

BOOK REVIEW

The Evolution of Time *Studies of Time in Science, Anthropology, Theology*

Argyris Nicolaidis & Wolfgang Achtner (Eds.)

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The title of this book, *The Evolution of Time*, might lead us into thinking that what we are about to read is a history of the concept of time in a number of different disciplines (comprising ‘hard’ sciences, Anthropology and Theology, as the subtitle indicates).

So, how should the title of this volume be understood? In my view, the ‘evolution of time’ should not so much be understood here as a historical perspective about the development, the successive changes and the progression of the notion of time from ancient times to our own present. Even though many of the contributions in this volume do offer brief historical outlines of this sort, the limited space offered to each author necessarily renders these historical *aperçus* sketchy and marginal. But the authors seem to be well aware of this and to assume it since this is not the aim of the volume. Which brings us to the idea that the notion of ‘evolution of time’ should not be taken here so much in a historical sense – in its relation to the past, therefore –, but should be understood in its relationship to the present. ‘What is time evolving into?’ - this seems to me to be the main question that this book leads us to ask – what is the notion of time becoming today, in our particular moment in time? The paradoxical nature of this question is, of course, not fortuitous, because it is inscribed in the nature of the subject itself, i.e. time: asking what time is becoming at this moment in time already indicates that time is somehow capable of ‘operating’ within itself or, to be more precise, of operating or receiving a change in a particular moment of itself. And this leads us to a further question, namely that of knowing whether this ‘operating within oneself’ or ‘operating with oneself’ is not merely a ‘capability’ or a capacity of time, but, more importantly, one of its possible – and certainly tentative – definitions.

What are the directions the notion of time seems to be opening towards in the light of our current scientific theories? What are the different aspects of time that different scientific domains are tackling and are able to tackle? And, finally, what aspects of time can be clarified by the dialogue between some of these scientific domains? These are the actual questions that this volume poses, and it is probably in this light that it should be read. Therefore, in reading this eBook,

stemming from the two gatherings (Thessaloniki – May 2007 and Athens – September 2007) of the research workshop ‘TIMES: Time in Science, Anthropology and Theology’, one should keep the balanced attitude taken by the author of the Forward, Professor Christos Tsagas, when he says: “Is there a convergence among these different points of view? Is there a shared understanding of the notion of time? It is not that certain”; but, even though a unifying concept might not be available, the volume has, in Christos Tsagas’ words, the important merit that it refrains from ‘easily offered solutions’. The fact that the contributors to this volume have very different backgrounds (Physics, Biology, Neurosciences, Psychology, Psychiatry, Philosophy, Theology) can only reinforce this point.

Therefore, in what follows, I will only offer a brief outline of each contribution’s contents, before turning towards some brief concluding remarks. The first contribution, signed by Professor Argyris Nicolaidis, begins with an inventory of the different notions of time that stem from classical Newtonian mechanics, special Relativity physics, Quantum mechanics and generalized relativity, before proposing an interesting suggestion: rather than mapping time as a single – possibly universal, but certainly monotonous – line, we should map it under the form of a ‘time plane’, where the two coordinates of the plane are represented by the ‘repetition time’ (where time appears to generate the same patterns) and ‘innovation time’ (where time is linked to the generation of new patterns). In this mapping, time would therefore cease to be a neutral and constant milieu, but would turn us towards an ontology of the temporal in which the fabric itself of reality is time-dependent, inasmuch as each type of phenomenon is constituted by a modulation of a substratum that requires a certain – and ‘whole’ – period in order to manifest itself. Whitehead’s ontology is compared in this light to string theory (in which elementary particles are not autonomous entities, but deformations or excitations of a string, where each excitation has its own period).

Professor Klaus Mainzer’s contribution takes us into the dynamics of complex systems, and identifies the nonlinear interactions of the elements of a complex system as the source of the emergence of distinctive temporal, spatial or functional structures within the system. Analyses and exemplifications of this type of processes range from the development of the Universe in quantum cosmology to dissipative systems in Thermodynamics, from species formation in evolutionary theory to brain functioning in Neurobiology or to the functioning of the global information network.

In a contribution that constantly moves between general relativity and the philosophical tradition from Plato to Kant, Professor Peter Mittelstaedt first outlines the special conditions that need to be assumed in general relativity in order to obtain a unitary cosmic time, before moving on to show that a further limitation of these conditions could also provide us with physical models in which – as one position of a much debated philosophical issue states – the universe would have an infinite age. Finally, the possibility of a physical meaning of the concept of eternity as it features in some philosophical debates

(i.e. as timelessness and as possession of a simultaneous view of the universe encompassing its past, present and future at once) is discussed in a similar general relativity setting.

