1042-46-95   **Piotr Hajlasz** and **Jeremy Tyson*** (`tyson@math.uiuc.edu`), 1409 West Green St., Department of Mathematics, University of Illinois, Urbana, IL 61801. *Lipschitz, Hölder and Sobolev surjections from Euclidean cubes.* Preliminary report.

We study highly regular Peano-type surjections from Euclidean cubes. When is a compact connected metric space the image of $[0,1]^n$ under a Lipschitz map? α-Holder map? $W^{1,p}$-Sobolev map?

We prove that every compact, quasiconvex, doubling metric space is the image of $[0,1]^n$ under an α-Holder surjection, or under a Lipschitz surjection if n is sufficiently large. For each $n \geq 2$, we show that every rectifiably connected metric space which is compact in its length metric is the image of $[0,1]^n$ under a metrically differentiable a.e. $W^{1,n}$-surjection. The maps which we construct are rank one singular: they are already surjective when restricted to a suitable Cantor set C, and map the complement of C to a 1-rectifiable subset of the target. As an application, we show that the first Heisenberg group, equipped with its Carnot-Carathéodory metric, is the Lipschitz image of R^n for $n \geq 5$.

This is joint work with Piotr Hajlasz. (Received August 12, 2008)