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Paweł Goldstein, Piotr Hajłasz* (hajlasz@pitt.edu) and **Pekka Pankka**. *Topologically nontrivial counterexamples to Sard's theorem*. Preliminary report.

We prove the following dichotomy: if $n = 2, 3$ and $f \in C^1(S^{n+1}, S^n)$ is not homotopic to a constant map, then there is an open set $\Omega \subset S^{n+1}$ such that $\text{rank } Df = n$ on Ω and $f(\Omega)$ is dense in S^n , while for any $n \geq 4$, there is a map $f \in C^1(S^{n+1}, S^n)$ that is not homotopic to a constant map and such that $\text{rank } Df < n$ everywhere. While the result deals with mappings between spheres, the motivation comes from the theory of mappings from Euclidean spaces into the Heisenberg groups H^n , because the rank of the derivative of such a mapping is bounded by n . In fact, our proofs are based on methods that have previously been applied to study Lipschitz homotopy groups of the Heisenberg groups. (Received February 16, 2018)