, conventionally, label *rational*. In fact this belief in the “rational”⁴⁵⁰ has been instrumental in the development of modern ideas about a “non-temporal universe” that simply *is*, that is, it does not evolve or become.⁴⁵¹ Thus we can say that the style of thinking we find within

⁴⁵⁰ “Rational” comes from the Latin word “*ratio*” meaning “thought” or “of the mind”. But now, in our present day, the word means the same as “being able to determine” which, however, must include, in order to be rational, that which is being determined as something entirely “independent of mind”.

⁴⁵¹ For a more extensive reading about this one could consult the writing of Milic Capek. See for instance his “Introduction” to *The Concepts of Space and Time*, BSPS, Vol. XXII, 1976. Interesting is also Edmund Husserl’s *The Crisis of European Sciences*, 1970, Northwestern University Press. Following, I will go into detail on the aspects that I believe are of the utmost importance to our understanding of the development of today’s concepts of “objective” time that is devoid of any “subjective” content and the inherent belief that this is “rational” and that we thus have concepts that correspond to an external and subject-independent nature as it is in-itself. However, the following is not a question of the intrinsic validity of science, I am not to be understood to be dismissing science. I do not intend to question science itself but the static and *fake* non-temporal “realistic” interpretation of it. What is questioned is the notion that nature “in itself” is mathematically structured, that time and everything “real” is mathematizable, that the universe can be described by applying deterministic laws because the universe or, reality, is in itself deterministic.

the physical sciences today, like it is presented through Einsteinian physics and quantum physics⁴⁵² has its origins in the thinking of Parmenides and Plato. The style of thinking got its *modern* features through the scientific ideas of Galileo Galilei.

Nevertheless, before we can go ahead with the Eleatic-Galilean styled thinking within *modern* science and philosophy of time we have to take a look at the very first *known* tendencies to “freeze” time.

The “eternism” of Parmenides is the *fundamental* idea. He formulates the idea as follows. Whatever that can be said to *be*, that is, what actually *is*, can have no beginning or end. If it had a beginning and an end, then, before or after, it would not *be*, and that is excluded according to Parmenides. Furthermore, in addition to “Being” having no beginning, he formulates the following proof: “What necessity would force it, sooner or later, to come to be, if it started from nothing? ... It neither was nor will be, since it is altogether now.”⁴⁵³ To sum this up in the words of B. Williams: “Here Parmenides gives the first expression to an idea of eternity.”⁴⁵⁴

However, Parmenides’ denial of becoming was too radical for the atomists. The atomists retained the principle of the immutability of Being in a slightly different way, so as to make the principle of the immutability of Being *fit* experience. Democritus, Epicurus and Lucretius did not deny change and becoming, they reduced it “to the displacement of the atoms, each of which was the Parmenidean *plenum* on a microscopic scale: uncreated, indestructible, immutable, impenetrable”, as Capek has put it.⁴⁵⁵ The universe of the Eleatics consisted of matter and void and there was no place for time. Therefore, time was explained away as “appearance” (Democritus), “accident of accidents” (Epicurus), and that time has “no being by itself” (Lucretius).⁴⁵⁶ Capek comments on these sayings by stating that time become “a mere function of the changing configurations of the immutable particles.”⁴⁵⁷ And thus the relational theory of time was born.⁴⁵⁸

⁴⁵² Well at least according to Edmund Husserl’s *Crisis* and Aron Gurwitsch’s interpretation of it. See Gurwitsch’s paper “Comment on the paper by H. Marcuse”, in R. S. Cohen & M. W. Wartofsky, eds., 1965, *BSPS, Vol. II*, p. 292.

⁴⁵³ Here Parmenides is quoted from B. Williams, “Philosophy” in M.I. Finley, ed., 1988, *The Legacy of Greece*, Oxford, p. 220.

⁴⁵⁴ *Ibid.*

⁴⁵⁵ M. Capek, “Introduction”, in M. Capek, ed., 1976, *The Concepts of Space and Time*, BSPS, Vol. XXII, p. xxvii.

⁴⁵⁶ *Ibid.*

⁴⁵⁷ *Ibid.*

⁴⁵⁸ *Ibid.*

With *time* as a *relation* between things philosophers focused their attention on the regularity and periodicity of the celestial motions as well as on day and night, the differing seasons throughout the year and all “events” that could be measured. Thus, importance was growing for the *metrical* aspect that can be applied to “time” as well as for the notion of *regularity* and *homogeneity* of the motions. Furthermore, the cleavage between experience that is fundamentally qualitative and the mathematical aspects became gradually more marked by the lack of corresponding properties between the two.⁴⁵⁹

The Parmenidean conception of the universe was extreme; however, the *influence* of his ideas has persisted throughout history as elements and aspects in the theories of other influential thinkers. Parmenides’ conception is actually of something to which no temporality apply at all. We cannot separate between past, present and future in the realm of perpetual present; of Being; of that, which simply is, and does not become or change. There is only that which *is*, that it *was not* is excluded. Therefore, in Parmenides’ point of view, Being is “uniform, unchanging, has no divisions, is the same under any aspect...”⁴⁶⁰ This concept of eternal, unchanging and uncreated being has, through Plato’s thinking, had a major impact upon the course of especially modern philosophical and scientific development. Hence, Plato applied the idea of “uncreated Being” in his characterization of the Forms. And the Forms are to be understood as the *fundamental forms of reality* that exist beyond any shape or seize that exists as something that can be presented to our senses and experience.

Thus, we find what can be termed as “Platonic-Parmenidean Reason”, that is, “Greek Reason”.⁴⁶¹ There are some very specific implications of this concept of reason. First of all, and with particular reference to the above notion of a static and uncreated world, we find that in the context of Plato’s thinking the true Being becomes *ideational* Being. That is, this is not the kind of being that “we experience immediately in the flux of our empirical, practical world”, as Marcuse puts it.⁴⁶² This is, according to Capek, the same as to say that we have a “coeternity of truth and fact.”⁴⁶³ This implies as Marcuse points out that the validity of reason is “supra factual” and “supra

⁴⁵⁹ Ibid.

⁴⁶⁰ B. Williams, in M.I. Finley, ed., 1988:221.

⁴⁶¹ See Herbert Marcuse, “On Science and Phenomenology”, in R.S. Cohen & M.W. Wartofsky, eds., 1965, *BSPS, Vol. II*, pp.279-290.

⁴⁶² Ibid., p. 281.

⁴⁶³ Milic Capek, “The Myth of Frozen Passage: The Status of Becoming in the Physical World”, in Cohen & Wartofsky, eds., 1965, *BSPS, Vol. II*, p. 443.

temporal”.⁴⁶⁴ The fundamental and real nature of reality can only be discovered, disclosed and defined by this kind of rational reason, and thus, as rational, it has the mandate to overrule, that is, to put itself up and against anything which is given to experience immediately. Marcuse writes that: “Reason establishes an authority and reality which is...antagonistic to the immediately given facts”.⁴⁶⁵ Thus, the characteristic cleavage in modern temporal realism between immediate experienced reality and the world as it “is” in objective scientific truth is as old as philosophy itself.

The set of beliefs we find within the modern temporal realism is identical to the set of beliefs that is part and parcel of the modern realistic interpretation of physics. This realistic interpretation was developed in the years from approximate 1600 to 1700. The goal of this interpretation was to pierce through all our common sense deceptions, to disclose the real mathematical structure of the universe; it’s deterministic and non-temporal being, to open up for a reality that is a mathematical manifold. Modern science starts by refusing to accept our common sense experiences at face value.⁴⁶⁶ What is of concern here is, as Aron Gurwitsch says, “the problem of the very existence and the sense of science... (that is) the conception of nature as in reality possessing a mathematical structure.”⁴⁶⁷

We can conceive of a nature that is disclosed as mathematical but without the aid of our immediate experiences because the experiences are taken to be deceptions or illusions. The world is not *believed* to be what it looks like. Only mathematical construction can discover the true condition of the world. Thus, one overlooked the fact that there are several mental operations involved in the performed conceptualizations. One omitted mental processes such as, for instance, the idealization, or formalization, which are crucial for the generalization of the conceptualized content. What happened was exactly the same as when the temporal realist attempts to *hide* subjectivity behind the product of his formalizations in our time. Thus, focusing on the formalized product one can discard the producing activity or the originating qualities from which the products spring. It is natural that the failure to refer the products and results to our mental operations from which they derive makes oneself the captive of

⁴⁶⁴ Marcuse, “On Science and Phenomenology”, p. 281.

⁴⁶⁵ Ibid.

⁴⁶⁶ Gurwitsch, 1965, “Comment on the Paper by H. Marcuse, p. 293. Others with similar viewpoints are P. Feyerabend, 1993, *Against Method*, Verso: London – New York, and of course E. Husserl, 1970.

⁴⁶⁷ Ibid. p. 294.

one's own creations.⁴⁶⁸ Furthermore, it is not enough that we lose sight of our own creativity when we create, because, as Einstein has commented, we want to regard the products of our imagination as nature in itself because they appear necessary and natural. Thus, we also would like others to regard them, that is, as *given realities*.⁴⁶⁹ Therefore “a cloak of mathematical ideas and symbols, metaphysical ideas, is cast upon the world of experience so as to conceal it to the point of being substituted for it.”⁴⁷⁰ Method becomes reality.⁴⁷¹ This means, in Husserl's context, that the ideas and symbols that are involved in the constitution of mathematical theories – ideas that thus facilitate the application of mathematics to the science of nature, become the “whole thing”. Hence, this new *mathematical* science encompasses everything that represents the “life-world”, that is, the world that is also found in human experience. In fact “it (*mathematical* science) dresses it up”, as Husserl says, “as ‘objectively actual and true’ nature.”⁴⁷² Through this complex of ideas we start to believe that it is the *true being* which is actually a *method*.⁴⁷³ Thus, we arrive at the conception of reality as being a mathematical manifold.⁴⁷⁴ And of special interest in the present context is that temporality must be looked upon as one of the most important customs or habits of nature; thus, time is a typical feature of natural behavior. However, not that kind of behavior that we experience but otherwise *disclose* as *fundamental* to processes on the *microscopical* and assumedly “*constitutive*” level of nature. Thus, we have a formula world of physics that works as a framework for the thinker that operates with the given formulae. As Husserl writes: They are “constantly oriented in their work toward ideal poles, toward numerical magnitudes and general formulae.”⁴⁷⁵

Historically speaking this specialization of a narrow and restricting scientific thought began with Galilei Galileo and his invention of the *universal law*. In the words of Husserl:

The “a priori form” of the “true” (idealized and mathematized) world, the “law of exact lawfulness”

⁴⁶⁸ Ibid., p. 300.

⁴⁶⁹ Einstein, “On the Method of Theoretical Physics”, *Ideas and Opinions*, Wing Books, 1954, p. 270.

⁴⁷⁰ Gurwitsch, p. 300.

⁴⁷¹ Gurwitsch, *ibid.* See also E. Husserl, 1970: 51.

⁴⁷² Husserl, *ibid.*

⁴⁷³ Ibid.

⁴⁷⁴ Gurwitsch, p. 300.

⁴⁷⁵ E. Husserl, 1970: 48.

according to which every occurrence in “nature” – idealized nature – must come under exact laws.⁴⁷⁶

The “ideal poles” are at the center of interest in all physical inquiry. What is discovered is discovered in the “formula world”, which thereafter is coordinated with nature.⁴⁷⁷

The coordination with nature is, of course, coordination with the whole set of metaphysical-epistemological ideas making up the notion of nature as *mathematically* structured, that is, with a suitable *ontology*. Thus, the substitution of *idealized* nature, which is ontology, for primitive or common sense experience.

For Galilei the course of action was to abstract from individual lived life; from whatever spiritual or mental; from cultural aspects as well as from those aspects of existence that are attached to things in human praxis.⁴⁷⁸ However, along with the mathematization of nature we also find the idea that is so crucial to the idea of a *deterministic* non-temporal universe. This is the idea that reawakens the Parmenidean notion of uncreated being and Democritean or atomistic self-enclosed natural causality. This is a causality in which *every occurrence is determined necessary or unequivocally and in advance*. Thus, we see that Galilei has opened the path for dualism to enter the arena of natural philosophy. The notion was to have a separation of reality in two worlds: nature and the psychic world. The first division was, as we know, Platonic, the second one was Cartesian. Thus, it is important to understand that the consequence of the separation of the objective world from that of the subjective is that the latter, psychic world, does not achieve the status of an “independent world”. On the contrary, the “psychic world” is dependent upon the world of matter as it was conceived in a scientific-theoretical construction. What else is, this separation led to a belief in an absolute distinction between the subjective and objective realms of being. The absolute line of demarcation thought to “exist” between, that is, to split the two worlds. From the point of view of objectivism, this was necessary because the real mathematical world of science should not be linked to the mental and relative world of subjectivity. In any case, as Husserl points out, “natural science possessed the highest rationality because it was guided by pure mathematics and achieved through inductions, mathematical results.”⁴⁷⁹

⁴⁷⁶ Ibid., p. 53.

⁴⁷⁷ Ibid., p. 48

⁴⁷⁸ Ibid., p. 60.

⁴⁷⁹ Ibid., p. 61.

The rational scientific world consists of bodies, a “world” that exists in itself. As we have pointed out before, a world that exists in itself must be a strangely “split” world. It is strange in comparison with our common sense experiences of the world because this one is split into the realist notion of “nature-in-itself” *and* a mode of being that is *absolutely distinct or different* from this, namely of what exists psychically. In the years after Descartes subjectivity became more and more separated from the rational scientific sphere. Thus, we can claim that the dualism, which Descartes perhaps founded upon Galileo’s idea of a self-enclosed natural causality in which every occurrence was determined unequivocally and in advance, is the reason for all these perplexing fiction-story problems believed to concern reason.

The amputation of the psychic from “the scientific real” causes difficulties whenever we are trying to determine the true source of “time”. The problem consists of the intuitive knowledge that the natural philosopher has of the *source* of his own knowledge, namely his own experiences and thoughts. These subjective manifestations clash against the nexus of assumptions and notions that constitutes his rational scientific ontology. What legitimates, and thus removes the doubts that the natural philosopher might have about the independence of his “objective and rational knowledge”, is an escape into the new psychology facilitated by the division of nature and spirit. This is to say, the subjective-objective distinction, which is a presupposition for the specialization of the sciences, and thus also the foundation of naturalistic psychology that holds subjectivity to be the nest of illusions. Thus, the Cartesian doctrine states that bodily and psychic “substances” are split apart by radically different attributes found to be fundamental to that kind of rationality which holds nature to be determined and non-temporal, since it is believed to be causally law-governed and mathematically representable. Thus, we see that Husserl, who claimed that “the naturalization of the psychic comes down through John Locke to the whole modern period up to the present day”, has pointed out the further historical development.⁴⁸⁰ Hence, as Capek points out, “what was relatively new in Locke was his interest in the introspective basis of our awareness of time. From this time on, the distinction between *subjective, psychological* and *objective, physical* time gradually became common.”⁴⁸¹

The scientific rationalism project looked upon as a whole, which includes dualism, non-temporalism, determinism, naturalism, scientism/psychologism, is surely an attempt to extrapolate an

⁴⁸⁰ Ibid., p. 62.

