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ENDOPHYSICS, TIME, QUANTUM AND THE SUBJECTIVE
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PREFACE

The workshop "Endophysics, Time, Quantum and the Subjective" was the third in a series started by "Studies on the Structure of Time: From Physics to Psycho(patho)logy" (1999, Palermo/Italy) and followed by the NATO ARW "The Nature of Time: Geometry, Physics and Perception" (2002, Tatranská Lomnica/Slovak Republic). The workshop focused on the possible role of the endo-physical paradigm in the future development of physics and in our understanding of Nature as a whole. General topics discussed were the nature of time, quantum theory and the concept of subjectivity; more specific topics included the puzzling discrepancy between the physical and psychological aspects of time, psychopathology of time, quantum entanglement, separability and non-locality, the status of first-person perspective and the prospect of naturalizing subjectivity.

Modern physical theories are based on reductionist and *exo*-physical perspectives. The reductionist point of view rests on the assumption that a few simple fundamental laws are able to account for all the observed and predictable phenomena. Per the exo-physical point of view, each human is able to achieve a complete description of the external world independently of other humans and irrespectively of their interaction with the world itself. These paradigms led, on the one hand, to the remarkable progress in sciences and technology. Yet, on the other hand, they gave rise to an ever-increasing discrepancy between our immediate experience of reality and the physical formalism.

One of the most striking and pronounced facets of this duality concerns the nature of *time*. Time, as we perceive it, exhibits a non-trivial internal structure, consisting of past and future, the two domains being separated from each other by a unique moment, the present. This time seems to "flow," to proceed from the past into the future — thus apparently manifesting an arrow of time. Physics, however, tells us a completely different story. For not only are its fundamental equations time reversible, i.e. they do not distinguish between past and future, but the very concept of the present, the "now," is absent. A host of fundamental questions naturally emerge: Why does there exist such a puzzling discrepancy between the two aspects of time? What does that imply? Can the two concepts be reconciled?...

Another example of where the exo-physical paradigms seem to be seriously at odds with the nature of scientific inquiry is furnished by *quantum* mechanics, whose interpretation has been a subject of serious debate for decades, triggered by the famous paradoxes of Einstein, Schrödinger and

others. Here, the crucial role of the subject/observer manifests itself at a minimum of three levels: 1) the properties of a phenomenon depend on the modality of its observation; 2) the prediction of an outcome can only be made in probabilistic terms, and 3) the description of a phenomenon can only be obtained after the process of measurement.

The third issue, where the exo- vs. endo- controversy is perhaps most pronounced, is the concept of *subjectivity* and what can be considered its three fundamental dimensions, viz. intentionality, self-awareness and inter-subjectivity. Here the most pressing questions are: Can subjectivity and consciousness be naturalized? Is it ultimately possible to account adequately for the puzzling discrepancy between the first-person perspective and third-person observable behaviour? What is the role of "anomalous/peculiar" experience in our understanding of Nature? A few prominent scholars (e.g., Wigner, Eccles, Penrose and Davies) suspect these three questions are intimately connected via the concept of time — the most basic element of any process. Hence, since time is poorly understood, difficulties in understanding the problem of measurement in quantum mechanics, as well as the age-old hiatus between brain mechanisms and conscious experience, may be overcome when studied per this triplet of questions.

In fact, the current stalemate in physics may result from the neglect of the *endo*-physical, *first*-person perspective in the development of physics. We believe that this perspective is crucial in obtaining deeper insight into the nature of time, quantum theory and the scientific appropriation of the subjective. Our workshop provided, for the first time in many years, an in-depth interdisciplinary dialogue/debate between these closely interconnected issues. It is therefore our hope that this volume will be of great relevance to anyone interested in the conceptual issues related to both contemporary physics and cognitive sciences.

Finally, we express our deepest gratitude to the Directorate and all the personnel of the Center for Interdisciplinary Research (ZiF), Bielefeld University, for providing the event with both financial and logistic support and a highly interactive and stimulating setting. We also acknowledge the partial sponsorship of SkyEurope Airlines, thank all the manuscript reviewers for their hard work and are grateful to Dr. Richard Komžík for his technical/software assistance.

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