1018-83-122 **Daniel Pollack*** (pollack@math.washington.edu), University of Washington, Department of Mathematics, Box 354350, Seattle, WA, and **Yvonne Choquet-Bruhat** and **James Isenberg**.

The Einstein-scalar field constraint equations on compact manifolds.

We introduce the constraint equations for the Einstein-scalar field system on compact manifolds. Using the conformal method we reformulate these equations as a determined system of nonlinear partial differential equations. By introducing a new conformal invariant, which is sensitive to the presence of the initial data for the scalar field, we are able to divide the set of free conformal data into subclasses depending on the possible signs for the coefficients of terms in the resulting Einstein-scalar field Lichnerowicz equation. For most of these subclasses we determine whether or not a solution exists. In contrast to other well studied field theories, there are certain cases, depending on the mean curvature and the potential of the scalar field, for which we are unable to resolve the question of existence of a solution. We consider this system in such generality so as to include the vacuum constraint equations with an arbitrary cosmological constant, the Yamabe equation and even (all cases of) the prescribed scalar curvature problem as special cases. (Received March 02, 2006)