⁴⁸¹ From M. Capek’s “Introduction” to *The Concepts of Space and Time*, M. Capek, ed., 1976, BSPS, Vol. XXII, p. xxxv.

epistemological-ontological model. It attempted “to classify thought in particular cases or situations, to the whole of reality...”, as the philosopher Owen St. John writes.⁴⁸² It was necessary for the concept of rationality that rationality was to be *uniform* and *conventional*, that there was no room left for subjective whims to enter the arena. However, as St. John says, in arguing that some particular thoughts are universal while others are not is to pass over from science to metaphysics. He writes:

We can never extrapolate from a deliberately restricted sphere to all possible spheres, to all aspects and levels of existence... We can never arrive in science at an unconditional generalization that everything, under all possible conditions, everything that is, or will be, or has been, is of such and such nature and behaves in such and such a way.⁴⁸³

If a deterministic, non-temporal universe is real, then we have a science that can transcend all possible experience. It can transcend experience because it can go beyond the temporal limits that are somehow put on experience. It can state unconditional knowledge about a universe that does not conform to the conditional thinking that is based upon experience. The metaphysics behind this kind of science have no *temporal* limits to knowledge, which are in deep disagreement with the stated empirical temporal limits that we, the experiencing individuals of the world, have to obey in order to have coherent and corresponding knowledge.

7.2. The Metaphysical “Nature” of the Laws of Nature

Historically speaking the removal of “natures” from scientific language has been metaphysically necessary. First of all, because science became something significantly independent from philosophy with its emphasis on inductive and/or hypothetical-deductive method, measurement, and its own specialized language. As the renowned historian of philosophy, Wilhelm Windelband has argued, the

⁴⁸² Owen St. John, “Nature, Life and Mind”, in John Lewis, ed., 1974, *Beyond Chance and Necessity*, Carnstone Press, p. 76.

⁴⁸³ *Ibid.*

independence of modern philosophy gained “the aid of a conscious use of a scientific method”. From this basis of method, from this new position the new brand of philosophers became able to “determine the new movement of thought as regards both form and content.”⁴⁸⁴ In other words, the new thing, which helped shape the new way of thinking, its “form” and “content”, was not so much all the new conceptions with new content, as it was a *methodical reflection*⁴⁸⁵ that was correlated with metaphysical ideas concerning both ontology and epistemology.

For example, the idea about “natures”, or in other words “essences”, that there exists an operative and active “nature” (“*natura naturans*”) is immanent in physical things that determine their behavior. When the idea about “natures” was removed from the scientific terminology another idea had to take its place: We got “laws of nature”. Thus, the focus of attention shifted from a qualitative knowledge of “capacities” to knowledge about “regularities”. In fact it was merely a modification of the philosophical/scientific language – laws are a better way of formulating qualitative and vague “natures” using definitions that apply quantities and formalizations. In other words, using the knowledge of natures or capacities as a basis, knowledge about regularities are necessary in order to effect the surrounding world by making reliable predictions about it.⁴⁸⁶

Epistemological theories about the laws of nature most often have a distinction between “phenomenological” laws and “theoretical” laws.⁴⁸⁷ Phenomenological laws *describe* the macro-world of experience, or appearances. On the other hand, theoretical physicists will apply theoretical laws of nature in order to *explain* the reality behind appearances. The epistemological aspect is that phenomenological laws are descriptive of physical objects that in principle can be *experienced directly*. Theoretical laws can only be grasped through indirect inference.⁴⁸⁸ This situation in theoretical physics about a distinction between levels of reality corresponding to different expressions of laws are analogues to the situation I have described as constituting the disjunction problem within the philosophy of time.⁴⁸⁹ The problem is furthermore reducible to the related problem of the subject-object dualism that has been described. Nevertheless, it is clear that the

⁴⁸⁴ See Wilhelm Windelband, 1958, *A History of Philosophy, II, Renaissance-Enlightenment-Modern*, Harper Torchbooks, New York, p. 378.

⁴⁸⁵ Ibid.

⁴⁸⁶ See Nancy Cartwright, 1999, *The Dappled World*, Cambridge, p. 47.

⁴⁸⁷ See Nancy Cartwright, 1983, *How the Laws of Physics Lie*, Clarendon Press.

⁴⁸⁸ Ibid.

⁴⁸⁹ See my chapter 4.4., “The Problem of Disjunction”.

theoretical and unobservable laws of nature stand out as the more *challenged* metaphysical assertion. However, realists talk about these laws as fundamental for the ontological grounding of real time since the very same “nature” of time seems to play a fundamental role in defining the characteristically atemporal and symmetrical nature of laws that is asserted to be about nature as it is in-itself. These laws are claimed to be able to present descriptions about how reality, that is, the “reality” that is “fundamental” for the experienceable world, behaves so that we can have the *appearances* we habitually call reality. The protagonists who defend the reality of theoretical laws are typically realists. On the other hand, anti-realists typically reject the reality of such laws.

Central to the thinking about laws of nature and their characteristics is the assumption that things happen because everything depends on conditions. When things happen, when we can witness an event it is because these conditions are met. It is the “dependence” upon conditions that is of interest since this dependence can be regular or not.⁴⁹⁰ If things happen in a certain regular manner, that is, when things that happen fit to determinate patterns then we have something happening in a *lawful* manner. This “lawfulness” is the same as “conformity to law”.⁴⁹¹ Universal lawfulness says that every event and all kinds of happenings and occurrences are lawful. This means that they are determined in accordance with objective laws.⁴⁹² Thus, we get the “principle of lawfulness”, in the words of Bunge: “Everything happens in a conditional and altogether regular way – in short, in a lawful, necessary manner.”⁴⁹³

Thus, there are at least two types of laws.⁴⁹⁴ The most familiar ones are “associative laws” applied to connect two phenomena associated together whether they are qualities or quantities. According to Cartwright these laws can be probabilistic, deterministic or universal.⁴⁹⁵ The essential characteristic with these types of laws is that they are “causally neutral”, that is, they do not refer to causes in order to explain what might be “behind” the occurrence. An example of an associative law is for instance the situation of mixing colors: When you mix equal parts *yellow* paint and *blue* paint, the consequence will always be a mixture of *green*.

⁴⁹⁰ See M. Bunge, 1979, *Causality and Modern Science*, Dover Publications, Inc. New York, p. 22.

⁴⁹¹ Ibid.

⁴⁹² Ibid.

⁴⁹³ Ibid.

⁴⁹⁴ N. Cartwright, 1999, *The Dappled World*, Cambridge, p. 21.

⁴⁹⁵ Ibid.

The other kind of law is the “causal law”. Here is the kind of law that explains occurrences and events by referring to certain underlying causes.

Hence we have to define “laws of nature”, which according to Cartwright are as follows:

Laws of nature are descriptions of what regularly happens, whether regular associations or singular causings that occur with regularity, where we may, if we wish, allow counterfactual as well as actual regularities or add the proviso that the regularities in question must occur by necessity.⁴⁹⁶

Following Cartwright’s definition we see that a law in a sense is a consequence of an event that has certain specific similarities to other events. This might give us the impression that the event on a more abstract level has some sort of inherent “mechanism”, a “fundamental nature”, that is similar or identical to the “mechanism” inherent in other events. Then, laws of nature are, as C. S. Peirce wrote, “...prognostic generalizations of observations”.⁴⁹⁷ The generalizations that are based upon abstracted mind-independent aspects of observations must, however, according to the structure of “theoretical laws” and a naturalistic metaphysics, be deterministic; they must express “universality” and “symmetry”. And it is at this juncture that the assumptions attached to the “nature” of laws of nature become influential on the issue of the “nature” of time.

According to John Earman would a physicist or philosopher who wishes to keep his “world deterministic”, will have to assert that laws of nature have properties like “a certain mathematical form”, “must incorporate certain variables”, and they would have to, most importantly, “conform to certain symmetry and invariance principles”.⁴⁹⁸ Let us take a short look at what is agreed upon with respect to the properties of natural laws.

It is greatly assumed that laws of nature must express *universality*, i.e. they must express “eternal truths”.⁴⁹⁹ This means that “when” and “where” is of little importance since they would apply without any limitations whatsoever to “all space” and “all time”. Furthermore, these universal laws cannot change with time. The

⁴⁹⁶ Ibid., p. 4.

⁴⁹⁷ Charles Sanders Peirce, *Values in a Universe of Chance, Selected Writings of Charles S. Peirce (1839-1914)*, ed.: Philip P. Wiener. Anchor, pp. 170-180.

⁴⁹⁸ John Earman, 1986, *A Primer on Determinism*, pp. 80-81.

⁴⁹⁹ Ibid., p. 90.

essential characteristic, and what defines the peculiar “nature” of “universality”, is exactly the “omnipresence” of the laws of nature, i.e. their validity for “all time” and “all space”. This peculiarity of the laws of nature, of being valid “everywhere all the time”, gives the scientific assertions considerable “strength” and “simplicity”.⁵⁰⁰ *Universality* is the most important feature of the laws of nature.

Universal laws have a place in a world that is deterministic. Thus, universality is related to symmetry through the concept of “time translation invariance”⁵⁰¹, which again presupposes the essential character of universality, that is, its applicability to all times and to all space. Earman writes that “time translation invariance demands that the physical possibilities are closed under the operation of time translation which shifts all of the physical contents of space-time forwards or backwards in time by a given amount.”⁵⁰² This means that laws of nature are symmetric, that is, what the laws explain will remain unchanged through time and space. By this it is assumed universal and symmetric laws can explain both past and future events, not hypothetically, but accurately, just as we can explain present ones.⁵⁰³

The final property of time symmetry requires that past and present have to be treated as something that ought to be temporally equal, since events occurring in the “present” or in the “past” are only occurring so because of our limitations as experiencing beings. The idea is that there exists no *objective* distinction between past and future. “Objective” is here taken to mean “actually real”. What occurs has the same value within science, whether it occurs now or in two years, the occurrence must obey the same laws anyway and therefore they are past and future occurrences like “symmetric mirror images of each other”.⁵⁰⁴ This is in essence the assumption about “time reversal invariance”.

⁵⁰⁰ Ibid.

⁵⁰¹ Ibid., p. 129.

⁵⁰² Ibid.

⁵⁰³ Ibid.

⁵⁰⁴ Ibid., p. 131.

7.3. The “Reality” of Time Symmetric or Universal Laws of Nature

The extraordinary structure given to the laws of nature imply an implicit structural limitation attached to the physical description and explanation of the world. This limitation is, in other words, the inability to explain why there are “irreversibility”, “becoming” and “chance”, without referring to the inadequacy of the human mind, and which in all other occasions is shunned because of the effort to keep its explanations to the realist defined concept of “objectivity”. As I have been arguing, the strategy has been to explain away human experienced temporality, irreversibility and transience by claiming that these are illusions and nothing but mere mind dependent appearances. With their assumed symmetric and reversible nature, the laws of nature are to be understood as “necessary” and “universal”. These laws are objective, as defined by the doctrine of metaphysical realism, since “universality” demands that laws of this kind must necessarily have an existence independently of the human mind.

However, the opposing view rejects any kind of reality to such laws, a justified claim -- as long as it does not reject all laws as being unable to represent general features within nature. The claim of those scientists opposed to the view that universal, symmetric and time-reversible laws are anything more than mere theoretical constructs argue instead that it is these features that in reality are mind-dependent. These are features that have to be specifically dependent upon a theoretical context, a context to which they necessarily must refer. These laws are real only on paper, not within “interacting open systems” found in the real world of life and death. Contrary to the “real” generality of the irreversible processes of open systems, these laws exist on the basis of attitudes, beliefs, and dubious metaphysical commitments.

Nelson Goodman exemplifies the above view, that universal symmetrical laws of nature are useful theoretical tools. He writes: “I want only to emphasize the Humean idea that rather than a sentence being used for prediction because it is a law, it is called a law because it is used for prediction...”⁵⁰⁵ Also Nicholas Rescher holds a similar view. He maintains that laws are man-made constructions that have little in common with nature. Laws are generalizations, lawfulness is mind-dependent, and lawfulness is not discovered but added to the overall picture we construct for our purposes. He writes: “Lawfulness is

⁵⁰⁵ Nelson Goodman quoted from John Earman, 1986:81.

not found in or extracted from the evidence, but it is super added to it. Lawfulness is a matter of imputation.”⁵⁰⁶ Scientific laws are mental things, and as K.G. Denbigh says about Rescher’s view, laws should also “be capable of supporting counterfactual conditionals...”⁵⁰⁷ And counterfactual conditions, says Rescher, exist in the human mind only.⁵⁰⁸

Furthermore, if laws are universal, the assumption is that they will never change, well, they do. That the universal and symmetrical laws of nature are tentative and provisional are illuminated by the fact that they take on different forms according to particular periods of history. As Denbigh says, laws “express partial states of knowledge at a particular period.”⁵⁰⁹ Laws have changed over the course of time; Newton’s laws had, for instance, to give way to Einstein’s laws.⁵¹⁰

Laws are about regularities. The traditional empiricist view on laws of nature is restricted to those “facts” and “regularities” found to be part of nature via the method of induction. Laws based upon induction have the form “*All* ravens are black” and “*All* swans are white”. These conjectures seem valid until one group of ravens or swans changes color. The method implies a jump, a generalization based upon a limited amount of empirical data. That is to say, here we have an imaginable “perspectival jump” from seen facts or qualities to the claim that these seen facts or qualities are identical to each other and thus representable as a property for all entities belonging to the group. The same goes for laws taking part as premises of the hypothetical-deductive method. Laws have to state regularities and identities that claim certainty not only for all entities identifiable as members of the species but also about all members of the species in the future until eternity. Hume’s critique of the problem of induction is classical in this respect, that is, as long as the claim is about properties of reality that are absolute, universal and necessary.

However, it is when “necessity” is claimed for the causal chain that the claim about laws representing reality becomes difficult to believe. The need for order and “necessity” relates these laws to the unavoidable claim for universality – as if only this relationship could enable us to respect law-like predictions. I believe that it is in this connection that we should take careful notice of Cassirer’s statement when he writes that: “...the original fallacy of the entire causal

⁵⁰⁶ Nicholas Rescher quoted from John Earman, 1986:81.

⁵⁰⁷ K.G. Denbigh, 1981: 73.

⁵⁰⁸ Ibid.

⁵⁰⁹ Ibid., pp. 71-72.

⁵¹⁰ Ibid.

problem consists of considering laws themselves as a kind of reality...”⁵¹¹

If we consider our own surroundings we discover a considerable degree of regularity. Likewise, our actions are to a great extent regular. Everywhere we have a display of regularity. However, as Denbigh has pointed out, *there is no display of necessity*.⁵¹² Wigner has elaborated on this point to some extent.⁵¹³ He states that it is a miracle that we are able to discover regularities in spite of the extremely complex world. Secondly, he writes, “These regularities are independent of so many conditions which could have an effect on them.”⁵¹⁴ This leads to the fact that “the ‘laws of nature’ contain, in even their remotest consequences, only a small part of our factual knowledge of the inanimate world.”⁵¹⁵ Then we have the claim that laws are nothing but conditional statements that allow for some prediction about future events that necessarily have to be based on our present knowledge. However, in practice, says Wigner, the “majority of the determinants of the present state (are) irrelevant from the point of view of prediction.”⁵¹⁶ Thus we see something interesting; namely that laws are essentially constructed to predict the future, that is, laws are about future events since they are entirely silent about the present state of the world.⁵¹⁷

According to Nancy Cartwright “laws of nature” are nothing but “*ceteris paribus*” laws.⁵¹⁸ And “*ceteris paribus*” laws are false.⁵¹⁹ “*Ceteris paribus*” laws are relevant only of specified conditions and are further restricted to the fact that they would not hold if there entered other factors relevant to the effect than those specified.⁵²⁰ This type of generalization cannot convey what would happen if the setting was different, for instance having different causes than the specified ones. The theory employing these generalizations as “laws” is thus restricted to its own concepts and definitions about explanation and what it is that is being explained. The conditions, under which these “*ceteris paribus*” generalizations hold, are in other words, *ideal*. Therefore, we cannot value the laws of nature as being exact mirror images of nature.

