

Harmonic maps and morphisms

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Harmonic maps are mappings between Riemannian manifolds which extremize a natural energy functional. They have been studied for many years in differential geometry, and also in mathematical physics as nonlinear sigma models. We shall report on recent progress in understanding their infinitesimal deformations, the “Jacobi fields” along harmonic maps, and what they tell us about moduli spaces of harmonic maps.

Harmonic morphisms are less well known — these are mappings between Riemannian manifolds which preserve Laplace’s equation. They can be characterized as harmonic maps which enjoy an extra property called “horizontal weak conformality”. We shall give a brief survey of the theory, in particular, showing how they behave in many ways “dual” to harmonic maps, and then we shall outline the connections with some equations of Mathematical Physics, including the *monopole equation* and the *Beltrami fields equation* of hydrodynamics.