

In this chapter the topics relates to what might be called quantum astrophysics. Motivation comes from the model for Nottale's findings suggesting Bohr quantization of planetary orbits. The model leads to the introduction of gravitational Planck constant $h_{gr} = GMm/v_0$, where v_0 corresponds to a typical rotational velocity in two particle system. h_{gr} characterizes the interaction of masses M and m and assigned to the magnetic flux tube connecting them and carrying the massless extremals mediating gravitational interaction. If m is planetary mass, the value of h_{gr} is gigantic. Since gravitational acceleration and gravitational Compton length do not depend on particle mass, one can however assume only that microscopic objects have gravitational flux tube connections to the central mass M . In this case the values of h_{gr} could be even identical to the corresponding values of $h_{eff} = n \times h$ in living matter and $h_{eff} = h_{gr}$ identification makes sense.

The topics discuss in this chapter are following.

\begin{enumerate}

\item An updated view about hierarchy of Planck constants is discussed and the connection $h_{eff} = h_{gr}$ is shown to be consistent with TGD inspired quantum biology. Quantum gravity would be in key role in biology as intuited also by Penrose.

\item Vision about formation of structures and quantum chaos is astrophysical scales is discussed. Also a speculative view about gravitational radiation based on h_{gr} is considered.

\item A simple model for gravitational radiation assuming that the emission occurs as dark gravitons is considered. $h_{gr} \rightarrow h_{gr}$ implies that the energy of graviton is scaled from that in standard model by h_{gr}/h factor. Realistic model might correspond to h_{gr} for microscopic particles. The basic prediction is that gravitons would be detected as bunches of ordinary gravitons.

\item TGD suggests that cosmological evolution involves a series of phase transitions changing the value of h_{gr} occurring via

periods
of quantum criticality. The critical cosmology is fixed apart from
its
duration. This suggests a piecewise accelerated expansion. Also
inflationary period would be example of this phenomenon as also
accelerating expansion much later.

\item Expanding Earth model has been proposed for long time ago to
explain why the continents seem to fit nicely to form a complete
covering of the Earth's surface. The model however makes sense if
the
radius of Earth is one half of its recent value. TGD based
interpretation for the expansion is in terms of a phase
transition
increasing h_{gr} by factor 2.

\item Blackholes in TGD is the topic of the last two sections.

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