1030-58-146 **Anders Linnér*** (alinner@math.niu.edu), Department of Mathematical Sciences, Northern Illinois University, DeKalb, IL 60115. *Infinite-dimensional steepest descent flow invariants and related nonlinear ordinary differential equations.*

The flow equation describing the steepest descent of a nonlinear functional in an infinite-dimensional Riemannian manifold typically involves 'global' quantities such as various averages of the functions in the manifold. This forces the application of specialized techniques when one attempts to generate the negative gradient trajectories. In some circumstances there are flow invariants that shed light on the long-term behavior of the trajectories. For instance, when E is the elastic energy and L is the length of the underlying curve, then $L(E + L)$ is invariant along each trajectory, assuming no boundary conditions are imposed. Since it is known that the energy tends to zero, this produces a formula for the limit length along the trajectory in terms of the initial data of the trajectory. When boundary conditions are imposed, there is a more complicated invariant that nonetheless may be useful. This is illustrated in a case where the invariant leads to a nonlinear system of ordinary differential equations in terms of E and L. Inversely, the invariant reveals a relationship between the two components of the solution of the nonlinear ordinary differential equation that may useful and possibly far from obvious, and this without assuming E nonnegative and $L > 0$. (Received July 30, 2007)