⁵¹¹ Ernst Cassirer quoted from Denbigh, 1981:73.

⁵¹² Denbigh, *ibid*.

⁵¹³ Wigner, “The unreasonable effectiveness of mathematics in the natural sciences”, *Commun. Pure Appl. Math.*, XIII (1), 1960. The following is from pp. 4-6.

⁵¹⁴ *Ibid*.

⁵¹⁵ *Ibid*.

⁵¹⁶ *Ibid*.

⁵¹⁷ *Ibid*.

⁵¹⁸ N. Cartwright, 1999:4.

⁵¹⁹ N. Cartwright, 1983:45.

⁵²⁰ Cartwright, 1999:28.

What they reflect are more the metaphysical-epistemological doctrines of metaphysical realism in conjunction with traditional scientism.

What we do know is that these physicists and philosophers have no special way of insight, any extraordinary cognitive powers which enable them to look behind illusions of human experience. They are as a social group affected by their own personal motives⁵²¹ and aspirations and of those of their academic heroes and intellectual authorities. Thus, we may say that it is not nature that has been consulted as the source of their concepts about universality, symmetry and reversibility, but the written sources of the authorities. Nature only plays a secondary role in this context. What we end up with, when we continue to pursue abstractions and generalizations, are at best other abstractions and generalizations. The base will always consist of certain pre-selected physical concepts and theories, believed to be the best. These abstractions cannot, however, exist independently without the aid of a relevant and corroborating set of metaphysical-epistemological ideas. Thus, we see that the abstractions and idealizations are essential elements in a paradigm, which is a truth-restricted cultural construction.

According to Cartwright, what is, in fact, taking place behind the desk of the theorist or in the laboratory of the experimental physicists is that physicists in practice have to “confine their predictions to the outcomes of their experiments.”⁵²² They cannot bring the laws outside to the open world. The laws are extracted in the closed environments of the laboratory. They can, however, take a small-scale laboratory to the outside world, while keeping the environment closed and thus secure the specified conditions which are needed to make the system work according to the predicted fashion.⁵²³ The flashlight could be an example. Cartwright writes, “For the most part, the laws of physics are true only of what we make.”⁵²⁴

The metaphysical realism position is seen in the attitude toward laws as representing *facts* about nature. Essential to this position is that the *underlying reality* must, as in the parallel case of the “block universe” reality definition in temporal realism and its “non-changing facts”, be unchangeable. Laws of nature, as “facts”, cannot refer to a shifting, transient world. The “reality” behind appearances, the unchanging reality that only laws describe and that explain the appearances, is the unmistakable background of this scientific

⁵²¹ Ibid., see p.46.

⁵²² Ibid.

⁵²³ Ibid.

⁵²⁴ Ibid., p. 47.

metaphysics that seek reductionism in methodology and deterministic fundamentalism in ontology.

7.4. Determinism

Determinism is a difficult concept to sort out. There are instances, that is, *expressions* of determinism that do not emphasize the “ism” part of the term, because determinations are part of the everyday life of mind-endowed human beings. Furthermore, to some degree mind-endowed human beings act from “pre-determination”, that is, according to plans, intentions and the like. Thus, we act on the “spur of the moment” in extremely few situations. When we believe that we do act spontaneously it is because all happens so fast that we do not realize that our brain has already pre-consciously made the decision for us. The brain “fills in” the needed information that is necessary for our decisions upon the right sort of action. However, this “provided information” can only be information that has been intellectually processed at some prior moment in time. That is, we must have the information we act upon prior to our actions. This is information leading to decisions about actions that we are not necessarily conscious aware of that we make. Our *experiences*, i.e., our intellectually processed perceptions and cognitions, form the *base* from where we retrieve all the information needed for all situations we act upon. In this sense all our actions are pre-determined.

Determinism, as we find it in modern philosophy, still has the character of being some sort of ontology, that is, a theory containing statements about the deterministic *being* of the *world* that is orderly and law-bound. This is ontology with lots in common with the Laplacean metaphysics. This means, Laplace expressed his version of the mechanical metaphysics of nature through the claim that the whole universe through all time, that is, the whole past, present and future is determined by Newton’s laws, given the initial positions and velocities of the components of the material world. Today this view is subsumed under the doctrine of “ontological determinism”. The ontological version of determinism has to be kept apart from the pure *predictive* kind, which is called “epistemological determinism”.

“Ontological determinism” becomes in the “philosophy of time” the familiar position known as “the block-universe view of time”, but also as “static time”. It is this metaphysical belief that we find as a presupposition in modern philosophy of time, and which emphasizes the objective time of physics as paradigmatic for the “temporal-

realistic” treatment of time. It is this kind of determinism that has facilitated and given temporal realism its connection with physical science. Thus, science has become the “hard facts fundament” that yields legitimacy to the temporal realist position. Thus, it is not the “nature of time” that is influential to this deterministic doctrine. It is the other way around; it is the deterministic doctrine that helps to indicate the kind of “nature” that is of interest when factors and elements in the temporal order shall be abstracted and thus be given ontological status and epistemological importance. The realist abstracts what he understands to be necessary properties: An understanding which is based upon two aspects, first, from actually having an experience of temporality, which is, as we have seen, an unavoidable perspective that is explained and comprehended in the negative, that is, as “merely” subjective. Secondly, and for the realist the most important point, to eliminate the “unreal” from the “real” properties. From a certain metaphysical perspective the appeal is to claim truth for the ontological and epistemological context in which this kind of temporality can “exist”. The objective “nature” of time is thus finally decided upon from the vantage point of the theory in question.

Hence, the “turnover” of temporality is not facilitated solely by “determinism”, it is being helped equally much by the conceptual linkage that in theory exists between the type of *nature*, which we find within determinism, and the type of *nature*, which the laws of nature are held to represent. Thus, there is a visible trace of this “turnover” in the conceptual relationship between determinism and causality, where symmetry and reversibility constitute the common conceptual theme, and thus already presuppose a non-temporal ontology of the real world.

However, many arguments are in favor for the view that “science offers no empirical support for the thesis of ontological determinism.”⁵²⁵ Ontological determinism is, as we have already talked about, the *recurrence* of the Eleatic ideal of keeping things of knowledge constant and changeless.

⁵²⁵ Denbigh, 1981:8.

7.4.1. Ontological Determinism

Ontological determinism is the doctrine that events are determined in advance. Nancy Cartwright expresses the opposite view, namely that: “Predictability in the world as it comes is not the norm but the exception.”⁵²⁶ Both the positions constitute the dualism within modern philosophy that we have become so familiar with. According to the usual way of conducting philosophy it seems to be implied that we should accept that either the world around us is “deterministic”, or it is “indeterministic”. In reality I believe that we are faced with a mixed situation. There is, at least if we keep to our experience of the world, a degree of both “deterministic” and “indeterministic” factors. We are able to predict⁵²⁷ outcomes of later events; however, this is limited by the time factor that says that the shorter time is between the prediction and the predicted event the more probable is the prediction. But there are also factors that seem to have had influence on events that we were not able to foresee, or predict, in other words, there are chance factors that do not tend towards predictable outcomes.

Ontological determinism is a metaphysical doctrine that gives structure to scientific thinking, a “structure” that implies the demand for certainty, regularity, familiarity, order and absoluteness in *all* things. Its first characteristic trait is given with its debt to “causalism”⁵²⁸, namely that same causes always have same effects, given that we are here dealing with a system that is sufficiently isolated. In this “causalistic” sense determinism has applied the pairing of “cause” and “effect” to refer to an assumed *necessary* relationship between defined factors within the system. The second trait that makes ontological determinism stand out is the claim that all events are governed absolutely by categorical and temporally invariant laws. By this it is stated that the usual perception we have of a cause that precedes the effect is beside the point, that is, not really interesting. This is so since through our perceptions of cause and effect we have built up a presupposition that time indeed has an “arrow”.

⁵²⁶ Cartwright, 1999:77.

⁵²⁷ This would not be ontological determinism but predictive or epistemological “determinism”, which is not “absolute”, that is, not to be understood as the traditional absolutist interpretation of “determinism”.

⁵²⁸ I am using the term “causalism” to distinguish a *trend* of thought from the *category* of “causality”.

However, ontological determinism does not need an “arrow”; its thesis refers only to temporally symmetric relations between states.⁵²⁹

Indeterminism is not any better off since it, as already said, denies order in nature as well as predictability together with the implicit claim that we are not capable of predicting outcomes of future events at all. Indeterminism hereby makes our ability to think and judge, our intentional actions, irrelevant as a rational basis for science. In this sense indeterminism is irrational since it rejects our ability to achieve greater insights and knowledge of the real world. Therefore determinism and indeterminism are, as doctrines about the “absolute”, nothing but categories of *theory*. Either the one or the other can be said to be real properties of nature.

However, as *categories of theory*, deterministic and indeterministic elements are cultural categories stemming from a specific intellectual culture. It is a culture that we have identified as having its roots in the ideals of the Eleatics and that became emphasized as the familiar dualism between the qualitative and quantitative, between mind and matter. The alternative view to all this, a view that to my knowledge overcomes this dualism within science, is the trend of thought that can be traced back to Bohr and Prigogine. Here, laws are regarded as giving only partial “descriptions” and/or “explanations” since all conditions cannot be known. Therefore laws can only be used to predict *probable* outcomes.⁵³⁰ Prognostic elements applied in our theories to help predict the most probable future outcome, and what is based upon observable regularities in nature itself, shall and must be kept apart from the metaphysical content of ontological determinism.

7.4.2. Determinism and Causalism

What is the relationship between causality and determinism? One view is that we can abandon ontological determinism without giving up on descriptions and explanations of reality that apply causal explanations. Therefore we have to distinguish between “deterministic causality” and “stochastic causality”. I believe “causality” can be applied when one

⁵²⁹ Denbigh, 1981:74.

⁵³⁰ We shall not go into this “tradition” here since it is the “improbability” of the deterministic thesis as a metaphysical background for temporal realist theories about the nature of time that is of our concern to refute.

event with empirical certainty is determined as *producing* another. Thus, we should look at the category of causality as a useful *methodological* principle. By this is only implied that causality may express a *partial truth* about the world. It does not need to express the whole truth because its sole function is to be a methodological part or aspect of the analytical abstraction process of science; it is to help us shed light upon things we would like to know something more about. These are factors that, of course, are of interest to the scientist, who again find them interesting because they are of interest to the scientific community. N.R. Hanson writes: "Causes certainly are connected with effects, but this is because our theories connect them, not because the world is held together by cosmic glue."⁵³¹

As M. Bunge has pointed out, we should keep three meanings of causality apart from each other.⁵³² The meanings are put as (1) the "category of causality", which is about a causal bond; (2) the "principle of causality", which is about the general law of causation; and, (3) the "doctrine of causality", which is about the universal validity of the causal principle. In other words the "doctrine of causality" may be identified with the "doctrine of ontological determinism". As Bunge writes, "causal determinism asserts that *everything* happens according to the causal law."⁵³³

The category of causality is an epistemological category, but unlike ontological deterministic claims on causality to be a universal feature of nature, this category is first and foremost connected to the experiencing capabilities of the human observer. "Causality" is an epistemological category belonging to our description of experience since causality is synonymous with the observation of both cause and effect. The term also includes the "relation" as such, that is, the *relation between cause and effect*.

However, Galilei writes: "If it is true that an effect has a single primary cause, and that between the cause and the effect there be a firm and constant connection, then it necessarily follows that whenever a firm and constant alteration is perceived in the effect, there be a firm and constant alteration in the cause."⁵³⁴ We thus see that the experienced connection between cause and effect, at least in Galilei's case, immediately becomes represented as something *general* but which is hypothesized as "universal". The relation or "connection"

⁵³¹ N.R. Hanson, 1958, *Patterns of Discovery*, Cambridge University Press. However, here Hanson is quoted from Denbigh, 1981: 82.

⁵³² M. Bunge, 1979, *Causality and Modern Science*, Dover Publications, Inc., New York, p. 3.

⁵³³ *Ibid.*, p. 4.

⁵³⁴ Galileo Galilei quoted from Bunge, *ibid.*

certainly becomes generalized to be a “constant” connection. Therefore, it is perhaps more correct to state again that the purely epistemological basis of cause and effect is not so much of human experience as it is a theoretical abstraction from experience.

It is important to take notice of the immediate elevation of the “connection” to the generalized statement in connection with the possibility of having a scientific application of the doctrine of causality. Thus, we can see that the deterministic rejection or denial of the truth of the evidence extracted from individual observation or experience and what confirms the irreversibility and asymmetry of the observed causal event become legitimized. Therefore, determinism have all the various generalized aspects of the causal category, which are applied within the doctrine of causality, and with the effect that the “doctrine” can “confirm” theoretical assumptions, that is, can confirm idealized aspects of an ontological as well as of an epistemological-metaphysical nature.

We are here siding with both empiricists and idealists in that we hold “causation” to be an epistemological category. It is a methodological construct made possible by abstraction, generalizing and idealizing. However, this construct becomes *fiction* the moment it pairs up with the “doctrine of causality”, which again has based its claims upon the doctrine of ontological determinism. It is an epistemological construct and becomes a metaphysical fiction since it has been turned into an overarching explanation of the world that can satisfy the individual scientist’s need for constants in his pursuit of knowledge. Thus, “causation” is not a trait of the things that we actually experience. I believe Lentzen to be correct when he writes: “Causality is a relation within the realm of conceptual objects. The relation of cause and effect refers to conceptual events regardless of the relation of the latter to reality.”⁵³⁵

7.4.3. Determinism, Laws and Symmetry of Time

As I have implied, the doctrine of determinism rests upon the belief in the assumed truth of the absolute, universal necessity of laws of nature.⁵³⁶ And that it was historically speaking from the time of

⁵³⁵ Lentzen is here quoted from Bunge, 1979:5.

⁵³⁶ See Bunge, 1979:24.

Galileo and Newton⁵³⁷ that the doctrine of determinism got its support from the laws of nature.⁵³⁸ Before Galileo, the fundament for the believed truth of determinism was, however, *theological*. But now we can claim that determinism is strongly related to the hypostatization of scientific law. This fusion of related ideas is further related to another idea, namely that physical nature is passive and without generative powers of its own, which give room for *blind causalism to enter the context as a necessary factor for the overall comprehension of the mechanics of nature*. But this does not mean that all laws of nature are committed to determinism, only the doctrine of determinism and the doctrine of causality keep claiming the validity of such an assumption. However, the peculiarly universal and symmetric structure of such laws is highly compatible to the basic elements of determinism and is therefore applied as fundamental to the doctrine of determinism.

