In this chapter the focus is on the hadron physics. The applications are
to various anomalies discovered during years.

\vm {\it 1. Application of the many-sheeted space-time concept in hadron
physics}\vm

The many-sheeted space-time concept involving also the notion of field body
can be applied to hadron physics to explain findings which are difficult to
understand in the framework of standard model.

\begin{enumerate}

\item The spin puzzle of proton is a two decades old mystery with no
satisfactory explanation in QCD framework. The notion of hadronic
space-time sheet which could be imagined as string like rotating object
suggests a possible approach to the spin puzzle. The entanglement between
valence quark spins and the angular momentum states of the rotating
hadronic space-time sheet could allow natural explanation for why the
average valence quark spin vanishes.

\item The notion of Pomeron was invented during the Bootstrap era preceding
QCD to solve difficulties of Regge approach. There are experimental
findings suggesting the reincarnation of this concept. The possibility
that the newly born concept of Pomeron of Regge theory might be identified
as the sea of perturbative QCD in TGD framework is considered.
Geometrically Pomeron would correspond to hadronic space-time sheet without
valence quarks.

\item The discovery that the charge radius of proton deduced from the
muonic version of hydrogen atom is about 4 per cent smaller than from the
radius deduced from hydrogen atom is in complete conflict with the
cherished belief that atomic physics belongs to the museum of science.
The title of the article {\it Quantum electrodynamics-a chink in the

armour?} of the article published in Nature expresses well the possible implications, which might actually go well extend beyond QED.
TGD based model for the findings relies on the notion of color magnetic body carrying both electromagnetic and color fields and extends well beyond the size scale of the particle. This gives rather detailed constraints on the model of the magnetic body.

\item The soft photon production rate in hadronic reactions is by an average factor of about four higher than expected. In the article soft photons assignable to the decays of Z^0 to quark-antiquark pairs. This anomaly has not reached the attention of particle physics which seems to be the fate of anomalies quite generally nowadays: large extra dimensions and black-holes at LHC are much more sexy topics of study than the anomalies about which both existing and speculative theories must remain silent. TGD based model is based on the notion of electric flux tube.

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\vm {\it 2. Quark gluon plasma}\vm

QCD predicts that at sufficiently high collision energies de-confinement phase transitions for quarks should take place leading to quark gluon plasma. In heavy ion collisions at RHIC something like this was found to happen. The properties of the quark gluon plasma were however not what was expected. There are long range correlations and the plasma seems to behave like perfect fluid with minimal viscosity/entropy ratio. The lifetime of the plasma phase is longer than expected and its density much higher than QCD would suggest. The experiments at LHC for proton proton collisions suggest also the presence of quark gluon plasma with similar properties.

TGD suggests an interpretation in terms of long color magnetic flux tubes containing the plasma. The confinement to color magnetic flux tubes would force higher density. The preferred extremals of K\"ahler action have interpretation as defining a flow of perfect incompressible fluid and the perfect fluid property is broken only by the many-sheeted structure of space-time with smaller space-time sheets assignable to sub-CDs representing radiative corrections. The phase in question corresponds to a non-standard value of Planck constant: this could also explain why the lifetime of the phase is longer than expected.

\vm {\it 3. Breaking of discrete symmetries}\vm

Zero energy ontology provides a fresh approach to discrete symmetries and provides also a general mechanism for their breaking.   A general vision about breaking of discrete symmetries relies on quantum measurement theory: the quantum jump selecting the quantization axes induces localization to a single CD and therefore induces breaking of discrete symmetries due to the choice of quantization axes. The time scale of CD is excellent candidate for defining mass and time scales characterizing the symmetry breaking. Entropic gravity idea has a variant in TGD framework resulting from the fact that in ZEO quantum theory is a square root of thermodynamics in a well-defined sense. Thermodynamical stability could force the generation of the arrow of time and also force it to be different for matter and antimatter inducing in this manner matter antimatter asymmetry and breaking of discrete symmetries like CP. Also CPT could be broken spontaneously and there are experimental indications that this takes place for top quark with mass difference which is surprisingly large- few per cent of top mass.

\vm{\it 4. Are exotic Super Virasoro representations relevant for hadron physics?}\vm

In p-adic context exotic representations of Super Virasoro with $M^2 \propto p^k$, $k=1,2,..m$ are possible. For $k=1$ the states of these representations have same mass scale as elementary particles although in real context the masses would be gigantic. This inspires the question whether non-perturbative aspects of hadron physics could be assigned to the presence of these representations. Some intriguing numerical co-incidences suggest that the exotic representations of Super-Virasoro should be assigned with hadron and whereas ordinary Virasoro representations would be assigned with the quark-gluon plasma or possibly sea quarks.