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This is a report on joint work with Nitu Kitchloo.

We argue that the space of free loops WITH CONNECTION on a smooth manifold (which is homotopy equivalent, but not EQUIVARIANTLY homotopy equivalent!) to the standard free loop space, provides a model for the way physicists think of loop spaces, better than the ‘bare’ loop space. In particular, we show that the tangent bundle of this ‘thickened’ model has a canonical equivariant filtration by finite-dimensional bundles; this allows us to connect our construction to the work of Cohen, Jones, and Segal on pro-spectra, and to work of Ando, Getzler, and others on the elliptic genus. The key ideas and techniques come from the theory of Tits buildings for loop groups. (Received February 14, 2006)