The doctrine of causality, the doctrine of determinism, and the fundamental laws of nature all have in common the symmetry and reversibility of time.⁵³⁹ I believe that ideas such as “symmetric laws”, “symmetry of spatial events”, symmetry in determinism, symmetry in causality, and the idea that time is *reversible* are intimately related to each other. That symmetry or reversibility of time and of spatial events in time has its basis in theology, and is later transmitted to science. It constitutes a culturally very firm basis for the production of a specific scientific knowledge.⁵⁴⁰ As pointed out by Earman several of the classic treatments of determinism apply time symmetries in their definition of determinism, others have these symmetries as an immediate consequence of their definitions.⁵⁴¹ As Earman writes:

...time translation invariance plus time reversal invariance implies that laws are deterministic in both

⁵³⁷ Bas van Fraassen has in his 1989 book *Laws and Symmetry*, Clarendon: Oxford, forwarded such a claim. Explanation and causation constitute a considerable feature of 17th Century science. From here on scientists and philosophers expressed their knowledge through the science as a frame or perhaps a process where knowledge should be of constant things expressed through quantified relations and symmetries. Only this kind of expressed knowledge could represent the true phenomena of nature.

⁵³⁸ See Denbigh, 1981:72.

⁵³⁹ Bas van Fraassen has written that the “symmetries of time, space, and motion determine the structure of modern science to a surprisingly large extent.” Quoted from M. Kruse, *Choosing a Methodology*, (www.phil.vt.edu/Kruse/dissertation/Kruse_chapt.2).

⁵⁴⁰ Bas van Fraassen has a similar view in which “symmetry arguments” are thought to provide a technique of argumentation, an argumentation technique that has unusual power and elegance. See van Fraassen, 1989.

⁵⁴¹ See John Earman, 1986:128.

directions of time if they are deterministic in either. Further, time translation invariance coupled with determinism guarantees conditional periodicity.⁵⁴²

Everywhere and all the time laws are thus descriptive and explanatory of all fundamental reality. This means that there really are laws that have an “unlimited precision” and that there are events that are fixed unalterably. Whether or not this is essential, the very idea about a passive and time-symmetric, deterministic world, is empirically implausible. Its truth, however, would depend upon two essential factors, namely, whether or not the system in question is sufficiently *isolated* and furthermore, on time to be reversible.

Modern versions of determinism emphasizing the symmetry of time and the interchangeability of cause and effect, thus denying that genuine observable causal connections really are asymmetrical, as they build their assumptions upon a deterministically biased interpretation of Einstein’s theory of Relativity. As I have said before⁵⁴³ Einstein claimed time-series to be relative to and dependent upon reference systems. This insight led Einstein to think that the time ordering of events can be reversed. We thus have two aspects: the actual event and with the ordering of the event, the observed event. Thus we can, for instance, observe two light signals that in fact arrive at a certain reference system in the order (1, 2), arrive as (2, 1), that is, in the reverse order at a different system and that is in motion relative to the other. But to jump to the conclusion that light and other physical objects actually can arrive at an observed point in space before it has been produced is unwarranted. The only thing that can be said in this context is that the ordering, that is, the time-intervals are relative, that is; differs numerically from one reference system to another.⁵⁴⁴ Bunge writes:

Time reversal is possible only for those pairs of events that, being separated by a distance, do not stand in causal relation to each other...relativity admitted the reversal of time series of physically disconnected events but excludes the reversal of causal connections.⁵⁴⁵

Effects can in the real world not arise before they have been produced; the past cannot be changed.

⁵⁴² Ibid., p. 132.

⁵⁴³ See Chapter 5 on Einstein’s STR.

⁵⁴⁴ See Bunge, 1979:67.

⁵⁴⁵ Ibid.

Furthermore, Ontological determinism cannot be true in a limited sense; it is not a doctrine that contains claims about futures and pasts that become more and more true as the temporal interval diminishes. As for what concerns the past what has been written above should suffice. This leaves us with the determinist claim that we can with absolute certainty determine future events, given we know certain conditions. Then the problem for ontological determinism consists in being a limited form of determinism since it is an absolute doctrine. Contrary to this view we have epistemological determinism that is concerned with *predictions* about future events, predictions that gain in certainty the shorter the time interval is between prediction and event. This predictive kind of determinism applies an asymmetrical time concept that reflects the objective limitations upon our ability to know about the future. This belief is reflected in the applied temporal factor, that is, the shorter the time-span is between moment of prediction and event the more probable the prediction will be. Contrary to this is the absolutism of ontological determinism with its claim about truth *everywhere* and *all* the time, or not at all.⁵⁴⁶ The claim is that everything that “happens” has been determined from the beginning of time. This means that all conditions and circumstances, with absolutely every detail that is part of the occurrence or event, must have been put in place before the beginning of time. What we in fact have here, is a determination that is done by human beings, which idealizes one state of affairs and applies it as the paradigm on what constitutes a good approximation on other events following the initial one. It all comes down to belief. As Bunge writes, “the question whether causality implies rigid universal interdependence rests upon the claim to validity of the block-universe doctrine.”⁵⁴⁷

It should also be noted that no matter how far one chooses to go in one's claim to ontological validity for one's expressions of natural laws, one could not escape the problem of contingencies. Laws of nature will ultimately depend upon independent contingency external to the context that the laws are supposed to cover. This means that the system, which the laws are supposed to explain, will eventually undergo “chance fluctuations relative to the motions inside the context in question.”⁵⁴⁸ Laws that are supposed to explain what happens within a system, that is, in an “isolated” system, will not be good enough for predicting what actually goes on inside this system. This is again an indication about the purely theoretical status of so-called “closed

⁵⁴⁶ See Denbigh, 1981:84.

⁵⁴⁷ Bunge, 1979:67.

⁵⁴⁸ See D. Bohm, 1957, “Inadequacy of Laplacean Determinism and Irreversibility of Time”, in *Causality and Chance in Modern Physics*, Harper Torchbooks, pp. 152-164.

systems”. However, as Bohm points out, this does not leave us with arbitrary knowledge. We can, he says, trace any given effect, at least in principle, “to the causes from which its essential aspects came.”⁵⁴⁹ We see then, Bohm continues, as we go further and further back into the past; that the causal problem becomes gradually more and more complicated. This leaves us with a feeling that the deterministic belief really is an oversimplification of reality that has no foundation in reality, whether this “reality” is scientific or existential. This, says Bohm, is due to at least three important aspects, which reject the possibility of determinism: (1) Causes that contribute to an effect increases without limit over time. (2) That a growing number of qualitatively different causes are found to be significant as we dig into the past. And, (3) that these causes again are dependent upon other new contingencies introducing new kinds of chance.⁵⁵⁰ All of these factors added up constitute the impossibility of the doctrine of determinism.

7.5. Fundamentalism

The last aspect related to the doctrine of determinism and its inherent notion of universality, that is, of the existence of time-reversible laws of nature, is the belief that these laws are conceived as descriptive of a “fundamental reality”. In my opinion, we are now facing the problem of deterministic-metaphysical physics reducing reality to theoretical entities postulated as representations of a “fundamental” reality. Reality has already been divided into a hierarchy where “reality” increases as we go from the visible macro-world to the microscopical “inside” of things. In all seriousness the reductionist is determined by his scientific culture to search for answers about matter *in* the sub-atomic sphere. This means that he will have to strive to formulate laws and produce entities or particles that will have the significance of being *explanations* for the apparent reality in and of experience. These fundamental particles are assumed to be the true building blocks of matter, of reality as such. Therefore everything should in theory be *reduced* to this ultimate and hence, “fundamental” reality.

However, for this to become true we would certainly need to have a world that is deterministic. This would then be a world that

⁵⁴⁹ Ibid.

⁵⁵⁰ Ibid.

would conform to the metaphysical doctrine of causality. And finally, this would be a world that would obey those laws that describe fundamental reality as symmetric and reversible. These laws would thus explain the apparent “change” that would take place as a “transient alteration in the spatial distribution of fundamental particles, or of the various conserved quantities such as energy or electric charge.”⁵⁵¹ Deterministic physics and philosophy do not see the macroscopic and perceptual world as something new since it is generally assumed that anything new ever comes into existence. The Pittsburgh philosopher John Earman represents this view.⁵⁵²

One of the most applied reductionistic strategies has been to formulate determinism broadly enough, to give it a definition and scope that allow for most philosophically applied senses of “mental”, “free action”, “chance”, “irreversibility” and so on, to be subsumed under its “explanation”. Earman’s theory on determinism is exemplary in this respect.⁵⁵³ In Earman’s view a physical event is any event that can be explained as a spatio-temporal event, and as such the event is, as a physical event, a “candidate for cause or effect”.⁵⁵⁴ In this minimal sense, says Earman, *mental* events are actually *physical* events. Still the mind-body dualism would not be completely overcome since it would be necessary to show how “those physical events we call mental are related to physical events in the narrower sense”, as when they would be a case for “standard physics” to study.⁵⁵⁵ In other words *mental* events are ultimately dependent upon the constitution of physical matter, or as Earman calls it, they are “parasitic” upon physical events. Thus Earman writes, “All right thinking physicists believe that macro-thermodynamical quantities, states and events are parasitic on the microscopic.”⁵⁵⁶ But as Earman has to admit, it is extremely difficult to make a successful reduction because it is difficult to establish an identity between the macroscopic event and the microscopic event that would be characteristic of this “parasitism”. It is perhaps impossible to characterize this parasitism in terms of identities. Earman says that it would most likely end up as an oversimplification of very complicated relations, which may not be a relation of identity after all.⁵⁵⁷

⁵⁵¹ Denbigh, 1981:8.

⁵⁵² See John Earman, 1986, *A Primer on Determinism*.

⁵⁵³ Ibid. See especially p. 249, as this page is an exemplary exposition of the naturalistic-scientific and metaphysical-realistic orientation of Earman’s work.

⁵⁵⁴ Ibid.

⁵⁵⁵ Ibid. Take notice the term applied is “standard physics” and not “psycho-physics”. Thus, Earman sees this as a task for traditional physics that only treats the material world.

⁵⁵⁶ Ibid.

⁵⁵⁷ Ibid.

However, says Earman, this problem can be overcome by looking more carefully at the problems of reductionism in physics so that new ways to attack the mind-body problem, from within physics, can be worked out. He states that, “the more precisely science (physics) locates man in nature the more difficult it becomes to sustain a sense of autonomy for human actions.”⁵⁵⁸

Related to this aspect of reductionism is the aspect of “closed systems”, as recently pointed out by R. Fjelland.⁵⁵⁹ In fact Fjelland himself refers to Popper’s *definition* of determinism. Popper points out what he calls “the deterministic nightmare” as physicists *over-emphasizing the physical closure of a system*.⁵⁶⁰ Ultimately, the world is a closed system in which its entities interact only with each other. Earman’s demand for physics to locate “man in nature” means in fact to define man as part of the mechanism of the world understood as a closed system. The interaction between such entities in a closed world system is, of course, in accordance with the deterministic laws of nature that dismiss any intrusion of interaction from factors outside the given system.⁵⁶¹ This closure is necessary for any successful reduction of the macroscopic to the assumed fundamental microscopic realm of reality.

Nevertheless, the fundamentalism in reductionistic physics is a manifest tendency within modern scientific thinking. Richard Feynmann described this paradigmatic belief by explaining why we *explain* by applying the fundamental laws; we are actually fitting phenomena into “the patterns of nature”, he said.⁵⁶² The problematic question is of course about the whereabouts of these patterns. This question is as good as impossible to answer since we can only know what *happens* in nature. Laws of nature that give a perfect 1:1 mathematical correspondence between events, and which are well defined both in their past and their future, can only be an abstraction. They cannot be valid for all thinkable domains at all times infinitely.⁵⁶³ What we are dealing with when we apply our laws are generalizations that merely serve as a device to identify analogies between events that have a perceived regular pattern and that are similar to other events which may occur other places at other times. A fundamental law is perhaps “basic” to physics but it cannot be universal because how can

⁵⁵⁸ Ibid.

⁵⁵⁹ R. Fjelland, “Niels Bohr on Physics, Biology and Psychology”, *Teorie & Modelli*, n.s., VI, 1, 2001, pp. 87-101.

⁵⁶⁰ Ibid., p. 88.

⁵⁶¹ Ibid.

⁵⁶² See Cartwright, 1983.

⁵⁶³ See Bohm, 1957.

we say that it holds everywhere and governs all domains? What happens, according to Duhem, is merely that we organize recurrences into types in a way that facilitates predictions.⁵⁶⁴ As the physicist M. Pauri says, “the status of physical description entails that we can have science of types but never of particulars.”⁵⁶⁵ Besides this we have, first, human experience of nature that never is of *types* or *natural kinds* but of particulars,⁵⁶⁶ and second, a nature that tends towards “a wild profusion”.⁵⁶⁷ Thus, in science we have laws of nature that are reversible but that cannot be anything else but an excessively and over-simplified representation of our world.

This brings us back to the issue of experience, that is, to the constructed “aporia” between the phenomenological-experiential appearances and the ontological; an aporia that, we have argued, has been of vital importance to those who want to dismiss the complex phenomenological-experiential aspect. Nevertheless, the way out is not to dismiss human experience,⁵⁶⁸ but to endorse it as our only access to Being. Human subjectivity cannot be done away with.

That subjectivity is the *fundamental* that science actually implies is seen in the fact that lawfulness and hypotheses are intrinsic to the scientific activity that presupposes thinking. This again means that the “causality” that we experience cannot be reduced to any other level hypothesized to be more “fundamental” in any ontological sense. That experienced temporality and causality are being interpreted within physical and philosophical theory, that is, within contexts embracing “universal lawfulness”, can only produce ontological and epistemological enigmas. According to Pauri, these enigmas about reality are nothing but metaphysical assumptions that have no support by the methodological foundation of physics.⁵⁶⁹ Thus, we are backing Niels Bohr.⁵⁷⁰

First of all, Bohr was what we today describe as a critical “moderate realist”. His aim in philosophy was to show how he synthesized elements from both realism and idealism. Thus, Bohr was able to transcend both the naïve realism of Einstein and the solipsism

⁵⁶⁴ See Cartwright, 1983.

⁵⁶⁵ M. Pauri, 1997.

⁵⁶⁶ Ibid.

⁵⁶⁷ Cartwright, 1983.

⁵⁶⁸ We should remember that we insist on thinking to be an inseparable part of human experience: A thinking that organizes, coordinates, fills in, corrects and transcends aspects and elements of perceptual experience. Experience and human thinking cannot be kept apart, which means that the definition of experience as perceptual or as a sensuous experience is a gross over-simplification of human experience.

⁵⁶⁹ Pauri, 1997.

⁵⁷⁰ I am here referring to R. Fjelland, 2001:92-93.

and nominalism that were clinging to so many aspects concerning the scientific way of conceiving nature in his time, especially the positivist doctrine.

