Meeting: 1004, Bowling Green, Kentucky, SS 4A, Special Session on Knot Theory and Its Applications

1004-57-137 **Louis H Kauffman*** (kauffman@uic.edu), Math UIC, 851 South Morgan Street, Chicago, IL 60607-7045, and **Samuel J Lomonaco** (lomonaco@comcast.com). *Spin Networks and Anyonic Topological Quantum Computation.* Preliminary report.

Spin networks were invented/discovered by Roger Penrose in an attempt to provide a combinatorial precursor to spacetime. The Penrose theory of spin networks generalizes to a recoupling theory that begins with the bracket polynomial skein relation rather than the Penrose binor identity. This q-deformed spin network theory has been of use in constructing $SU(2)_q$ topological quantum field theories, the Witten invariants of three manifolds and measurement and spin-foam techniques in loop quantum gravity.

Freedman, Kitaev and their collaborators have shown how braiding operators in certain topological quantum field theories are universal for quantum computation. In particular, one can focus just on the topoloogical quantum field theory called Fibonacci Anyons. There are two basic particles call them 1 and 0. The only non-trivial interaction is $1 + 1 \longrightarrow 0$ or 1. The corresponding recoupling theory is intricate. The braiding is non-trivial and can model quantum computation. We give a simple model for the Fibonacci Anyons in terms of $q = e^{i\pi/5}$ deformed spin networks, and show how the structure of the model proceeds from the structure of the bracket polynomial. (Received January 22, 2005)