

Hill, Michael A.; Hopkins, Michael J.; Ravenel, Douglas C.

A solution to the Arf-Kervaire invariant problem. (English) Zbl 1246.55014

Akbulut, Selman (ed.) et al., Proceedings of the 17th Gökova geometry-topology conference, Gökova, Turkey, May 31–June 4, 2010. Somerville, MA: International Press; Gökova: Gökova Geometry-Topology Conferences (ISBN 978-1-57146-226-8/pbk). 21-63 (2011).

In the preprint [On the non-existence of elements of Kervaire invariant one, [arXiv:0908.3724v2](https://arxiv.org/abs/0908.3724v2)], the authors of the paper under review prove that Kervaire invariant one elements in the stable homotopy groups of spheres do not exist above dimension 126, thereby resolving a major problem (except in dimension 126) in algebraic topology. The present paper provides the history and background of this problem, and gives an outline of the authors' solution. The paper would be an excellent first document to read, before studying the more detailed preprint cited above. For example, it describes the manifold, stable homotopy theoretic, and unstable homotopy theoretic formulations of their main result and has sidebars reviewing basic material, for the sake of the beginner.

It is worth noting that Section 1.5 states two mysteries that can now be explored, thanks to the work described in this paper. Also, according to the authors, the most difficult computation in their solution to the Kervaire invariant problem is their proof of the “Reduction Theorem”: this proof is considered in the last subsection of this paper.

For the entire collection see [[Zbl 1226.14001](#)].

Reviewer: [Daniel G. Davis \(Lafayette\)](#)

MSC:

- [55Q45](#) Stable homotopy of spheres
- [55Q91](#) Equivariant homotopy groups
- [55P91](#) Equivariant homotopy theory in algebraic topology
- [57R55](#) Differentiable structures in differential topology

Cited in 1 Review

Keywords:

[Kervaire invariant](#); [stable homotopy groups of spheres](#); [slice spectral sequence](#)