In science it was his concept of complementarity that was first applied to overcome the aporia of the ontological and the phenomenological. Fjelland uses the double-slit experiment to illustrate that to determine whether electrons are particles or waves depends upon how the experiment is conducted, that is, the differences of descriptions came as a consequence of applying different experimental arrangements.⁵⁷¹ However, Bohr's insight was that this contradiction evaporated as soon as the human observers were brought into the explanatory framework.⁵⁷² Fjelland writes that Bohr was never tired of insisting on that physics can only be a human activity, that it is an accomplishment of human skills and ordinary language. It is a terrible mistake to eliminate the human agent from the results of science. When it is done, as it is the case of how most realist philosophy and science defines "objectivity"⁵⁷³ today we get a limitation on scientific thought that we dare not venture beyond. As I have argued, as a paradigmatic ideal of science, objectivity is an impossible ideal to maintain. "Objectivity" in Bohr's sense means "intersubjectivity". It is, however, important to remember that "subjectivity", "objectivity", and "intersubjectivity" are *concepts*. They shall not be used in any postulation of aporia between subject and reality. These concepts shall only be used to distinguish *our* perspectives on reality, to give us certain distinctions as to where and why we are *relating* or *correlating* certain concepts that are *about* reality to the actuality of the real world. Reality must ultimately be understood to be so complex that it comprises human perspectives, both the subjective and the objective ones. Thus, I believe Cartwright is correct when she writes that, "there is no better reality besides the reality we have to hand."⁵⁷⁴ Therefore, the only place where we can encounter the distinction between theory that describes large-scale or macroscopic appearances, and fundamental laws that explain these appearances, that is, the reality behind these appearances, is in philosophical and physical *theory*, that is, in *theory* alone. The conclusion must be, that physics that cling to the naturalistic doctrine, a doctrine that believes time to be reversible, is an improbable foundation for any theory that sets out to unveil the "real nature of time". The sheer absence of "realism" in the concept of

⁵⁷¹ Ibid.

⁵⁷² Ibid.

⁵⁷³ That is, as the "objectivist-contradiction" within metaphysical realism, which states that "objectivity" is "knowledge" about the "thing" as it is *in-itself*.

⁵⁷⁴ Cartwright, 1983.

“time reversal”, as in the concept of a “time-symmetric world” should be admitted. Thus, the aporia between human experience and an objective world that is in-itself cannot any longer be upheld as credible.

8

The Evolution of Temporal Adaptation

Finally, we shall now look at the *biological* basis for the temporality which is characteristic of human experience. In other words, we are going to focus on temporality as partly an organic development that is prior to primitive temporal *experience* and partly as something which will eventually be brought to a symbolic representation or misrepresentation by intellectual reflection. For me, it is of vital importance that human temporality is seen as an “innate product of organic development”: The understanding of human temporality has to include some kind of intelligible “real-world”, or “natural”⁵⁷⁵ foundation. That is, human experienced temporality, contrary to the scientific notion of being a “universal deception” or “illusion”, is in its fundamental essence a by-product of human evolution. This means that human beings, in their mental activity of *experiencing* and *thinking* are adapting to environments and shifting living-conditions. Fundamental to this development are those basic qualities that define organic living which is and arises in the process; by which the organism comes into existence, and hence follows through all the different stages of its life. Humans become humans only through the process of growing; from an embryo, through childhood and to adulthood. It is in this process that nature and culture play alongside in shaping and defining the “thinking man”. Therefore, it should be obvious that it is not nature that leads human temporality on a sidetrack. Rather it is the cultural aspect that sidetracks us. Culture includes persuasive popular trends within the sciences; trends that we have to admit are influential in our personal beliefs. It is this cultural aspect that provides the information that misleads us in our effort to understand the *nature* of time. But as long as our bond to the experienceable natural time is intact we have both an unavoidable correspondence and opportunity for coordination with natural temporal processes.

⁵⁷⁵ I must emphasize that by “real-world”, or “natural” foundation I do not mean this in a *materialistic* or *naturalistic* sense. This should be clear from my previous discussion, and will hopefully become clearer as I proceed.

First we shall look at how time in several ways is involved in living processes; then how this involves the human being and his/her awareness of time.

8.1. Time in Nature; the Organic Perspective

Human temporal awareness of time, its sense of time, is a product of many factors, sociological, psychological as well as *biological*. Thus, *life* and *time* are intimately linked, and that in the same intimate manner as consciousness is linked with life and time with consciousness. In biology there are several ways of investigating how time is included in living nature, an inclusion that will eventually lead to the level of life that is investigated by psychology, that is, the level where we can talk about the human *awareness* of time. However, we find time firstly as an essential part of *metabolism*. Metabolism, which is peculiar to life, cannot take place all at once and must therefore take its time. There is also the time of *ontogeny* and *maturation*, and furthermore, the time of *evolution*. Another biological aspect where time enters is by the *diurnal* and *annual* rhythms; thus they link the *ontogenetic*⁵⁷⁶ and *phylogenetic*⁵⁷⁷ development, as well as *phenotypic*⁵⁷⁸ changes and changes in *genotype*⁵⁷⁹ to the rhythms of the physical world itself. By establishing a correlation and coordination between the temporal rhythm of nature, internal biological “clocks” and mind, it hereby connects the human awareness of time to the time of nature.

As in every field of investigation biology also has its controversies concerning differences of metaphysics. This is especially apparent in the debate about the *origin* of life. It seems to be generally accepted that life has somehow emerged from nonliving physiochemical processes.⁵⁸⁰ The causalism view presents the origin of life as an emergence from a primordial chemical liquid and where necessary

⁵⁷⁶ The *ontogenetic* development concerns every individual organism, from “conception” to the phase where it is fully developed and finally to its death.

⁵⁷⁷ *Phylogenetic* means the development that species undergo and that is based upon older or earlier forms, as for instance found in the traditional interpretation of Darwin’s theory that “man” has evolved from the more primitive species of “monkeys”.

⁵⁷⁸ “Phenotypic changes” relate to changes that *individuals* undergo *in response* to environmental conditions.

⁵⁷⁹ Changes in *genotype* are changes that are related to a whole species of some kind and that obviously takes some considerable time.

⁵⁸⁰ E. E. Harris, 1988:63.

protein substances synthesize by an accidental discharge of electricity. From this moment the complex of synthesized proteins is self-reproductive.⁵⁸¹ The problem about this synthesis is that we do not know about any enzymes that can do the trick of synthesizing independently of metabolism. In addition, as E.E. Harris writes, “the process of synthesis involves the absorption of energy released in small installments, which, if made available all at once, would disrupt the compound, so that it requires the complex cyclical chemical activity of numerous other enzymes systemically interrelated, which is precisely the metabolism of a living organism.”⁵⁸² This indicates that life cannot arise from nonliving chemical processes, it cannot *become* by accident. It remains a mystery, although we may assume that life somehow is potentially inherent in the processes of the world as a whole.

Thus, in the organic world we have living entities that are “self-maintaining” and “self-reproductive” and hence form specific systems of species. However, all reproduction is not by replication but through variations. Entities within a species are self-maintaining and self-reproductive; this means that they form some kind of a *system*. Life depends on these specific self-maintaining and self-reproductive systems. Biology describes what is precisely produced through these reproductive systems as a chemical metabolic system; it is this system that is necessary for the species to maintain through changing and unfavorable conditions by adapting its entities individual and species-specific cyclical activity to these conditions. It is at this point that it becomes natural to talk about evolution and natural selection. As Harris writes, “what evolves is nothing less than the adaptive versatility of such systems in their methods of self-maintenance.”⁵⁸³

From a slightly different perspective, however, the organism is a system that is “balanced” with its surroundings. As such a system, the organism continually exchanges energy and matter with the environment. In doing so the organism must maintain its specific order of organic development, its persistent form and pattern.⁵⁸⁴ But the organism is in its organic development also in constant metamorphosis.

From this we can conclude that change and time are integral to life since we now know that life is about constantly adaptation to change. Life is therefore “becoming”; it is a process and therefore presupposes, as Harris says, “an ongoing flux in which and to which it

⁵⁸¹ Ibid.

⁵⁸² Ibid.

⁵⁸³ Ibid., p. 62.

⁵⁸⁴ Ibid.

is adaptive.”⁵⁸⁵ Time is a necessary precondition for life to become, as well as life is a continuance in time where metabolism, maturation, reproduction and ontogeny are the essential characteristics of organisms, of individual self-maintaining systems.

8.2. Evolution and Temporality

Evolution is a natural creative process. Theory offers ideas that point towards a distinction between successive forms of existing organisms and also of different levels of integration.⁵⁸⁶ Of special interest to our investigation of the reality of human temporal experience is the dynamic relationship between phenotypes⁵⁸⁷ and genotypes.⁵⁸⁸

We are thus talking of man as an organism which as such is a self-maintaining system that must modify habits and pre-dispositions in order to adapt to sudden or long-term changes in the environment. We must therefore understand that phenotype and genotype are on an equal footing since both are only parts of a larger reality. However, if any organism cannot modify and adapt it will perish. Therefore, actualized⁵⁸⁹ genetic elements will by modification through reproduction pass on the structure and those functions that favor further reproduction and individual survival.

The original phenotype will evolve and in its turn become the source of variation and natural selection. It is my hypothesis that human experienceable temporality, our awareness of time’s presence, has become a conscious reality through *adaptation* and *coordination*, first of innate metabolic rhythms, secondly, of internal time sense *with* the rhythms, cycles and dynamic processes of the world. This is especially true if these are processes and cycles that have importance for our ability to survive. All in all, we find a display of temporality in nature, in organic nature as well as in inanimate nature fluctuations,

⁵⁸⁵ Ibid.

⁵⁸⁶ See Fraser, 1990, *Of Time, Passion, and Knowledge*, Princeton.

⁵⁸⁷ *Phenotype* has to do with changes of the individual in response to environmental conditions, that is, with the ability to adapt to these conditions.

⁵⁸⁸ *Genotype* has to do with long-term changes in external conditions that will eventually help trigger changes in the genetic constitution of many individuals, by forming a species and perhaps leading to new sub-species.

⁵⁸⁹ Genes possess a vast amount of potential; hence, we can develop in different and alternative ways according to external conditions. However, there is of course a limit as to how different we can differ from other individuals of our own species.

in the changing climate and other environmental conditions, within a flux of ongoing metamorphosis of individual organisms as well as of whole species. Organisms display a large variety of biological “clocks” that have a wide spectrum of periods in order to image a variety of external periods. It may be claimed that already early on evolving species must have gathered physiological knowledge about the kind of external temporality that has importance for its existence.⁵⁹⁰ It must have the ability to both follow its own internal “clocks” as well as of adjusting to external cycles. This kind of physiological knowledge must also contain the limits set by the biochemical and biophysical properties of matter as to what can be done and how it can be done.⁵⁹¹ Our bodily cells or soma constitute this limit. This limit must, however, be overcome at some point in order to get an evolution through adaptation. The limit is overcome by a “regression” to the genotype, which Fraser says is the structure from which the phenotype is continuously rebuilt in “the evolutionary process of phylogeny and ontogeny.”⁵⁹²

Thus, we have (if we view this diversity of organic forms as a hierarchy) a widening spectrum of adaptations to temporality. These are adaptations, which in the human case, at least give us some enlightenment in our labor to understand how we have managed to develop such sophisticated temporal techniques as well as techniques for managing everyday life. Of obvious reasons, life is deeply embedded in the temporal structure of the world.⁵⁹³

500 million years is the time span which has taken life to evolve into its present forms. Organic life, intelligence and a variety of biological “clocks” have evolved and been modified under this evolution.⁵⁹⁴ The evolution of intelligence and temporality is an evolution that has commenced peacefully for suddenly to accelerate. The accelerated development is found in the development of a larger human brain, that is, to be more specific, of the frontal cortex that actually doubled its size or volume in less than a million years. These years mark the metamorphosis of man, from *Homo erectus* to *Homo sapiens*.⁵⁹⁵

⁵⁹⁰ See also Fraser, 1990:212.

⁵⁹¹ Ibid.

⁵⁹² Ibid.

⁵⁹³ See Fraser, *ibid.*, and E.E. Harris, 1988: 65.

⁵⁹⁴ See H.J. Jerison, 1976, “Paleoneurology and the Evolution of Mind”, *Scientific American*, 234:1, 90-101, p.98. See also Fraser, 1990: 212.

⁵⁹⁵ See Lestienne, 1995: 147. See also Jerison, 1976:99 where it is stated that the metamorphosis of man is furthermore analogous to that of the dolphin, who also doubled its brain volume over the exact time span in the history of evolution.

Jerison's mission is to trace changes in the relation between brain size and body size, relations between mind and body that may shed some light upon the nature of intelligence. In doing this Jerison directs us indirectly to something I believe to be of importance, namely that time becomes the crucial element of human survival, reproduction and adaptation. Jerison tells us that most likely the enlarged brain first originated from a need to adapt, that is, of the need to supplement *vision*, as a distance sense with the evolving of hearing and smell. All corresponding neural elements of the auditory and olfactory systems are to be found in the brain. Then discriminative audition and olfaction were introduced. However, the two new senses give an opening for the "pre-man" to discriminate more of the world than he could do before, and this demanded new ways of encoding neural information.⁵⁹⁶ "Visual information is encoded at a retinal level with a structurally determined spatial code," Jerison writes.⁵⁹⁷ If we skip the olfactory system and its way of encoding and instead concentrate our attention on the auditory encoding of land-mammals, that is, "pre-man", we can have an encoding of the same happening that vision gives a spatial encoding by encoding it by the use of the auditory system. A bat uses for instance echolocation as a means to identify the source of distant objects. The bat does this by translating spatial information into a *temporal code*.⁵⁹⁸ Early mammals and "pre-man" must also have had the means to do such a similar encoding of sounds and their sources if audition should be used as a distance sense. Then we see that two necessary dimensions of sensory experience had to be part of the evolution and functioning of the brain and its neural apparatus.⁵⁹⁹ The two dimensions are, of course, space and time. To be able to encode any information from the environment, space and time are *necessary* dimensions.

But of course we need more than only the dimensions of space and time to render our account intelligible. In connection with the evolvment of time as a neural dimension there must also be some kind of cognitive integration of all those different stimuli. This means that the integrating code would work by the labeling of stimuli of the different modalities as coming from the same object in space at a particular time.⁶⁰⁰ Thus, the dimension of time becomes fundamental for the conscious temporal experience which, together with the construction of objects in space, gives us a sustainable reality.

⁵⁹⁶ Ibid.

⁵⁹⁷ Ibid.

⁵⁹⁸ Ibid.

⁵⁹⁹ Ibid.

⁶⁰⁰ See also Jerison, *ibid*.

We may notice a connection between the idea that at least some mammals, like humans, have regulatory genes and that the idea we adapt to that temporality is dominant within the local environment. Lestienne⁶⁰¹ applies the theory of J. Campbell in order to illustrate that there can be distinguished between structural genes and regulatory genes. Campbell argues for a parallel in the distinction between certain elements in language and certain elements in nature, that is, between grammatical rules and words and between environment and regulatory genes. To be more specific, in language we can, when we juxtapose words in a rational and controlled way, apply acquired grammatical rules. When applied even by a child we find that new meaningful phrases and sentences are invented. Likewise, changes in a species will not be caused in any haphazardly fashion, like it would if the idea that completes random mutations were true. Changes come about by some kind of rules immanent to nature itself. These are rules that, according to Lestienne, have been imposed partially by the environment and partially by the regulatory genes.⁶⁰²

Lestienne's and Campbell's "language rules" and "nature rules" may be seen analogous to the mechanism of temporal adaptation. We know that some kind of temporal structure is already integrated in our minds and bodies when we begin to perceive the world. This kind of temporality is by some theorists held to be brought in by metabolism. And when we perceive and think we coordinate our innate temporality with the one of our local and surrounding world.

Thus, we have to keep in mind that a natural selection can only operate on the individual who has or has not the ability to adapt. Therefore there must be some kind of interrelation, or transfer of information, between phenotype and genotype. According to J.T. Fraser there is.⁶⁰³ Fraser calls the interaction between phenotype and genotype for "feedback", and the feedback operates when there are agencies like "relation to environment, geographic separation of population segments, relative success of reproduction, etc., the loop incorporates both the phenotype and genotype."⁶⁰⁴ All differences in genotype have to do with gene flow, with recombination, that have the ability of producing completely new combinations of genes; combinations that only can come about by a reproduction by individuals that migrate and mix with other individuals but of an entirely different populace.

