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Salah-Eldin A. Mohammed* (salah@math.siu.edu), Department of Mathematics, Southern Illinois University at Carbondale, Carbondale, Il 62901. *Infinite-Dimensional Cocycles and Stochastic Systems with Memory.*

We define the notion of a smooth cocycle in Hilbert space over a measure-preserving group on a probability space. We show that a non-linear stochastic system with memory on a Euclidean space admits a locally compact smooth cocycle on a Hilbert space. The construction is based on the theory of random diffeomorphism groups on Euclidean space coupled with variational techniques. The infinite-dimensional cocycle is then used to prove a local stable manifold theorem for the non-linear stochastic system with memory. For this purpose we introduce the notion of hyperbolicity for stationary trajectories of the stochastic system.. We then establish the existence of smooth stable and unstable manifolds in a neighborhood of a hyperbolic stationary trajectory. The stable and unstable manifolds are asymptotically invariant under the cocycle. The proof uses infinite-dimensional multiplicative ergodic theory techniques and interpolation methods. (Received January 19, 1999)