The physics-oriented section of the volume is fittingly concluded by Brandon Carter's essay that addresses the question of the necessary conditions for the formation of a link between the time of the external world and psychological time. His conclusion indicates that a very small ratio of gravitational attraction between particles to their electromagnetic attraction is favouring the link between the two 'times', and this could serve as an argument in favour of the strong version of the anthropic principle.

In a strongly antireductionist contribution, Professors Gernot and Renate Falkner use the notion of 'biological time' to account for self-organizing phenomena in microbial life. With the help of an ingenious experiment on cyanobacteria, the authors show that describing a state of a biological system simply as a time 'slice' that gives us its elements and their respective positions and interrelations at a given moment is biologically unsatisfactory since these phenomena don't only involve adaptive states (where energy conversion is optimal in a particular environmental context), but also 'adaptive operation modes' that are described as sub-system reconstruction measures taken by the organism in order to achieve a new adaptive state after an environmental change. Moreover, these adaptive operation modes are shown to depend on environmental change patterns interpreted by the organism in view of obtaining future adaptive states.

Two contributions stemming from neurosciences occupy the centre of this volume. The first one, signed by Professor Hans Förstl, offers us an overview of the current knowledge about the (different) regions of the brain that are responsible for our perception of the dimensions of time (past, present, future), in correlation with the time-perception effects of the diseases affecting these parts of the brain. For his part, Professor Ulrich Ott indicates – via an analysis of different spiritual traditions – that the experience of unity and timelessness is a prominent characteristic of mystical experiences and advances a hypothesis – backed by several existing experiments – according to which mystical practices could be read as shifts in the overall organization of brain dynamics, while the experience of unity and timelessness would be correlated to a "phase transition to extended coherent EEG gamma activity" (p. 104); this is a significant find, since the gamma activity – implying a large and broad ranged "number of neurons firing synchronously" (p. 109) – have recently been shown to be closely linked to attention, perception and cognition.

Professor Jiří Wackermann returns to the question of the relationship between the plurality of time-scales that correspond to different phenomena (physical, psychological, biological, social, etc.) and asks how these time scales could be integrated – and are integrated in our everyday life – into a common description of time; his suggestion is that inter-subjective communication is the means by which such a quasi-unification becomes possible.

A parallel discussion of J.E. McTaggart's A-series and B-series view of time with the counterarguments that it may receive from generalized relativity pushes Professor Dirk Evers to accept a presentist philosophical position in his paper. He can thus show that human beings don't only exist in time, but also relate to time, and this leads him not only to superpose the Augustinian faculties of the mind (memory, attention and expectation, relating to past, present and future) with Saint Paul's triad of faith, hope and love, but also to show that eternity and time should not be bluntly opposed: God may not be in time, but He relates to our time, just as human beings need not extract themselves from time in order to reach God, but they can participate in His work by their way of relating to time. Without embracing the presentist stance (but, on the contrary, offering a preeminence to the future), Professor Elisabeth Gräß-Schmidt's contribution proposes a very interesting parallel between the idea of an eternal universe ("At the birth of the universe, its end was present already" – p. 171) as it is found in the physical theories of Christoph von der Malsburg and Kierkegaard's view of the relationship between time and eternity. This strong notion of eternity or eternal universe and the priority of the future ensure that the notion of human freedom does not lose its meaning: on the contrary, in this theoretical setting, even though the future is 'already there', we are the ones contributing to its shaping.

Professor Wolfgang Achtner's concluding contribution again reinterprets mystical experiences – from different traditions – of timelessness through chaos theory, but his suggestion is that such states should be understood as the transition from a stable state of the self-organizing brain-nervous-respiratory system (with a strong attractor provided by the consciousness of linear time) to another – less stable – state with consciousness of timelessness as strange attractor. However, the last part of the paper distinguishes this consciousness of timelessness in mystical experiences from God's eternity, and argues that the latter should not be understood as timelessness but, in a Trinitarian perspective, as the creation, redeeming and pushing forward of time.

Researchers in Physics, Biology, Human sciences and Theology, as well as philosophers and the instructed general public can greatly benefit from the overview of the different transformations that the notion of time finds itself engaged in through the concepts and theories of these contemporary disciplines as well as – and most importantly – through the dialogue between these disciplines. And this volume offers a good exemplification of this very dialogue.

Dr. Ciprian Jeler

*Interdisciplinary Research Department – Human and Social Sciences
'Al. I. Cuza' University, Iasi*