

Abstract Submitted  
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**Braids as a representation space of  $SU(5)$**  DANIEL CARTIN, Naval Academy Preparatory School — The Standard Model of particle physics provides very accurate predictions of phenomena occurring at the sub-atomic level, but the reason for the choice of symmetry group and the large number of particles considered elementary, is still unknown. Along the lines of previous preon models positing a substructure to explain these aspects, Bilson-Thompson showed how the first family of elementary particles is realized as the crossings of braids made of three strands, with charges resulting from twists of those strands with certain conditions; in this topological model, there are only two distinct neutrino states. Modeling the particles as braids implies these braids must be the representation space of a Lie algebra, giving the symmetries of the Standard Model. This presentation makes this representation explicit, obtaining the raising operators associated with the Lie algebra of  $SU(5)$ , one of the earliest grand unified theories. Because the braids form a group, the action of these operators are braids themselves, leading to their identification as gauge bosons. Although this realization of particles as braids is lacking a dynamical framework, it is very suggestive, especially when considered as a natural method of adding matter to loop quantum gravity.

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