

Topological Geometro-dynamics: Overview

This book tries to give an overall view about quantum TGD as it stands now. The topics of this book are following.

1. In the first part of the book I will try to give an overall view about the evolution of TGD and about quantum TGD in its recent form. I cannot avoid the use of various concepts without detailed definitions and my hope is that reader only gets a bird's eye of view about TGD. Two visions about physics are discussed. According to the first vision physical states of the Universe correspond to classical spinor fields in the world of the classical worlds identified as 3-surfaces or equivalently as corresponding 4-surfaces analogous to Bohr orbits and identified as special extrema of Kähler action. TGD as a generalized number theory vision leading naturally also to the emergence of p-adic physics as physics of cognitive representations is the second vision. Number theoretical vision involves three loosely related approaches: fusion of real and various p-adic physics to a larger whole as algebraic continuations of what might be called rational physics; space-time as a hyper-quaternionic surface of hyper-octonion space, and space-time surfaces as a representations of infinite primes.
2. The second part of the book is devoted to the vision about physics as infinite-dimensional configuration space geometry. The basic idea is that classical spinor fields in infinite-dimensional "world of classical worlds", space of 3-surfaces in $M^4 \times CP_2$ describe the quantum states of the Universe. Quantum jump remains the only purely quantal aspect of quantum theory in this approach since there is no quantization at the level of the configuration space. Space-time surfaces correspond to special extremals of the Kähler action analogous to Bohr orbits and define what might be called classical TGD discussed in the first chapter. The construction of the configuration space geometry and spinor structure are discussed in remaining chapters.
3. The third part of the book carries title "Algebraic Physics". Classical physics is an exact part of the configuration space geometry and the identification of space-time surfaces as generalized Bohr orbits is not a mere approximation. Path integral is replaced by a functional integral over 3-surfaces and there are reasons to expect that the decomposition of the configuration space to a union of symmetric spaces allows to carry out the functional integral exactly. This together with quantum classical correspondence and Bohr orbit property suggests a generalization of the duality symmetry of hadron models stating that the addition of loops does not affect the physical amplitude assignable to a given diagram. Hopf algebras are used to formulate this symmetry. In the second chapter the profound implications of the fact that configuration space spinors correspond to von Neumann algebras known as hyper-finite factors of type II_1 are considered.
4. The physical applications of TGD are the topic of the fourth part of the book. The cosmological and astrophysical applications of the many-sheeted space-time are summarized and the applications to elementary particle physics are discussed at the general level. TGD explains particle families in terms of generation genus correspondences (particle families correspond to 2-dimensional topologies labelled by genus). The notion of elementary particle vacuum functional is developed leading to an argument that the number of light particle families is three is discussed. The general theory for particle massivation based on p-adic thermodynamics is discussed at the general level. The detailed calculations of elementary particle masses are not however carried out in this book.