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Quantum groups as fundamental symmetries

The role of quantum groups, a particular class of Hopf algebras, as describing the fundamental symmetries of the Standard Model is investigated. Using the quantum group SUq(3) as a flavour symmetry leads to exceptionally accurate baryon mass sum rules that agree perfectly with experimental data and magnetic moments that agree significantly better with experimental data.

The consideration of quantum groups is the result of asking that physical theories respect a natural input-output symmetry between the observables and states of the theory. The language of Hopf algebras and quantum geometry allows for the observables and states to be treated on such an equal but dual footing.

The close relationship between quantum groups and invariants of knots allows for the possible description of elementary particles and their interactions as extended objects that carry topological information. Some ideas towards the development of such a model are presented.

Experimental Collaboration

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