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Ricci curvature and martingales

We generalize the classical Bochner formula for the heat flow on a manifold M to martingales on the path space PM, and develop a formalism to compute evolution equations for martingales on path space. We see that our Bochner formula on PM is related to two sided bounds on Ricci curvature in much the same manner as the classical Bochner formula on M is related to lower bounds on Ricci curvature. This establishes a new link between geometry and stochastic analysis, and provides a crucial new tool for the study of Einstein metrics and Hamilton's Ricci flow in the smooth and non-smooth setting. Joint work with Aaron Naber.