Extension of standard model by knot algebra

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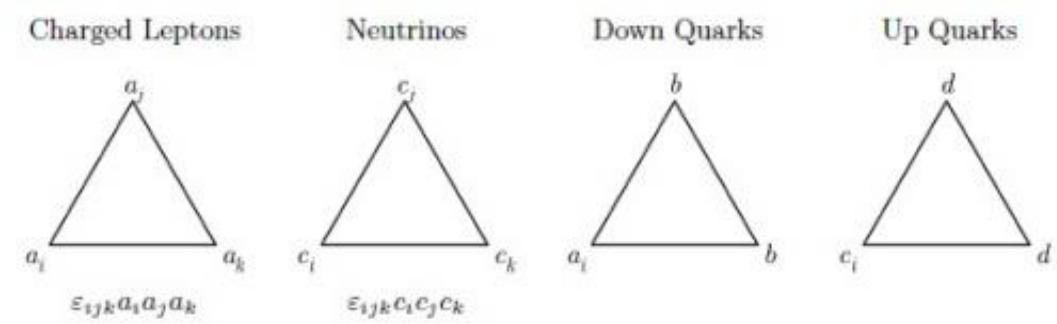

Three-preon structures for charged leptons, neutrinos, down quarks, and up quarks. Credit: World Scientific Publishing

This paper makes a connection between the quantum group SLq(2), which described knots, and the elementary particles of the standard model. The elements of the fundamental (j = 1/2) representation of SLq(2) are interpreted as creation operators for preons. The preons interact through a preonic vector field defined by elements of the adjoint (j = 1) representation. The leptons and quarks then appear (as required by the electroweak data) as elements of the j = 3/2 representation. Unexpectedly the electroweak quantum numbers of the so defined preons, leptons, and quarks agree with the corresponding quantum numbers of the elementary constituents conjectured earlier by Harari and Shupe.

In the schematic figure displayed here the leptons and quarks are composed of preons (a, b, c, d) as shown a, b, c, d are the elements of

the fundamental representation of the SLq(2) a_i and c_i are also elements of the fundamental representation of SU(3).

In the SLq(2) extension of the standard model, the field operators of the standard model are renormalized by knot factors which are representations of SLq(2), and the couplings of the standard model Lagrangian are thereby modified by SLq(2) form factors. A similar development leads to a Lagrangian for preons.

Since the SLq(2) extension of the standard model describes a finer level of structure than the standard model, there are many open problems, including questions concerning gravitational binding, the existence of free preons, and the renormalization of the Lagrangian dynamics.

The study can be found at www.worldscientific.com/doi/ab … 42/S0217751X14500924 in the volume 29, issue 15 of the *International Journal of Modern Physics A*.

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