1052-35-266   **Leonard Gross*** (`gross@math.cornell.edu`), Mathematics Department, Cornell University, Ithaca, NY 14853, and **Nelia Charalambous**. *The Yang-Mills heat equation on 3-manifolds with boundary.*

Let M be a compact Riemannian 3-manifold with boundary. We consider the product bundle $M \times k \to M$ where k is the Lie algebra of a compact connected Lie group.

Theorem: The Yang-Mills heat equation over M with twice differentiable initial data has a unique long time solution under Marini's (nonlinear) boundary condition: normal component of curvature =0 for all positive time.

We also prove a similar theorem for Dirichlet and Neumann boundary conditions for initial data with one derivative in $L^2(M)$.

The main tool is a gauge invariant Gaffney-Friedrichs inequality, which we use in combination with the Zwanziger-Donaldson-Sadun method of conversion of the Yang-Mills heat equation to a strictly parabolic equation. (Received August 30, 2009)