

1077-53-2470

**Dan Christensen** ([jdc@uwo.ca](mailto:jdc@uwo.ca)), Department of Mathematics, Middlesex College, the University of Western Ontario, London, Ontario N6A 5B7, Canada, and **Enxin Wu\*** ([ewu22@uwo.ca](mailto:ewu22@uwo.ca)), Department of Mathematics, Middlesex College, the University of Western Ontario, London, Ontario N6A 5B7, Canada. *A Model Category Structure on Smooth Spaces.*

Manifolds are favorite objects in mathematics. However, the category of manifolds are not so pleasant, for example, not every subset or quotient set of a manifold is again a manifold, and there is no standard way to talk about infinite dimensional manifolds which appear all the time, for instance, the loop space or the diffeomorphism group of a manifold, etc. Over the years, people are looking for nicer categories which contains the category of manifolds as a full subcategory, and on which we can still do differential geometry. There are many such kinds of generalizations, and one of them is called diffeological spaces, which was introduced by J. Souriau and further developed by P. Iglesias-Zemmour. One of the most beautiful thing in that theory is the irrational torus, on which the smooth homotopy groups differ from the usual continuous homotopy groups. We develop a homotopy theory on the category of diffeological spaces which extends the usual homotopy theory of manifolds and respects the smooth homotopy of the irrational torus. Moreover, based on the work of J. Baez and A. Hoffnung, we give a sufficient condition for the existence of a model category structure on the category of concrete sheaves over a concrete site. (Received September 22, 2011)