⁶⁰¹ Lestienne, 1995:148. The reference to J. Campbell is from 1982, *The Grammatical Man*, New York: Simon and Schuster.

⁶⁰² Ibid.

⁶⁰³ Fraser, 1990:221.

⁶⁰⁴ Ibid.

Natural selection has to do with usefulness of certain qualities or abilities between the individual and the local environment.⁶⁰⁵ And the only mechanism to reach such a state where there is benefit for the individual is called adaptation. Adaptation is not only something that happens within the individual's will to survive and its habitat. Adaptation is also used to describe what goes on within the genetic sphere of the individual. Genes do not act on their own when certain characteristics shall be determined. There is a feedback between the genes whose effects depend on where they are located in the chromosome. Thus, the genome⁶⁰⁶ is a wholeness that acts organismically. Changes within this wholeness happen, for example, by spontaneous crossovers of chromosomes. The point is that they are mutually adjusted. Not all "crossovers" are beneficial, some are even disadvantageous, and some of these beneficial ones become dominant. Some of the not beneficial crossovers are recessive but can become dominant at a later stage.⁶⁰⁷ The organism is in itself adaptive. Thus, in one perspective evolution is the same as "the extended process of the intrinsic adaptive character of living things, constantly maintaining, and to that end increasing, their integrative coherence, to become progressively more self-dependent and self-determining in perpetually changing circumstances."⁶⁰⁸ A more simple definition is given by J.T. Fraser, who defines adaptation as, "the adjustment of environmental conditions by an organism or a population so that it becomes more fit for existence under the prevailing conditions."⁶⁰⁹ Although most neo-Darwinian theory sees natural selection as a natural process of elimination of all those unfavorable mutations, of eliminating the unfit, we have chosen to focus upon it as a "source of favorable characteristics".⁶¹⁰ However, time as change, as passage, or as transience is a dominant feature of this organic world. As such time cannot be eliminated since it is, as Harris says, "a permanent pattern of becoming".⁶¹¹

⁶⁰⁵ Ibid.

⁶⁰⁶ Which is the same as all of the genetic material that an organism possesses.

⁶⁰⁷ See Harris, 1988:66.

⁶⁰⁸ Ibid., pp. 66-67.

⁶⁰⁹ Fraser, 1990:221.

⁶¹⁰ Harris, 1988:64.

⁶¹¹ Ibid.

8.3. The Temporality of the World: Coordination of “Biological clocks” and “Natural Rhythms”

Now we shall take a look at the adaptation issue from a slightly different perspective. It should be noted that we possess “natural rhythms” through our metabolic system. We have to resist treating the organism and its environment as something that can be separated from each other. Organism and its environment are not external to each other. In this intimate relationship between organism and environment we have to understand that the rhythm of the environment is immanent in the organism as functions and abilities to master its surroundings.

Thus, we have to make a distinction between two biological aspects. The first are short-term environmental conditions, the second are long-term environmental conditions. Short-term environmental conditions have to do with our phenotype. Long-term environmental conditions refer to genotype. The first one, the “short-term/phenotype response” explains how the individual can handle or master his or her environment when the offered conditions are abnormal. That is to say, when there are sudden unusual situations and other type of conditions that have to be controlled in order for the individual to cope with the situation. This is an adaptation to the situation. The second “long-term/genotype response” aspect includes the metabolic system, which again means that this is about species that, over very long time, have been adapting to the temporal structure through regularities and rhythms that can be observed in the environment, rhythms that otherwise are besides the metabolic processes.

However, both short-term and long-term aspects are linked to the metabolic system of the individual organism. The metabolic system of the individual organism is thus linked with its fluctuating body temperature. With a higher body temperature than normal the individual will experience situations as unfolding rapidly, whereas with lower body temperature than normal the same situation can be experienced as unfolding much more slowly.⁶¹² Only the short-term

⁶¹² See G.J. Whitrow for an exposition of the issue of body temperature and time estimation in his 1980 book *The Natural Philosophy of Time*, Clarendon Press, Oxford, p. 124. He writes: “Whatever the dependence of our sense of time awareness and powers of time estimation on our bodily metabolism may be, it is highly probable that man’s homeothermy is the crucial factor linking our individual physiological time in the short term (i.e. from day to day) with universal physical time and preventing the relationship between them from becoming too erratic.” (p. 125).

aspect of the individual is influenced by this internal relationship between metabolism and environment. For instance, this aspect has importance for the individual organism's ability to gain a "calculable accuracy of external temporal relations". This actually indicates that a "calculable accuracy of external temporal relations" has profound importance, but no significance of the making of the human sense of time. To estimate time is a product of the human mind, however, it is a product that presupposes some kind of coordination of rhythms, cycles and other temporal processes external as well as internal. In its most primitive expression the biological/psychological significance of time sense is whether we are fit to handle the concrete situation or not. But what is this temporality that man has to adapt to?

All organisms at all levels of complexity disclose some kind of rhythmic behavior.⁶¹³ This means that there are living things that act according to an external periodicity as well as to its own innate periodic behavior. This behavior is independent of the environment and is therefore a manifestation of endogenous⁶¹⁴ "clocks".⁶¹⁵ The periodic behavior is clock-like because for different purposes we have selected obvious regularities, that is, regularities that we can recognize. The most obvious regularities are the circadian⁶¹⁶ rhythm, that is, the rhythm of day and night, or of 24-hour periods. This kind of periodicity is species-specific and endogenous. In addition to this, we find that there are also seasonal rhythms corresponding to the changing living conditions of summer and winter, of the long days of summer and the short days of winter. Environmental climate-changes are, of course, reflected in the behavior of plants and animals. Hence, if flies or animals can alter their behavior, which corresponds to the changing length of day, then these organisms must possess some kind of physiological "clock" by which the length of the day can be "measured" and thus coordinate the behavior according to environment.⁶¹⁷ The existence of a "photoperiodic response" has been established in research on flies like the *Sarcophaga Argyrostoma* and *Nasonia Vitripennis*.⁶¹⁸

Saunders writes that the flies, that he has studied, follow circadian rhythms or daily oscillations. The flies respond to the onset of

⁶¹³ J.T. Fraser, 1990:180.

⁶¹⁴ Meaning "internal" that works from within the organism.

⁶¹⁵ J.T. Fraser, 1990:180.

⁶¹⁶ "Circadian" is from Latin *circa dies*, which means "about a day".

⁶¹⁷ There is a response to seasonal cycles. This response would thus be visible by a change in the metabolism of the animal, bird or insect. The response is called photoperiodic.

⁶¹⁸ See D. S. Saunders, 1976, "The Biological Clock of Insects", *Scientific American*, 234:2, pp. 114-121.

shorter days by diapause, which is a period of dormancy. Changes of as short as 10-15 minutes of the length of the day transform the status of the metabolism of a population of flies from growth and development to diapause.⁶¹⁹ Saunders lists three minimum requirements for the photoperiodic mechanism. First, there has to be a receptor to detect the presence or absence of daylight. Secondly, there has to be a “clock” to “measure” the length of the day or the night and to integrate that information. Thirdly, there must be an effector system to control these metabolic changes as entry into diapause.⁶²⁰ The receptors that detect the change of daylight and as such are involved in the photoperiodic response are located in the brain of animals. The eyes of the insects are not involved in this detection or photoperiodic response. Saunders writes that eyes can be surgically removed without impairing the response.⁶²¹ It is the brain that is exposed to shorter or longer days and thus is the seat for certain hormone changes. Shorter days inhibit the hormones, long days release these hormones.⁶²² Saunders thinks that the most likely place for the “clock” would have to be the brain.

However, there are two temporality-systems operating within flies. Both systems are not present in the same species of flies since there is a different system operating in *Sarcophaga argyrostoma* than in *Nasonia vitripennis*.⁶²³

The temporality thus unveiled is complex. Saunders gives evidence of two different models: The first says that the use of an “interval timer”, an “hourglass” type of mechanism estimates the length of day or the night. Such a mechanism could be triggered by the onset of dawn and halted when dusk sets in, or vice versa. The other model or system is the “Bünning/Pittendrigh” idea. First Bünning’s idea is that the “measurement” of the length of the day or night is due to the endogenous, or innate, daily rhythm that consists of two half-cycles, one photophilic (“light-loving”) and one scotophilic (“night-loving”). Bünning thought that the phase of the innate rhythm would be set by dawn. Long days give long periods of illumination, which extend to the scotophilic part of the cycle, and then the organism will exhibit its long day responses. Vice versa if the days are short, the insect would then exhibit short day responses. Insects estimate time with an innate circadian oscillator.⁶²⁴

⁶¹⁹ Ibid., p. 114.

⁶²⁰ Ibid.

⁶²¹ Ibid.

⁶²² Ibid.

⁶²³ Ibid., p. 118.

⁶²⁴ Ibid., p. 115.

Pittendrigh extended Bünning's idea by proposing that the innate "clock" consists of two independent oscillators, one set by dusk and the other set by dawn. Saunders says that as the photoperiod changes, the phase relations of the two oscillations also change ("the internal-coincidence model").⁶²⁵ In this model light has one significance only, namely that of "entrainment", or *to set* the necessary type of oscillator into action. Long days would change the type of oscillator in operation until it would be in step with the other, and the combination of the two oscillations would result in a development without diapause. Short days would put the two oscillations out of phase and initiate diapause.⁶²⁶ The ideas presented here were confirmed by Saunders' experiments.⁶²⁷ The conclusion, however, is that temporality, even at the level of the flesh fly, is not simply an hourglass or oscillator – it is a subtle combination of both.⁶²⁸ From these considerations we must assume that the temporality of the human consciousness increases in complexity, although at the fundamental biological level it must have similarities with that of the fly since both man and fly have a behavior that indicate an endogenous circadian system, which links man's temporality to reality. It follows that biological time is not different or separable from physical time. This presupposes that the processes of the physical world cannot go contrary to the biological world, or "if there were no processes in the physical world there would be (no one) in the biological," as Harris has put it.⁶²⁹

Even if biological rhythms have been important for man's development of a time-sense, they now tend to play a less prominent role than in the life of plants, insects, birds and animals. In the course of evolution man has become less dependent upon these rhythms. Nevertheless, even now they cannot be entirely dismissed since they have influence on humans' sleep cycle, menstrual periods and so on.⁶³⁰

This is important for our understanding of the ontological status of human experienced temporality that it is grounded in reality at a fundamental level. As we have seen the capacity to initiate physiological "clocks" of a certain nature are in response to local environmental conditions necessary for all kinds of organisms. We have also seen that all innate physiological clocks are exogenous, that is, the physiological temporality is a coordination of the life of the organism with the temporality that is without, that is external to the

⁶²⁵ Ibid., p. 118.

⁶²⁶ Ibid.

⁶²⁷ Ibid., see pp. 118-121.

⁶²⁸ Ibid., see p.121.

⁶²⁹ Harris, 1988:71.

⁶³⁰ Whitrow, 1980:159. See also Fraser, 1990:181.

organism. Therefore, it is important to understand that human temporality has its basis in nature in a way that our sense of time must rest upon a temporality that is endogenous or innate. Thus, we have to understand that it is what is equally and inextricably woven into the fabric of temporal organization that must dominate all biological development, an organization that, perhaps, has “arisen in the evolution of the metazoa”, as Fraser claims.⁶³¹ He writes that: “Biological clocks do not assist but, to a large degree, make up the individual. Unlike a clockmaker who fabricates clocks so that they may serve man, the physiological clocks created by evolution comprise man – and life in general.”⁶³²

It is safe to state that man’s temporality at least has its fundament in nature, even if it can now depart from the restrictions of certain cycles. Thus, it has been shown that man’s innate physiological temporal system does not conform to, for instance, astronomical rhythms.⁶³³ There have been experiments that have examined periodicity in surroundings that are free from the changing phases of light and darkness, of a revolving sky and its changing scenery of planets and stars, moon and sun. It then becomes clear that man’s circadian rhythm of 24 or 25 hours only stays at this value for a certain time.⁶³⁴

During a very long period of isolation the sleep cycle will eventually (after two weeks) adjust itself to a value of about 33.4 hours, or it may plunge to half of this value.⁶³⁵ The point is that the whole organism, body and soul, according to Lestienne, chooses an arrangement of its own innate or endogenous rhythm that is different from that which it adopts in natural light.⁶³⁶ This shows that our innate temporality coordinates with astronomical rhythms, with other non-biological processes of the external world, processes that, in order to become influential, must be perceived and processed by an observer with a mind like the one possessed by man.

Becoming is characteristic of life and of time that shape and form life. Becoming, understood as the most fitting characteristic of life-processes, is fused into matter and mind, but we see that it, being fused with matter, also must be fused with the time that is characteristic of the successive transformations of the physical world. I will not, as most physicist and philosophers have done, create a

⁶³¹ Fraser, 1990:186.

⁶³² Ibid.

⁶³³ See Lestienne, 1995:156.

⁶³⁴ Ibid.

⁶³⁵ Ibid.

⁶³⁶ Ibid.

theoretical distinction between physical time and living time in order to facilitate the claim for truth for this distinction as *ontological*: As if this distinction itself is based in reality. Our awareness of the passage of time must, on the other hand, derive from the often-obscure sense we have of the physiological rhythms that find its way through our behavior.⁶³⁷ To this temporal consciousness the irreversibility of the temporal processes of the world must become insight; it must become an awareness with the experienceable temporal properties of past, present and future. The distinctions cannot come to consciousness without somehow being connected to the natural world. Hence, we adapt to the world's temporality in a two-fold way, one way that has taken a long time, a way that has formed the distinctive characteristics of organisms and their environment to form specific species and sub-species. Another way to gain access to time is through the individual person's cognitive coordination of self with essential properties belonging to the surrounding environment. With mind and reflective cognition the temporality of natural processes are brought to a level of immaterial thought. We tend to forget that temporal experience carries within itself the spores of its origin, that is, that my *now* must have its origin in my sense of passage. And that my sense of passage and change somehow must derive from physiological processes taking place within my brain and my body. And consequently we neglect that these processes are open processes. The temporal processes that are unveiled in my consciousness are open processes intimately related to changes and processes of the world at large.

⁶³⁷ Errol E. Harris, 1988:74.

9

Reality of Time or Objectivity of Time

First, I will take a look back on the central issues which have been discussed in this dissertation. Then, I will summarize my own argument. Lastly, I will offer a perspective on man and nature.

9.1. The Central Issues

Time can never be studied “in itself”, which means that time should be studied in relation to something else, a) “time and subjectivity”, b) “mind, time and nature”, c) “time and nature” and d) “time and scientific conceptualizations”. These are the contexts that I have applied to my investigation.

In retrospect we see that the distinction between two very important meanings related to objectivity has to be carefully considered before one embarks upon the task of determining the nature of time. Firstly, this distinction has to do with objectivity as a *re-presentation* of something *real*, and secondly, with objectivity as a representation that in fact is an *abstract idealization of non-empirical elements* and therefore rests upon an *exclusion* of subjectivity. The two aspects, reality and objectivity, are often thought to go hand in hand but the peculiarities emerging from the philosophy of time and from philosophy of physics indicate that this does not necessarily need to be true. Thus, we have two perspectives on the *nature* of time, that is, on the one hand we have sciences, like physics, which operates with *concepts of objective time*, and on the other hand, we have the “thing itself”, namely the *reality of time*. There are no obvious necessary links between the abstract and subjectivity-excluding *objectivity* in science and *reality* since physics operates with an “objectivity of time” that looks as if it must be of a pure theoretical (hypothetical) construct.

