1050-46-113 **Marta Lewicka*** (`lewicka@math.umn.edu`), University of Minnesota, School of Mathematics, Minneapolis, MN , and **Reza Pakzad**. *A scaling law for 3d nonlinear elastic energies of thin plates with strain at free equilibria.*

A Riemannian metric $G = [g_{ij}]$ on a simply connected domain $\Omega \subset \mathbb{R}^n$ can be realized as the pull-back metric of an orientation preserving deformation $u \in W^{1,1}(\Omega, \mathbb{R}^n)$ if and only if the associated Riemann curvature tensor R vanishes identically. When this condition does not hold, one may seek a mapping u as above, yielding the closest metric realization. We set up a variational formulation of this problem by introducing the energy functional:

$$E(u) = \int_\Omega \mathrm{dist}^2 \left(\nabla u(x), SO(n)\sqrt{G(x)}\right)\, \mathrm{d}x.$$

It can be shown that when $R \not\equiv 0$, the infimum of E over $W^{1,2}(\Omega, \mathbb{R}^n)$ is positive. We shall discuss the scaling behavior of the infimum energy for thin plates $\Omega = \Omega^h$, in the limit of their vanishing thickness h, as well as the Γ-limit of the scaled energy functionals. This work is motivated by studying elastic materials which show non-zero strain at free equilibria. (Received March 01, 2009)