1107-19-323   **Mahmoud Zeinalian*** (`mzeinalian@liu.edu`), **Scott O. Wilson** (`scott.wilson@qc.cuny.edu`) and **Thomas Tradler** (`ttradler@citytech.cuny.edu`). *Loop Differential K-theory.*

We introduce an equivariant extension of the Chern-Simons form, associated to a path of connections on a bundle over a manifold M, to the free loop space LM, and show it determines an equivalence relation on the set of connections on a bundle. We use this to define a ring, loop differential K-theory of M, in much the same way that differential K-theory can be defined using the Chern-Simons form in the work of Simons and Sullivan. We show loop differential K-theory yields a refinement of differential K-theory, and in particular incorporates holonomy information into its classes and enjoys several good properties. Additionally, loop differential K-theory is shown to be strictly coarser than the Grothendieck group of bundles with connection up to gauge equivalence. (Received January 18, 2015)