My argument has been that the objective time concept of physics, i.e., the specific time concept which includes properties like “reversibility” and “symmetry”, is a highly metaphysically context-

dependent time concept. This means that it is the physical theory itself, as far as metaphysical ideas and commitments are in fact imported and incorporated into the explanatory structure of the theory, which provides the necessary “well-defined” conceptual context in which these abstractions give sense. Hence, in many theories it is not *reality* as such that serves as the ultimate context for knowledge.

Although it is denied or omitted time must have some kind of relationship with both subjectivity and nature. For example, the relationship between man and the creation of the concepts of “subjectivity” and “objectivity” is omitted. Concepts like subjectivity and objectivity are concepts that come in pairs and which are incomprehensible without their counterpart. There cannot be objectivity without some sense in which subjectivity comes into play. The present situation of the philosophy of science, as well as of the philosophy of time, of epistemology and of metaphysics shows that there is a tendency among certain scholars to believe that they can eradicate subjectivity completely in order to extract a purified concept of objectivity. In consequence, if this should be possible, we might have to face the coming into being of a surreal science.

Especially characteristic is the *omission* of subjectivity as a source of time that can be accessed in order to determine real properties of time. This omission means that the empirical access to time is at stake. When temporal realism denies importance and relevance of temporal experiences, new problems are created. It becomes impossible for temporal realists to explain what their own source for the concept of time is. This gives us a picture of realism as a brand of metaphysical thinking that downplays the importance of subjectivity. Temporal realism cannot escape subjectivity because it must use it as the medium of language; language is analyzed for detensed representations of events and facts. Nonetheless, the view of temporal realism is allowed to play a most important role in science.

The belief in a world which existence is absolutely independent of the human mind presupposes a definition in which the stated ontological disjunction between mind and nature is treated as a fact. This is to say, it is stated that there is a world existing *independently* of man.⁶³⁸ Epistemologically speaking, realists state that we shall not rely on our empirically based cognitions in order to determine whether the world exists independently or not. This is, of course, quite absurd. What is originally contained in the realism claim is that no minds are needed for the world to exist. However, the metaphysical distinction is

⁶³⁸ While it is commonly held to be true that man cannot exist independently of the world. This aspect implies a relationship between man and nature that is utterly omitted by the realists in question.

between *a world*, which is *a reality*, and that is entirely different from *minds*. Here the problem of plurality is introduced by implication, which states that minds are individual objects belonging to a vast number of different individuals on different locations. Minds represent the world as events by the “when” and “where” these events *appear* to the individuals. Appearances are therefore a chaotic plurality of different perspectives and should thus be kept out of any definition of reality. It is commonly thought that “reality” *appears differently* to different minds than it does within the strict descriptions of methodical science.

Man is also held to be of “nature” but only as far as it can be defined without a qualitative ambiguity. It is when *mind* is introduced the problems begin. For the realist this means that man has to be viewed as a “spiritual and mind-endowed spectator” who only has random and rare glimpses of the real content of reality. This “spectator” can hardly ever obtain true facts by the use of his inaccurate and qualitative senses. What is hoped for in a scientific description, as a subject-independent description, is reality as it is “in-itself”. In truth, this is merely an *analytical* distinction that is used to claim that there is a real or ontological distance between human experience and reality. The separation of man and reality is hypothesized as “ontological” truth.

In temporal realism we find different ideas from the history of thought that has led thinkers to embrace this peculiar tendency of splitting up the world, of creating a disjunction between experience and reality. As already stated, these ideas are intrinsic to the peculiar “rationale” of certain temporal realists, a few philosophers of physics and physicists.

The “rationale” of thinking, we stated, began with Parmenides and the Eleatics, and Plato and Plotinus brought it further. After considerable philosophical turmoil during a few centuries of the millennium after Christ, the particular “rationale” reappeared as “neo-Platonism”. In the renaissance it was modified by Galileo’s emphasis on mathematical science of nature, whose intellectual strength influenced other thinkers in such a way that it was given further philosophical clarity by Descartes, Hobbes and even Locke. This is a “rationale” leading up to Einstein’s realism, a scientific project in which the solutions to the problems of time and subjectivity become exemplary to modern temporal realists. This is of course seen in the special way Einstein’s solutions appear in the philosophy of time and the philosophy of physics and where emphasis is put on the illusions created by the temporal mind.

It is worth to remember that in the Platonic context resting on Parmenides and the Eleatics “true being” becomes *ideational* being.

This is a “being” that transcends experience; which escapes the five senses. It is a “being” that is inaccessible by any empirical means. Ideational being implies that there is a “coeternity of truth and fact”.⁶³⁹ Only reason can access the world of eternal ideas, therefore is the validity of reason itself “supra factual” and “supra temporal”, as Marcuse has put it. And he continues by stating that “reason establishes an authority and reality which is...antagonistic to the immediately given facts”.⁶⁴⁰

The disjunction between the transcendent but intelligible accessible reality on the one side and the world in experience on the other was already integrated as a paradigm for the antique world. And it is precisely this “Parmenidean-Eleatic-Platonic” rationale that is being reactivated by the new anti-Aristotelian tendencies that emphasize natural philosophy following the trail of Galileo’s thinking.⁶⁴¹ It was from here onwards that the joint project of philosophy and science became a project of elimination. The important thing for the establishment of rational science was the eradication of the influence of subjectivity. Philosophy and the new Galilean-Cartesian science of nature in fact developed the concept of objectivity by redefining the religious disjunction between man and nature. This was a redefinition that could hide the influence of human subjectivity behind the scientific language, the methods and the results of scientific inquiry. As Husserl and Gurwitsch have commented, philosophers and scientists who emphasized the mathematical structure of nature and the relevance of mathematical symbolization, “threw a cloak” of metaphysical ideas over the world of experience, not only to conceal it but “to the point of being substituted for it”.⁶⁴²

⁶³⁹ See previous p. 196. For quote see Capek, 1965:443.

⁶⁴⁰ See p. 196. About Marcuse -- see Marcuse, 1965:281.

⁶⁴¹ Galileo’s science must be viewed as something apart from the long tradition of esoteric Platonism, which must be understood as a different way of understanding the relationship between nature and man and of the positive application of mathematics in natural philosophy. This tradition was i.e. upheld by men like John Dee, Johannes Kepler, Johann Valentin Andreae, Jacob Böhme, Giordano Bruno, Robert Fludd, Robert Boyle and even Francis Bacon. In this context it is of interest to see that the interrelationship between nature and man did not constitute a problem. On the contrary, the harmonious connection between inner man and outer nature was the most important and discussed issue of contemporary philosophy. The trend can, for example, be seen in the macro-microcosmical philosophy of Robert Fludd’s “Pansophia” doctrine. For works on this issue see the careful studies of F. Yates, 1972, *The Rosicrucian Enlightenment*, Routledge; F. Yates, 1964, *Giordano Bruno and the Hermetic Tradition*, Chicago University Press; F. Yates, 1979, *The Occult Philosophy in the Elizabethan Age*, Routledge.

⁶⁴² See previous p. 198; Gurwitsch, 1965:300; E. Husserl, 1970:51.

Galileo invented the *universal* law. This reorientation of Eleatic metaphysics has led to the fact that non-temporalism has gradually become an integral part of the scientific world-view. With the elements of “determinism”, “mathematics as the language of nature” and “eternism” the founders of physics thus laid the metaphysical-scientific foundation for Einstein’s brand of realism.

Einstein has had a profound impact upon modern science and philosophy. But we have realized that temporal realism has claimed to have gained more than other schools of thought from Einstein’s thinking. Although Einstein’s success is restricted to physical theory his work has been severely abused in order to extract an epistemological basis, or a basis of validation for the claims of temporal realism. This has, of course, to do with Einstein’s own confusing views on the nature of time.

Einstein himself maintained that the *macro-scopical world* behaves *asymmetrically* and that there are thermodynamic laws that describe this world. However, Einstein did not reject interpretations characterizing time as being “non-transitive” and “reversible”. He seems to have endorsed the idea about a time-reversible world, which is a structure of the world at its most fundamental level and that opens up for symmetry. We have a micro-level in nature that is more real since it is before and therefore constitutive of, the macro-level. The asymmetry of the perceptual world is due to our coarse-grained cognitions. Therefore, we have to deal with a metaphysical system as well as with a physical theory when we discuss Einstein’s work. The metaphysics are integrated with the scientific thinking. This thinking divides the world into levels of the more or less real or of more or less “constitutive impact”. This kind of thinking is characteristic of reductionism that holds the micro-level of reality to be the level to which all others can be subsumed.

Einstein’s double-sided view on time shows that he was thinking about different strata of reality according to the reductionism-doctrine. If STR is interpreted independently of what Einstein said about it, we find that STR can be regarded as a theory about measurements and transformations of these measurements from one frame of reference to another frame of reference. This was done by the help of Lorentz-transformations. These frames of reference have a time that indeed is transitional and irreversible. The universe is dynamical. Milic Capek, among others, has defended such a view.

Nonetheless, I believe that Einstein did not want to determine the *nature* of time in favor of the dynamical view. His STR has indeed had profound influence on the development of temporal realism and the idea of a “non-lapsing” time. It is precisely this Eleatic element in Einstein’s work that has been emphasized by temporal realists. The

ideational elements are simply transported, by the temporal realists, over from theoretical relativity physics to the defense of the temporal realist doctrine. The similarity between the ideational elements in Einstein's thinking and in the temporal realism doctrine consists more precisely of the similarity between space-time and the *timeless* Being of the Eleatics. These ideational elements also contain the idea that facts and truths transcend time. And, of course, we should not forget the impact of determinism upon our knowledge about nature and the high value we give to universal laws.

The most significant idea of the special theory of relativity is that the universe is a "space-time world". From a static perspective the idea of space-time subordinated time to space. The important thing was to get rid of the notion of transience. The static conception of space-time having its foundation in the Eleatic idea of uncreated and non-temporal Being is brought in connection with Minkowski's characterization of space-time as a "four-dimensional *world*". This theoretical operation is not epistemological but metaphysical in the sense that the product of a theoretical operation (space-time geometry) changes status when it is transformed into the metaphysical category of being a space-time *world*. We are not talking of mathematical concepts and theory anymore but about abstractions hypothesized into ontology: Method becomes reality. We see here that the Eleatic idea about non-lapsing time in an uncreated universe of Being, i.e. the "block universe", is carried through a shielded backdoor in order to, in the next moment, to be brought forward as the unavoidable ontological precondition for space-time physics.

There is a correspondence between Einstein's view on truth and facts and the view of modern temporal realism. This view is, of course, carefully connected with the doctrine of ontological determinism. Determinism comes in naturally when one begins to believe that to operate with universal physical laws means that one is dealing with the non-temporal world. That physical laws are universal means that one can operate with laws that have a truth-value with unlimited validity, which is to say that universal laws are valid eternally. "Facts" also have this kind of truth-value. A fact will always remain identical to itself; it will always be true that it was raining today at 8:30 a.m. Facts have, according to temporal realism, to do with dating, timing and the spatial localization of an occurrence in space and time. These related data have been obtained, it is claimed, without the use of A-series or tempus. The eternality aspect comes in with the realist aspirations to hold only those things to be real that are independent of the human mind. Only things or forms that persist through time have epistemological value.

This view leads us to Einstein's determinism where we have the Eleatic non-temporality as precondition for the validity of microphysical laws. This means that fundamental physical laws can be given a validity that transcends the characteristic limitations of unidirectional transitive temporality.

A good reason why physics find it difficult to operate with temporal characteristics such as "transitivity" and "becoming" is seen in C.D. Broad's statement "...we are trying and failing to force temporal facts into the mold of non-temporal facts about abstract objects such as numbers."⁶⁴³ Thus, it is stated that we reflect about temporal relations between external occurrences or things analogously to the way we reflect of abstract objects that are situated neither in space nor in time. These abstract objects are theoretical objects and only abstract theoretical objects can be applied as a reference when we talk about "timeless abstract objects", or "non-temporal facts". We can also think about temporal relations and occurrences as mathematical points on a line that is drawn in space from right to left, which means that we think of them as simultaneously and continuously existing particularia.

The above suggests a formalism that explains nature by reference to eternal "forms". These "forms" are further formalized through mathematical and geometrical representations. In the words of the Danish philosopher Mogens Wegener, this is nothing but a "vulgar Platonism".⁶⁴⁴

Concepts like "becoming", "change", "transitivity" and "transformation" are synonymous with *instability* and are therefore considered to be *incomplete*. The incompleteness of change and becoming suggests yet again that reality is a question of degrees. This means that there are levels of reality in the world, levels that yield different degrees of stability and instability, change and permanence. The more fundamental the level is the more real, i.e. permanent, it is. The representation of the most permanent level of reality is the most truth-yielding representation. To avoid the implicit and obvious metaphysics it is claimed that it is not the origin of the ideas that is of interest for epistemologists, but the truth of the theories.⁶⁴⁵ Permanently law-bound and predictable processes of fundamental physics become the truest level of reality because deterministically

⁶⁴³ C.D. Broad, "Ostensible Temporality", in Richard Gale, ed., 1968, *The Philosophy of Time*, p. 137.

⁶⁴⁴ Mogens Wegener, "Conflicting Ideas of Relativity".

⁶⁴⁵ See for instance K. Popper, 1983, *Realism and the Aim of Science*, Routledge, pp. 81-82.

law-bound particles traveling back and forth in time do not change over time.

However, in relation to the representation of permanence the situation is quite different. McTaggart was flabbergasted that one could not operate with permanence alone. McTaggart found that temporality presupposes change and that without change time would be outside of cognitive reach. Change presupposes the A-series and without the distinction between past, now and future there could be no B-series, that is, series that could represent the unchangeable relations between events. McTaggart thought to have identified a contradiction to the fact that we give each and every event all three A-series characteristics, that is, of being past, present and future in the very same act of determination. McTaggart's solution was to declare that time is mind-bound and therefore an illusion.

The confusion starts when one separates too strongly between the A-series and the B-series. This begins with the theoretical aspect of both series being recreated as "autonomous entities" and then by ascribing the same factuality to data of both the A-series and the B-series. The A-series have to do with the actuality of the event, that is, with the actuality and transitivity of the intuitive content of experience; they have to do with the intelligibility of data. The B-series are a secondary reflection which orders the same intuitive data by creating a fixed temporal and spatial perspective on the event. McTaggart made the mistake not to distinguish sharply between "real-world-truths" and "permanent-logical-truths". Logical truths can easily be made into truths about the world, with the essential difference. In this case it is where logical truths are taken to be identical to truths about the world, of being *permanent* truths about the world. This gives us two contradictory worlds and two very opposite natures of time.

Today, this kind of thinking can be localized both within temporal realism and in physicalistic thinking where the fundamental nature of time is typically understood to be reversible. Temporal realism claims that the B-series are the only series about time that can give a correct representation of the events taking place in space and time since facts are not about becoming, of something occurring or changing, or of flux. Facts cannot become, they are. Facts have to do with logical identity. The detensed representation freezes the fact to an eternal point in time, to a date, to an hour on the clock, to specific minutes and seconds. The representation is a tenseless determination of the hour on the clock, and is thus meant to capture something significant about the event itself.

