

Physics in Many-Sheeted Space-Time

This book is devoted to what might be called classical TGD.

1. Classical TGD identifies space-time surfaces as kind of generalized Bohr orbits. It is an exact part of quantum TGD.
2. The notions of many-sheeted space-time, topological field quantization and the notion of field/magnetic body, follow from simple topological considerations. Space-time sheets can have arbitrarily large sizes and their interpretation as quantum coherence regions implies that in TGD Universe macroscopic quantum coherence is possible in arbitrarily long scales. Also long ranged classical color and electro-weak fields are predicted.
3. TGD Universe is fractal containing fractal copies of standard model physics at various space-time sheets and labeled by p-adic primes assignable to elementary particles and by the level of dark matter hierarchy characterized partially by the value of Planck constant labeling the pages of the book like structure formed by singular covering spaces of the imbedding space $M^4 \times CP_2$ glued together along four-dimensional back. Particles at different pages are dark relative to each other since local interactions defined in terms of the vertices of Feynman diagram involve only particles at the same page.
4. Zero energy ontology brings in additional powerful interpretational principle.

The topics of the book are organized as follows.

1. In Part I extremals of Kähler action are discussed and the notions of many-sheeted space-time and topological condensation and evaporation are introduced.
2. In Part II many-sheeted-cosmology and astrophysics are summarized. p-Adic and dark matter hierarchies imply that TGD inspired cosmology is fractal. Cosmic strings and their deformations are basic objects of TGD inspired cosmology. The study of imbeddings of Robertson-Walker cosmology shows that critical and over-critical cosmology are unique apart from their duration. The idea about dark matter hierarchy was originally motivated by the observation that planetary orbits could be interpreted as Bohr orbits with enormous value of Planck constant, and this picture leads to a rather detailed view about macroscopically quantum coherent dark matter in astrophysics and cosmology.
3. Part III includes old chapters about implications of TGD for condensed matter physics. The phases of CP_2 complex coordinates could define phases of order parameters of macroscopic quantum phases manifesting themselves in the properties of living matter and even in hydrodynamics. For instance, Z^0 magnetic gauge field could make itself visible in hydrodynamics and Z^0 magnetic vortices could be involved with super-fluidity.