

# Testing amsrefs with the hyperref package

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The following examples are derived from Homology manifold bordism by Heather Johnston and Andrew Ranicki (Trans. Amer. Math. Soc. 352 no 11 (2000), PII: S 0002-9947(00)02630-1).

## 4 Homology manifold bordism

The results of Johnston [5] on homology manifolds are extended here. It is not possible to investigate transversality by geometric methods—as in [5] we employ bordism and surgery instead.

The proof of transversality is indirect, relying heavily on surgery theory—see Kirby and Siebenmann [7, III, §1], Marin [8] and Quinn [11]. We shall use the formulation in terms of topological block bundles of Rourke and Sanderson [12].

$Q$  is a codimension  $q$  subspace by Theorem 4.9 of Rourke and Sanderson [12]. (Hughes, Taylor and Williams [4] obtained a topological regular neighborhood theorem for arbitrary submanifolds ....)

Wall [13, Chapter 11] obtained a codimension  $q$  splitting obstruction ....

... following the work of Cohen [2] on  $PL$  manifold transversality.

In this case each inverse image is automatically a  $PL$  submanifold of codimension  $\sigma$  (Cohen [2]), so there is no need to use  $s$ -cobordisms.

Quinn [10, 1.1] proved that ...

Theorem 4.1 (The additive structure of homology manifold bordism, Johnston [5])

...

For  $m \geq 5$  the Novikov-Wall surgery theory for topological manifolds gives an exact sequence (Wall [13, Chapter 10]).

The surgery theory of topological manifolds was extended to homology manifolds in Quinn [9, 10] and Bryant, Ferry, Mio and Weinberger [1].

The 4-periodic obstruction is equivalent to an  $m$ -dimensional homology manifold, by [1].

Thus, the surgery exact sequence of [1] does not follow Wall [13] in relating homology manifold structures and normal invariants.

... the canonical  $TOP$  reduction ([3]) of the Spivak normal fibration of  $M$  ...

Theorem 4.2 (Johnston [5]) ...

Actually [5, (5.2)] is for  $m \geq 7$ , but we can improve to  $m \geq 6$  by a slight variation of the proof as described below.

(This type of surgery on a Poincaré space is in the tradition of Lowell Jones [6].)

## References

- [1] J. Bryant, S. Ferry, W. Mio, and S. Weinberger, Topology of homology manifolds, *Ann. of Math.* 143 (1996), 435–467. MR97b:57017 [↑1](#)
- [2] M. Cohen, Simplicial structures and transverse cellularity, *Ann. of Math.* 85 (1967), 218–245. MR35:1037 [↑1](#)
- [3] S. Ferry and E. K. Pedersen, Epsilon surgery theory I, Novikov conjectures, index theorems and rigidity, vol. 2 (Oberwolfach, 1993), 1995, pp. 167–226. MR97g:57044 [↑1](#)
- [4] B. Hughes, L. Taylor, and B. Williams, Manifold approximate fibrations are approximately bundles, *Forum Math.* 3 (1991), 309–325. MR92k:57040 [↑1](#)
- [5] H. Johnston, Transversality for homology manifolds, *Topology* 38 (1999), 673–697. MR99k:57048 [↑1](#)
- [6] L. Jones, Patch spaces: a geometric representation for Poincaré spaces, *Ann. of Math.* 97 (1973), 306–343. 102, 183–185 (1975) MR47:4269; MR52:11930. [↑1](#)
- [7] R. Kirby and L. Siebenmann, Foundational essays on topological manifolds, smoothings, and triangulations, *Ann. of Math. Study*, vol. 88, Princeton University Press, 1977. MR58:31082 [↑1](#)
- [8] A. Marin, La transversalité topologique, *Ann. of Math.* 106 (1977), 269–293 (French). MR57:10707 [↑1](#)
- [9] F. Quinn, Resolutions of homology manifolds, and the topological characterization of manifolds, *Invent. Math.* 72 (1983), 264–284. Corrigendum 85 (1986) 653. MR85b:57023, MR87g:57031 [↑1](#)
- [10] ———, An obstruction to the resolution of homology manifolds, *Michigan Math. J.* 34 (1987), 284–291. MR88j:57016 [↑1](#)
- [11] ———, Topological transversality holds in all dimensions, *Bull. Amer. Math. Soc.* 18 (1988), 145–148. MR89c:57016 [↑1](#)
- [12] C. P. Rourke and B. J. Sanderson, On topological neighbourhoods, *Compositio Math.* 22 (1970), 387–425. MR45:7720 [↑1](#)
- [13] C. T. C. Wall, *Surgery on compact manifolds*, 2nd ed., Academic Press, 1970. [↑1](#)