It is in McTaggart's sense that we shall understand Einstein's view on truth: Logical truth means that there is a *necessary* correspondence between a statement and a real event. The logical

validity is thus elevated to become true about real relations, events, occurrences, and so on. Tenseless logic operates with truth where the validity is taken to be identical to the validity of the fundamental laws of nature, which is to say that the validity in question transcends everything we usually relate with time, and especially with what we usually understand to be the temporal limit on our knowledge about the future. That the temporal limitations on reality and knowledge can be eliminated by tenseless logic therefore has to be understood within the framework of determinism.

Einstein protested strongly against the new quantum mechanics that were being worked out by Planck, Bohr, Heisenberg, Schrödinger and Born. He rejected the new quantum theory because his beliefs in a fundamental determinism were shaken. It was, of course, not only Einstein's beliefs that were shaken since all of classical physics were built upon the fundament of deterministic thinking.⁶⁴⁶ Along with quantum theory came the reinforcement of concepts such as "probability", "chance", and "uncertainty", creating an uneasy feeling about determinism as foundational ontology for the fundamental laws of physics. The new tendency in physical thought emphasized the intuition that knowledge has temporal limitations. It thus connected the concept of knowledge with concepts such as "uncertainty" and "unpredictability". With the new tendencies of the sciences came a new trend of rational thinking that was criticizing its own foundations in classical theories. The interesting thing is that the critique came from within physics itself. One of the most discussed issues was the validity of scientific realism. This critique struck at the core of Einstein's philosophical program. This is apparent in the classical discussions between Bohr and Einstein, for instance, in the dispute about physics and epistemology and in the discussions resulting from the EPR paper.

In the years after STR and the General Theory of Relativity Einstein tried to develop a unified field theory that would save determinism. All talk about "particles" should be stopped and the concept of particles should be subsumed under the more fundamental concept of the field. All the properties of the material world should be explained from a field-theoretical point of view. From this perspective a particle is an area of a field and the properties of the particle can be construed as the basis of the properties of the field. A particle is an area that is particularly intense, as a bump on a perfect smooth surface. The difference between the field in itself and its matter consists in variations of intensity-degrees. It is not any more a question

⁶⁴⁶ See G. J. Whitrow, 1967, *Einstein the Man and his Achievement*, Dover Publications, Inc., p. 67.

about determining the nature of the individual particle or about identifying it but instead about calculating its numerical degree of intensity.⁶⁴⁷

The two known fundamental field theories that Einstein tried to unite were the electromagnetic theory and the theory of general relativity. With the unified super-field theory the *entire* physical reality would have been *explained* once and for all. The threat from quantum physics and indeterminism would have been eliminated and determinism reinstated as the true dogma behind scientific explanation.

Einstein never succeeded with this idea. Nevertheless, the idea was far from being dead. The ideas of determinism, universality of laws, symmetry and reversibility of time have never ceased to appeal to the scientific community.

In the “realistic” theories we see that neither nature nor experience can have been consulted with regard to the meaning applied to the concept of time. The time concept must have been construed so it could be fitted in and subordinated to other impending issues; what we have discussed and identified with positions that claim that “reality is deterministic”, that “laws are universal” and also “symmetrical in time”, that “time” itself, as a consequence “is reversible”. Nature plays a secondary role in comparison to theories. Metaphysical ideas, assumptions and preconceptions are more important than what in fact is experienced; what actually takes place, occurs or happens. The context in which the reversible time-concept, understood as the objective, and therefore true concept of time, consists of theories which distinguish sharply between man and reality, between mind and nature, finds truth in the abstractions and idealizations that leave out the imprint of subjectivity. One does not see that the concept loses its intelligibility, that is, if we remove the concept of objective time from its metaphysical-theoretical context it becomes nonsense. We therefore conclude that abstractions and idealizations give us aspects and elements to our work of theoretical analysis, but that these elements cannot have any kind of validity outside the analysis and the theory in which they occur.

9.2. Objectivity or Reality

⁶⁴⁷ Ibid.

The objective time of physics is a theoretical construct. The “objectivity” attached to the physical concept of time can be termed “epistemologically objective”. This is a type of construction that makes sense within specific theoretical ontology’s. Convictions and beliefs about a deterministic world can never be proved, as a basic assumption of the theories’ determinism will remain a metaphysical idea, nothing but a mere assumption.

Real time, on the other hand, has to do with lived time, with human experiences, but also with organic and inorganic real world processes.

I have argued that the human sense of time has epistemic primacy, that it is fundamental and necessary for the construction of time-concepts, and that it can be modified to the particularities of the applied ontology in question. I believe that experience does get things right because we correct experiences by other experiences and reflections. Also, we have innate structures that, prior to perceptions, already apply temporal order. The temporal order cannot be a contingent feature of the mind but is innate and thus prior also to the constructive acts of *thinking*. The common mistake in most accounts and analyses of time and temporality is that temporal experience is identified with the particular *content* of experience. Little attention is given to the fact that the temporal structuring of experience is *general* or inter-subjective. Our sense of time must of this reason alone, be connected with the external world. Although we cannot view time in the external world we can view processes, events, occurrences, birth and death, as particularities that are ordered precisely in the same unidirectional and irreversible manner as our particular and concrete experiences. That there is such a correspondence between the temporal order of events in the world of experience and of the temporal structuring of experience in itself must have something to do with our biological nature.

Evolutionary epistemology is therefore brought into the discussion in connection with my claim that temporal experience has its origin in nature. The relationship is necessary in order to show that time of mind applies symbolic representations of a temporal structure that has the same temporal properties of irreversibility and transience that is characteristic of organic nature. Mind, or the mental perspective, includes, besides consciousness and self-awareness, an aspect of “filling in”. This aspect can be explained as a necessary life preserving ability from the evolutionary epistemological approach. This means that “filling in” is a human ability that has *survival value*.

“Filling in” has usually been taken as proof of the illusionary character of temporal experiences, meaning that we add material that objectively is not there. It has been shown by Davies (1997) that Libet,

Wright, Feinstein and Pearl (1979) as well as Dennet (1991) are wrong in assuming that the conclusions drawn from their tests and experiments prove that human temporality is the nest of illusions. On the contrary, their experiments can be taken as proof of the opposite, namely that our brains act prior to any form of conscious participation when danger is imminent. Mind acts immediately on the scarce information at hand and according to the temporal structures innate as well as external to the mind, because it has no time to await the outcome of the dangerous event that evolves. In order to survive mind must act before the event has evolved. The fact that we survive is due to the ability to anticipate the outcome of imminent danger. This anticipation rests upon a necessary coordination of the external and the internal temporal order.

We adapt to the temporality of the world in such a way that our organism, mind and body adjust to the changing conditions of the environment, including the change of season, of the periods of light and darkness, etc. This organization is a “deep” structure of the mind, of the way we think, experience, act and organize our lives. By “deep” I mean that we cannot actually reach down to the depths of the soul and get a grip of the aspect of reality that would be established provided there is a relationship between the time of nature and the time of mind. However, the reasons to believe in the possibility of such a relationship are very strong.

As I have mentioned in my introduction Whitrow (1980), Fraser (1990), Harris (1988, 1993), Jerison (1973, 1976) and Saunders (1976) have all shown how mankind has developed cognitive capacities including the sense of time through adaptation. Saunders has studied the sense of time by experimenting with flies. I included this study in order to show that flies have a *modus operandi* that is organized by adaptation to changes in the environment. This is temporal adaptation. I take Saunders’ argument further by turning the relationship between “organic time structure” and “phenomenological time structure” into a topic of the discussion about the organic impact on phenomenological time. This does not mean a reduction of phenomenological time to biological time, as would not be possible. Instead it is an attempt to show that the phenomenological temporal structure rests upon the long evolutionary history of mankind adapting to his environments through a more gradually complex interaction that involves more and more of the conscious mind.

This leads us to the beginning of the dissertation, namely to the importance of metaphysical contexts behind scientific explanations. Although metaphysical theories, i.e. epistemological doctrines, ontologies and cosmologies, will always be acting through the scientists’ commitments and thus open for new discoveries, the

background can very well have the opposite effect, namely, to be an obstacle to rationality.

I have argued for the reality of experienced temporality by showing, in different ways, which it emerges from within the deep temporal structures of nature. I have tried to show this by criticizing the haphazardly way science and philosophy have treated human experience and temporality. My critique has been directed mainly against the context of mind-dependence in which human temporality and experience are set.

In order to identify the components of this type of orientation I have consulted a variety of different sources. These sources, which deal with metaphysical tendencies in modern scientific thinking, do not, however, mention how the tendencies have tended to treat human temporality. This is partly what I have tried to show. I believe the context of metaphysical-epistemology can help to clarify what is simply assumed and conjured in the scientific thinking about time, and what has nothing to do with time but is simply superimposed on the fundamental sense of time. Everybody has a background of metaphysical commitments and I believe that I have shown that this background must influence our thinking, both the concrete one but even more so, our theoretical way of thinking.

The conclusion is that an abstraction from experience; the subtraction of subjective qualitative elements and idealizations of an order that can be applied symmetrically, leading to the superimposition of these non-temporal elements on the nature of time, is a mistake of science and philosophy. Subjectivity cannot be ruled out, it can only be hidden; temporality cannot be eliminated, it is always presupposed.

9.3. Perspectives on Man and Nature

Time must always be studied from a variety of sources and approaches. The study of time should indeed be done by a variety of disciplines. The most profitable study of time is inter-disciplinary. Human experience is the epicenter from which the investigation must move.

In this dissertation I have focused on a variety of perspectives from where we may view the world and its contents. Among its contents we find that time can never be viewed, thought, conjectured as it is “in itself” *independently* of mind. What can be seen, as elements of nature that are independent of mind, are processes that we instantly identify as temporally structured. What the modern scientist has to do

in order to realize the importance of nature's temporality is first and foremost to overcome the disjunction between subjectivity and the world, which he has set out to investigate. The modern scientist has to overcome the fundamental symbolic crevasse between things that obviously are part of one and the same world. The scientist must be able to distinguish between true and possible realities. He has to overcome the dualism that splits man in two opposing natures and that chatters our trust in the immediate awareness of existence.

Our present scientific world-view rests upon ideas from two reorientations of scientific thinking.⁶⁴⁸ These reorientations of science have been of considerable importance of the way I have dealt with the triangular relationship between time in mind, physical concepts of time and time in nature. The time of mind has its roots in nature, and the time concepts developed in physics are constructive modifications of temporal experience. The static concept goes astray. However, the dynamic understanding of time in Prigogine's thinking conforms to the general characteristics of time in both experience and in biological processes.

The two reorientations of science have had a tremendous impact upon our world-view. These reorientations did not only form the way we reflect about the nature of time but have influenced how we are to understand the origin of knowledge as well. Perhaps, in some near future, we will have a third reorientation of science where the constructive human participation in the scientific enterprise is hailed as the true source of science.

On the one side we had the reorientation associated with Darwin, but where Haeckel, Huxley and Wallace helped in developing concepts like "evolution", "growth", "change", "development" etc. and thus developed biological science. The other reorientation of science was the one, which has been given most attention in this dissertation, namely the elements of modern physics that are associated with names like Einstein, Planck and deBroglie, Heisenberg and Schrödinger.

However, it is only during the last century that we have come to appreciate the tremendous importance of the biological nature as the setting of human life. This means that it is only during the last century or so that we have come to get a deeper scientific understanding which takes time and temporal processes seriously.

However, biology did manage to give man a natural origin and a natural history. It did not manage to overcome the disjunction between matter and mind, between the immediate awareness of the experiencing mind and reality. What it overcame was the belief that

⁶⁴⁸ See Randall, Jr., J.H., 1976, *The Making of the Modern Mind*, Columbia University Press, pp., 458-496.

man possessed a little bit of God inside. To some people, this meant that man was elevated above the rest of nature. These people simply forgot that the ancient esoteric philosophy about microcosmos and macrocosmos in fact revealed the most intimate relationship imaginable between man and nature. The metaphysical dualism of Descartes became the substitute. And the understanding of mankind's spirituality as "God's light in nature" became extinct.

With this new situation we find that man was not any longer divorced from material nature. The consequence of this is well known, as it led to the scientific-philosophical downplaying of whatever was qualitative and could be related to experience and human awareness. It is from within this schism of world-views, from the schism between dualistic science and the early esoteric-philosophical roots of science, which the mind-dependency theory of time stems. The same applies to the relational theory about sense-qualities. The central tenet being that experience and awareness cannot disclose what is true about reality; it denies reality to temporality, colors, sounds, flavors and odors.

I have focused on nature and the process of development, that is, on a continual growth towards diversification and variety.⁶⁴⁹ I have emphasized the richness of life and possibilities of the multiplied forms of nature. However, this is not the same as admitting to a naturalistic reductionism.

The non-evolutionary approach (temporal realism) stresses that the only approach to time of any importance is a logical analysis of the language. Its elucidations of the tenseless structure of representation and fact proceed in isolation from any in-depth phenomenology of perception and experience. Furthermore, by choosing this as the only way of determining the ontology of the temporal mind, temporal realism has chosen to omit significant references to experience -- and to the origin of experiences. To understand the intimacy between the temporality of mind and the temporality of "mind-independent" (objective) organic processes in nature -- by conjoining the temporality of mind to the temporality of natural processes by applying the evolutionary concepts "survival value" and "survival interest" -- is not the same as claiming that knowledge is merely an instrument of the service of survival interests. On the contrary, I believe that evolution is in itself a knowledge process. This puts new light to the importance of temporal experience. In many respects, my work is a reminder of the philosophies of both Herbert Spencer and Henri Bergson.

⁶⁴⁹ See Randall, Jr., 1976:604.

In Spencer's *First Principles* we can read that the truth, that guides us in action and the consequent maintenance of life, is the correspondence between subjective and objective relations. Error leads towards death, and error stems from the absence of such correspondence.⁶⁵⁰ Besides the mechanistic character of Spencer's theory, we have the relation between man and world as a truth yielding relation. He thus implied that the instinctive nature of man is the forum where the relation manifests itself through action, while the instinct itself is a product of evolution and individual learning. In the large scope of the evolution of humankind we can almost believe that adaptation and evolutionary processes culminated in a correlation of subjective and objective relations, which are, according to Spencer, the development of human intelligence.

Many things can be said about Spencer's evolutionism from today's scientific perspective. He neglected the degree of abstraction that is always involved when we take experience as an exemplification of the formal categories of thought.⁶⁵¹ What we shall pursue in our continued philosophical and scientific effort, however, is as Bergson expresses it, to "view that the present form of human intellect is a result of the gradual evolutionary adaptation of the human psychophysical organism to the order of nature."⁶⁵² The only access to this world beneath our immediate awareness is the origin of our concepts and experiences and their complex interrelations with the real world.

⁶⁵⁰ Spencer, Herbert, 1910, *First Principles*, D. Appleton: New York and London, pp. 70-72.

⁶⁵¹ A.G. Bjelland, "Evolutionary Epistemology, Durational Metaphysics, and Theoretical Physics: Capek and the Bergsonian Tradition" in Griffin, D.R., ed., 1986, *Physics and the Ultimate Significance of Time*, SUNY, pp. 58-59.

⁶⁵² *Ibid.*

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