Shnoll and collaborators have discovered strange repeating patterns of random fluctuations of physical observables such as the number $n$ of nuclear decays in a given time interval. Periodically occurring peaks for the distribution of the number $N(n)$ of measurements producing $n$ events in a series of measurements as a function of $n$ is observed instead of a single peak. The positions of the peaks are not random and the patterns depend on position and time varying periodically in time scales possibly assignable to Earth-Sun and Earth-Moon gravitational interaction.

These observations suggest a modification of the expected probability distributions but it is very difficult to imagine any physical mechanism in the standard physics framework. Rather, a universal deformation of predicted probability distributions could be in question requiring something analogous to the transition from classical physics to quantum physics.

TGD gives hints about the nature of the modification.

\begin{enumerate}

\item TGD inspired quantum measurement theory proposes a description of the notion of finite measurement resolution in terms of inclusions of so called hyper-finite factors of type II$_1$ (HFFs) and closely related quantum groups parameterized by quantum phase $q_m=exp(i\pi/m)$. Canonical identification mapping p-adic integers to to their real counterparts is central element of TGD. For $m=p$ one can consider also the quantum variant of p-adic integer $n$ mapped to $n_R$ by canonical identification. There are 2 candidates for quantum-p-adics depending on whether the pinary digits are interpreted as quantum integers as such or mapped to a product of quantum counterparts of their prime factors.

\item Adelic physics provides a possible unification of real number based physics as physics of sensory experience and various p-adics physics as physics of cognition and predicts a hierarchy of Planck constants $h_{eff}=nh_0$ and suggests the identification of preferred p-adic prime $p$ as a ramified prime of extension of rationals associated with the adele.

\end{enumerate}

p-Adicization or perhaps even quantum-padicization could explain the findings of Shnoll.

\begin{enumerate}

\item The universality of the modified distribution $P(n)$ would reduce to the interpretation of the integer $n$ in the distribution $P(n\vert\lambda)$ of counts as a p-adic integer or its counterpart mapped by canonical identification to a real number $n_R$ appearing as argument of $P(n\vert\lambda)$. Same can be applied to $n!$. The fractality implied by the quantum criticality of TGD Universe suggests that $P(n)$ should be approximately scaling invariant under $n\rightarrow p^kn$ .

\item TGD can be regarded formally as complex square root of thermodynamics, which suggest the representation $P(n)=\vert\Psi(n)\vert^2$, where $\Psi(n)$ would be wave function in the space of counts expressible as product of classical part and \blockquote{quantum factor}. One could have wave functions in the space of counts $n$ expressible as superpositions of \blockquote{plane waves} $q_m^{kn}$, with $k$ playing the role of momentum.

A more concrete model relies on wave function proportional to $(kn)_{q_p} \propto q_m^{kn}+q_m^{-kn}$ - analog to a superposition of plane waves with momenta $k$ propagating to opposite directions in the space of counts reduced effectively to a box $0\leq n<p=m$ representing modulo $p$ counter. One would have effectively wave functions in finite field $G_p$. The symmetries of quantum factor would correspond to a multiplication or shift of $k$ by element $r$ of $F_p$.

Various additional rational-valued parameters characterizing the probability distribution can be mapped to (possibly quantum-) p-adics mapped to reals by canonical identification. The parameters taking care of the converge such as the parameter $\lambda$ in Poisson distribution must be mapped to a power of $p$ in p-adic context.

\end{enumerate}

The model can be applied to explain the findings of Shnoll.

\begin{enumerate}

\item The model makes rather detailed predictions about the periodically occurring positions of the peaks of $P(n)$ as function of $p$ based on number theoretical considerations and in principle allows to determine these parameters for given distribution. There is $p$-periodicity due to the fact that the lowest pinary digit of $n_R$ gives first approximation to $n_R$.

\item The slow variation of the p-adic prime $p$ and integer $m=p$ characterizing quantum integers could explain the slow variation of the distributions with position and time. The periodic variations occurring with both solar and sidereal periods could be understood in two manners.

The value of $p$ could be characterized by the sum $a_{net}$ of gravitational accelerations assignable to Earth-Sun and Earth-Moon systems and could vary. If the value of $p$ is outcome of state function process, it is not determined by deterministic dynamics but should have a distribution. If this distribution is peaked around one particular value, one can understand the findings of

Shnoll.

\item An alternative explanation would be based on slow dependence of quantum factor of $\Psi(n)$ on gravitational parameters and on time. For instance, the momentum $k$ defining the standing wave in the space of counts modulo $p$ could change so that the peaks of the diffraction pattern would be permuted.

\end{enumerate}