Gravitational anomalies

1. During years I have considered models for various claimed gravitational anomalies.

   (a) The basic assumption has been that the anomalies are modellable in terms of submanifold gravity and many sheeted space-time.

   (b) Also large gravitational Planck constant has been considered and could be reduced to the $h_{gr} = GMm/v_0$, $v_0/c \simeq 2^{-11}$ applied to elementary par- ticles to obtain $h_{eff} = h_{gr}$ of reasonable size. Compton length does not depend on the mass m of the particle.

   (c) The anomalies should reflect the failure of the as sumption that the space-time of GRT provides effecti ve description of TGD. This notion is discussed in separate context and is implied naturally by many-sheeted space-time.

2. The dependence of effective light-velocity on space-time sheet.

   (a) Dependence of light-velocity on space-time sheet is basic effect predicted by submanifold gravity and might become visible when the no- tion of effective space-time fails.

   (b) This effect could become visible if light from distance object can arrive along several paths identified as space time sheets. The distance and thus also the time for travel along light-like geodesic depends on space-time sheet.

   (c) The measurements of Hubble constant give rise to two different results. This could be due to the fact that light can arrive along different space-time sheets.

   (d) It has been found that the time taken for laser light to travel to Moon and back seems to change as if Moon were receding. The explanation could be that the time used in measurements corresponds to that assignable to distant start and in good approximation to cosmological time. This time unit is however proportional to $\sqrt{g_{tt}}$ for cosmological metric and depends on cosmic time. This would cause apparent increase of the distance of Moon. The predicted size of the effect is correct.

   (e) The neutrinos from SN1987A came in two bursts. This could be understood if they arrived along different space-time sheets with $\Delta c/c \sim 10^{-9}$. Photons came later than neutrinos which could be understood if they arrieve along different space-time sheet as neutrinos.

3. Anomalous time dilation due to warping of space-time.

   (a) Sub-manifold gravity predicts warping of the space-time. The warping of flat 2-surfaces bend ing without stretching is familiar for 2-dimensio- nal surfaces. For a flat 2-D surface $z = f(x, y)$ the imbedding depends on say linear coordinate, say x, can be arbitrary function of the coordina- te.

   (b) Also M^4 can have this kind of warped flat imbeddings. The induced metric however codes for the time dilation (say for $\Phi = \omega t$, where Φ is angular coordinate for geodesic circle of CP_2. One therefore ob- tains time dilation in absence of gravitational fields.

4. Could the sheets of many-sheeted spacetime be revealed somehow?

   (a) One could dream of demonstrating the sheets of many-sheeted space-time in an experimental situation where two sheets are present such that the sheets carry em field. If the second sheet is of finite length or there is sequence of copies of this sheet, the interactions of test particle could reveal the presence of the sheets

   (b) This kind of experiment has been indeed performed using mag netic field of strength .2 Gauss, which happens to be same as the strength of endogenous magnetic field in TGD inspired biolo gy. The effect is seen as variation of the frequency of cyclotron ra diation.

5. Allais effect and TGD.

   (a) Allais effect is observed during solar eclipse when Moon is between Sun and Earth. The rotation plane of the pendulum begins to rotate as observed first by economy Nobelist Allais. The sign and magnitude of the effect vary in wide limits, as if it would depend very sensitively on precise relative distances of Sun, Moon and pendulum.

(b) Suggests interference effects and this in turn that large values of gravitational Planck constant h_{gr} are involved. $h_{gr} = h_{eff}$ can make sense for elementary particles and Equi valence Principle allows the reduction of the situation to elementary particle level.

(c) Assumption:gravitational force corresponds to a transfer of radial four-momentum along gravitational massless extremal (ME) connecting particle and Sun or Moon. The force is integral over wavelengths of mo- dulus squared of an amplitude multipied by transferred momentum gi ven in terms of wavelength using generalization of standard expression. This fixes the from of the amplitude.

(d) By EP only gravitational acceleration matters so that one can consi- der either pendulum or elementary particles forming it and sum the forces in this case.

(e) Interference occurs with the gravitational MEs from Moon and Sun are parallel.

(f) The large value of h_{gr} for Moonpendulum and Sun-pendulum sys tems implies that the effect is highly sensitive to the relative distances. Gravitational interferometer results.

6. Claim for anomalously strong gravimagnetism.

(a) It has been observed that the mass of Cooper pair as deduced from Thomson magnetic field associated with su perconductor is slightly higher than the sum of electron masses instead of being smaller than the sum by the binding energy of Cooper pair. The discrepancy is of order $\Delta m/m \simeq 10^{-4}$.

(b) Also Tajmar et al have done experiments. They suggest that the effect might be due to a small contribution from gravimagnetism to the effective Thomson magnetic field. Thomson field is to a square of the ratio of gravitons Compton wavelength λ_g and imagi nary grav- imagmnetic penetra- tion depth λ_L. Graviton mass is assumed to result from cosmological constant and is something like 10^{-55} kg). The outcome is by about factor 10^{-28} too small. Authors argue that graviton mass should be by factor 10^{14} higher.

(c) TGD suggests that it is h_{gr} associated with Cooper pair and Earth, which increases λ_g by a factor $h_{gr}(2e, E)/h$. The scaling factor of B_{gr} would be $(h_{gr}/h)^2$, $h_{gr} = 2GM_E m_e/v_{0,E}$. $v_{0,E}$ can be estimated from the condition that it corresponds to a typical velocity, now the ve- locity of the rotation of Earth around its own axis. The resulting scaling factor is 3.6×10^{14} and happens to have correct order of magnitude!

(d) The value of h_{gr} is of same order of magnitude as obtained from the condition that EEG photons are dark photons with energies of bio-photons. $h_{eff} = h_{gr}$ implies that the energy of cyclotron photons does not depend on the mass of ion.