Khovanov homology generalizes the Jones polynomial as knot invariant. The
challenge is to find a quantum physical construction of Khovanov homology
analous to the topological QFT defined by Chern-Simons action allowing to
interpret Jones polynomial as vacuum expectation value of Wilson loop in
non-Abelian gauge theory.

Witten's approach to Khovanov homology relies on fivebranes as is natural
if one tries to define 2-knot invariants in terms of their cobordisms
involving violent un-knottings. Despite the difference in approaches it is
very useful to try to find the counterparts of this approach in quantum TGD
since this would allow to gain new insights to quantum TGD itself as almost
topological QFT identified as symplectic theory for 2-knots, braids and
braid cobordisms.   This comparison turns out to be extremely useful from
TGD point of view.

\begin{enumerate}

\item Key question concerns the identification of string world sheets. A
possible identification of string world sheets and therefore also of the
braids whose ends carry quantum numbers of many particle states at partonic
2-surfaces emerges if one identifies the string word sheets as singular
surfaces in the same manner as is done in Witten's approach.

In TGD framework the localization of the modes of the induced spinor fields
at 2-D surfaces carrying vanishing induced W boson fields guaranteeing
that the em charge of spinor modes is well-defined for a generic preferred
extremal is natural. Besides string world sheets partonic 2-surfaces are
good candidates for this kind of surfaces. It is not clear whether one can
have continuous slicing of this kind by string world sheets and partonic
2-surfaces orthogonal to them or whether only discrete set of these
surfaces is possible.

\item Also a physical interpretation of the operators Q, F, and P of
Khovanov homology emerges. P would correspond to instanton number and F to
the fermion number assignable to right handed neutrinos. The breaking of
M^4 chiral invariance makes possible to realize Q physically. The
finding that the generalizations of Wilson loops can be identified in terms
of the gerbe fluxes $\int H_A J$ supports the conjecture that TGD as
almost topological QFT corresponds essentially to a symplectic theory for
braids and 2-knots. \end{enumerate}

The basic challenge of quantum TGD is to give a precise content to the
notion of generalized Feynman diagram and the reduction to braids of
some kind is very attractive possibility inspired by zero energy ontology.
The point is that no $n>2$-vertices at the level of braid strands are
needed if bosonic emergence holds true.

\begin{enumerate} \item For this purpose the notion of algebraic knot is
introduce and the possibility that it could be applied to generalized
Feynman diagrams is discussed. The algebraic structures kei, quandle,
rack, and biquandle and their algebraic modifications as such are not
enough.   The lines of Feynman graphs are replaced by braids and in
vertices braid strands redistribute. This poses several challenges: the
crossing associated with braiding and crossing occurring in non-planar
Feynman diagrams should be integrated to a more general notion; braids are
replaced with sub-manifold braids;   braids of braids ....of braids are
possible; the redistribution of braid strands in vertices should be
algebraized.   In the following I try to abstract the basic operations
which should be algebraized in the case of generalized Feynman diagrams.

\item One should be also able to concretely identify braids and 2-braids
(string world sheets) as well as partonic 2-surfaces and I have discussed
several identifications during last years. Legendrian braids turn out to
be very natural candidates for braids and their duals for the partonic
2-surfaces. String world sheets in turn could correspond to the analogs
of Lagrangian sub-manifolds or two minimal surfaces of space-time surface
satisfying the weak form of electric-magnetic duality. The latter opion
turns out to be more plausible. This identification - if correct - would
solve quantum TGD explicitly at string world sheet level which corresponds
to finite measurement resolution.

\item Also a brief summary of generalized Feynman rules in zero energy
ontology is proposed. This requires the identification of vertices,
propagators, and prescription for integrating over al 3-surfaces. It turns
out that the basic building blocks of generalized Feynman diagrams are
well-defined.

\item The notion of generalized Feynman diagram leads to a beautiful
duality between the descriptions of hadronic reactions in terms of hadrons
and partons analogous to gauge-gravity duality and AdS/CFT duality but
requiring no additional assumptions. The model of quark gluon plasma as s
strongly interacting phase is proposed. Color magnetic flux tubes are
responsible for the long range correlations making the plasma phase more
like a very large hadron rather than a gas of partons. One also ends up
with a simple estimate for the viscosity/entropy ratio using black-hole
analogy. \end{enumerate}