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**Igor Belegradek** (ib@math.gatech.edu), Department of Mathematics, Georgia Institute of Technology, Atlanta, GA 30332, **Slawomir Kwasik** (kwasik@math.tulane.edu), Department of Mathematics, Tulane University, New Orleans, LA 70118, and **Reinhard Schultz\*** (schultz@math.ucr.edu), Department of Mathematics, University of California at Riverside, 900 Big Springs Road, Riverside, CA 92521. *Souls and moduli spaces of nonnegatively curved manifolds.*

The Cheeger-Gromoll Soul Theorem yields strong interrelationships between geometric topology and the structure of complete, noncompact manifolds with nonnegative sectional curvature by means of compact submanifolds which they call *souls*. New examples and results involving these relationships are obtained including (i) several families of new examples with nonunique souls of low dimension, (ii) finiteness and nonfiniteness results for possible diffeomorphism types of souls in a fixed manifold, (iii) metrics which have diffeomorphic souls but lie in different components of the moduli space of complete nonnegatively curved metrics on the underlying smooth manifold. Some results are obtained by means of surgery theory, and others are shown by global-geometric methods. (Received September 10, 2009)