A knot theory of physics, spacetime in co-dimension 2 CLIFFORD
ELLGEN — Attempts to describe particles as topological phenomena go back at
least as far as Kelvin's conjecture that atoms are knots in the ether. A modern par-
allel is to ask whether the spacetime manifold of general relativity can be knotted
and what properties those knots might have. However, if the manifold is everywhere
Lorentzian, then a change of the topology of a spacelike slice of spacetime requires
violation of causality. A consistent model emerges if we assume that the spacetime
manifold is a 4-dimensional manifold embedded in a 6-dimensional Minkowski space
and that each spacelike slice of the manifold has finite energy. A finite energy em-
bedding allows the metric on the manifold to be degenerate on a set of measure
zero, therefore the manifold may not be everywhere Lorentzian, which allows for
certain types of topology change. An n-dimensional manifold embedded in an n+2-
dimensional space can be knotted. We show that the possible knots on the spacetime
manifold have properties corresponding to the known elementary particles. If we in-
clude the electromagnetic potential then we can use a simple Lagrangian to describe
all of the forces including gravity. A simple extension of the assumptions produces
quantum field theory.

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