Preface

Today many important directions of research are being pursued more or less independently of each other. These are, for instance, strings and membranes, induced gravity, embedding of spacetime into a higher-dimensional space, the brane world scenario, the quantum theory in curved spaces, Fock–Schwinger proper time formalism, parametrized relativistic quantum theory, quantum gravity, wormholes and the problem of "time machines", spin and supersymmetry, geometric calculus based on Clifford algebra, various interpretations of quantum mechanics including the Everett interpretation, and the recent important approach known as "decoherence".

A big problem, as I see it, is that various people thoroughly investigate their narrow field without being aware of certain very close relations to other fields of research. What we need now is not only to see the trees but also the forest. In the present book I intend to do just that: to carry out a first approximation to a synthesis of the related fundamental theories of physics. I sincerely hope that such a book will be useful to physicists.

From a certain viewpoint the book could be considered as a course in theoretical physics in which the foundations of all those relevant fundamental theories and concepts are attempted to be thoroughly reviewed. Unsolved problems and paradoxes are pointed out. I show that most of those approaches have a common basis in the theory of unconstrained membranes. The very interesting and important concept of membrane space, $\mathcal{M}$, the tensor calculus in $\mathcal{M}$ and functional transformations in $\mathcal{M}$ are discussed. Next I present a theory in which spacetime is considered as a 4-dimensional unconstrained membrane and discuss how the usual classical gravity, together with sources, emerges as an effective theory. Finally, I point out that the Everett interpretation of quantum mechanics is the natural one in that theory. Various interpretational issues will be discussed and the relation to the modern "decoherence" will be pointed out.

If we look at the detailed structure of a landscape we are unable to see the connections at a larger scale. We see mountains, but we do not see the mountain range. A view from afar is as important as a view from nearby. Every position illuminates reality from its own perspective. It is analogously so, in my opinion, in theoretical physics also. Detailed investigations of a certain fundamental theory are made at the expense of seeing at the same time the connections with other theories. What we need today is some kind of atlas of the many theoretical approaches currently under investigation. During many years of effort I can claim that I do see a picture which has escaped from attention of other researchers. They certainly might profit if they could become aware of such a more global, though not as detailed, view of fundamental theoretical physics.

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