In this chapter the possible effects of dark matter in nuclear physics and condensed matter physics are considered. The spirit of the discussion is necessarily rather speculative. The most general form of the hierarchy would involve both singular coverings and factors spaces of CD (causal diamond of M^4) defined as intersection of future and past directed light-cones) and CP_2. There are grave objections against the allowance of factor spaces. In this case Planck constant could be smaller than its standard value and there are very few experimental indications for this. Quite recently came the realization that the hierarchy of Planck constants might emerge from the basic quantum TGD as a consequence of the extreme non-linearity of field equations implying that the correspondence between the derivatives of imbedding space coordinates and canonical momentum is many-to-one. This makes natural to the introduction of covering spaces of CD and CP_2.

Planck constant would be effectively replaced with a multiple of ordinary Planck constant defined by the number of the sheets of the covering. The space-like 3-surfaces at the ends of the causal diamond and light-like 3-surfaces defined by wormhole throats carrying elementary particle quantum numbers would be quantum critical in the sense of being unstable against decay to many-sheeted structures. Charge fractionization could be understood in this scenario. Biological evolution would have the increase of the Planck constant as as one aspect. The crucial scaling of the size of CD by Planck constant can be justified by a simple argument. Note that primary p-adic length scales would scale as $\sqrt{\hbar}$ rather than $\hbar$ as assumed in the original model.

Recently the hierarchy of Planck constants have been traced to the non-determinism of K\"ahler action predicting in zero energy ontology (ZEO) that two space-like 3-surfaces at the ends of causal diamonds (CD) can be connected by several space-time surfaces. As a matter fact, by

infinite
number of them related by quantum critical deformations identifiable as
conformal transformations respecting the light-likeness of partonic orbits
at which the signature of the induced metric changes. The number of
conformal equivalence classes of space-time sheets would be integer n
defining the effective Planck constant $h_{eff}=n\times h$.

\vm{\it 1. What darkness means?}\vm

Dark matter is identified as matter with non-standard value of Planck
constant. The weak form of darkness states that only some field bodies of
the particle consisting of flux quanta mediating bound state interactions
between particles become dark. One can assign to each interaction a field
body (em, Z^0, W, gluonic, gravitational) and p-adic prime and the
value of Planck constant characterize the size of the particular field
body. One might even think that particle mass can be assigned with its em
field body and that Compton length of particle corresponds to the size
scale of em field body.

Nuclear string model suggests that the sizes of color flux tubes and weak
flux quanta associated with nuclei can become dark in this sense and have
size of order atomic radius so that dark nuclear physics would have a
direct relevance for condensed matter physics. If this happens, it becomes
impossible to make a reductionistic separation between nuclear physics and
condensed matter physics and chemistry anymore.

\vm{\it 2. What dark nucleons are?}\vm

The basic hypothesis is that nuclei can make a phase transition to dark
phase in which the size of both quarks and nuclei is measured in
Angstroms. For the less radical option this transition could happen only

for the color, weak, and em field bodies. Proton connected by dark color
bonds super-nuclei with inter-nucleon distance of order atomic radius
might be crucial for understanding the properties of water and perhaps even
the properties of ordinary condensed matter. Large $\hbar$ phase for weak
field body of D and Pd nuclei with size scale of atom would explain
selection rules of cold fusion.

\vm{\it 3. Anomalous properties of water and dark nuclear physics}
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A direct support for partial darkness of water comes from the H$_{1.5}$O
chemical formula supported by neutron and electron diffraction in
attosecond time scale. The explanation could be that one fourth of protons
combine to form super-nuclei with protons connected by color bonds and
having distance sufficiently larger than atomic radius.

The crucial property of water is the presence of molecular clusters.
Tedrahedral clusters allow an interpretation in terms of magic Z=8 protonic
dark nuclei. The icosahedral clusters consisting of 20 tedrahedral clusters
in turn have interpretation as magic dark dark nuclei: the presence of the
dark dark matter explains large portion of the anomalies associated with
water and explains the unique role of water in biology. In living matter
also higher levels of dark matter hierarchy are predicted to be present.
The observed nuclear transmutation suggest that also light weak bosons are
present.

\vm{\it 4. Implications of the partial darkness of condensed matter}
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The model for partially dark condensed matter inspired by nuclear string
model and the model of cold fusion inspired by it allows to understand the
low compressibility of the condensed matter as being due to the

repulsive
weak force between exotic quarks, explains large parity breaking
effects in
living matter, and suggests a profound modification of the notion of
chemical bond having most important implications for bio-chemistry
and
understanding of bio-chemical evolution.

%\end{abstract}