1125-57-1491 **Ben Blum-Smith*** (`ben@cims.nyu.edu`), Courant Institute of Mathematical Sciences, 251 Mercer St., Room 607, New York, NY 10012. *When is a sphere quotient a sphere? And an application to invariant theory.*

Let $G$ be a finite group of orthogonal transformations of $\mathbb{R}^n$. The unit sphere carries the structure of both a topological and piecewise-linear manifold, so that $G$ acts on it by piecewise-linear homeomorphisms. For what $G$ is the quotient by this action a topological sphere? A piecewise-linear sphere? We report on recent work of Christian Lange which fully answers these questions, and apply the results to the invariant theory of finite groups, as follows. The invariant ring of a finite group acting linearly on a polynomial ring over a field is usually Cohen-Macaulay, meaning that it is a finite free module over a subring generated by algebraically independent elements. However, it can fail to be Cohen-Macaulay if the group order is divisible by the characteristic of the field, and it has become an important problem in invariant theory to determine when this failure occurs. We use a connection between commutative algebra and the topology of cell complexes developed in the 70's and 80's by Hochster, Stanley, Reisner, Garsia, and Stanton to show that Lange's results can be used to give a complete solution to this problem in the case that $G$ is a permutation group. (Received September 17, 2016)