# The string Lie bialgebra of a manifold

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The goal of our work (with Dennis Sullivan) is to understand certain interactions of families of strings on a oriented manifold.

We interpret chains of strings on the manifold as the image I of the degree +1 operator induced by the action of the circle on the chains of the free loop space of the manifold.

Given a family of strings in the manifold, each point of self intersection of a string determines two strings. In this way, we get a map from families of strings to families of ordered pairs of strings.

Consider now a family of ordered pairs of strings. At each point of intersection of such a pair of strings, form a new closed curve by going around the first curve and then going around the second. Thus, we get a map from families ordered pairs of strings to families of single strings.

We prove that these two operations taken together define in a precise sense the structure of a Lie bialgebra (namely, any identity of a Lie bialgebra is defined and holds for a collection of chains if they are appropriately transversal.

In particular, we obtain a Lie bialgebra structure in the homology of the subcomplex I. If the dimension of the manifold is two, this is the Lie algebra of Goldman (1985) and the Lie bialgebra of Turaev (1988).