

## BIBLIOGRAPHY

- [An] D.R. Anderson, *Geometric applications of lower algebraic K-theory* (Preliminary Report), Abstracts of the AMS, 4 (1983), 373.
- [AH1] D.R. Anderson and W.C. Hsiang, *Extending Combinatorial PL Structures on Stratified Spaces*, Invent. Math. 32 (1976), 179-204.
- [AH2] D.R. Anderson and W.C. Hsiang, *The Functors  $K_{-i}$  and Pseudo-isotopies of Polyhedra*, Ann. of Math. (2) 105 (1977), 201-223.
- [AH3] D.R. Anderson and W.C. Hsiang, *Extending Combinatorial Piecewise Linear Structures on Stratified Spaces, II*, Trans. Amer. Math. Soc. 260 (1980), 223-253.
- [AM1] D.R. Anderson and H.J. Munkholm, *The Algebraic Topology of Controlled Spaces*, Preprint, Odense University 1984.
- [AM2] D.R. Anderson and H.J. Munkholm, *An Introduction to Boundedly Controlled Simple Homotopy Theory*, in Geometry and Topology (C. McCrory and T. Shifrin, eds.), Marcel Dekker, New York and Basel, 1987, 27-42.
- [AM3] D.R. Anderson and H.J. Munkholm, *A Geometric Construction of the Boundedly Controlled Whitehead Group*, in Geometry and Topology, loc.cit., 13-26.
- [Ba] H. Bass, *Algebraic K-theory*, W.A. Benjamin, New York 1968.
- [BHS] H. Bass, A. Heller, and R.G. Swan, *The Whitehead group of a Polynomial Extension*, Publ. Math. IHES 22 (1964), 61-80.
- [Br] R.A. Brualdi, *Transversal Theory and Graphs*, Studies in Graph Theory, Part 1 (D.R. Fulkerson, ed.), Mathematical Association of America, Washington, DC, 1975, 23-88.
- [Ch] T.A. Chapman, *Controlled Simple Homotopy Theory and Applications*, Lecture Notes in Mathematics 1009, Springer-Verlag, Berlin, Heidelberg, New York, 1983.

- [CH] E.H. Connell and J. Hollingsworth, *Geometric Groups and Whitehead Torsion*, Trans. Amer. Math. Soc. 140 (1969), 161-181.
- [Co] M.M. Cohen, *An Introduction to Simple Homotopy Theory*, Springer-Verlag, New York, Heidelberg, Berlin, 1973.
- [EK] R.D. Edwards and R.C. Kirby, *Deformations of Spaces of Imbeddings*, Ann. of Math. (2), 93 (1971), 63-88.
- [Fe] S.Ferry, *Homotoping  $\epsilon$ -maps to Homeomorphisms*, Amer J. Math. 101 (1979), 567-582.
- [FJ1] F.T. Farrell and L.E. Jones, *H-cobordisms with Foliated Control*, Bull. Amer. Math. Soc. 15 (1986), 69-72.
- [FJ2] F.T. Farrell and L.E. Jones, *K-theory and Dynamics, I*, Ann. of Math. (2), 124 (1986), 531-569.
- [Gr] D. Grayson, *Higher Algebraic K-Theory II* (after D. Quillen), Algebraic K-theory, Lecture Notes in Mathematics 551, Springer-Verlag, Berlin, Heidelberg, New York, 1976, 217-240.
- [Hu] J.F.P. Hudson, *Piecewise Linear Topology*, W.A. Benjamin, New York, 1968.
- [Ki] R.C. Kirby, *Lectures on Triangulation of Manifolds*, Mimeo, UCLA, 1969.
- [Ma] S. MacLane, *Categories for the Working Mathematician*, Springer-Verlag, New York, Heidelberg, Berlin, 1971.
- [Mil] J. Milnor, *Lectures on the h-cobordism Theorem*, Princeton Math. Notes, Princeton Univ. Press, Princeton, N.J., 1965.
- [Mi2] J.W. Milnor, *Whitehead Torsion*, Bull. A.M.S. 72 (1966), 358-426.
- [MA] H.J. Munkholm and D.R. Anderson, *Lower Simple-homotopy Theory, a Classical Approach*, Abstracts of the AMS, 5 (1984), 102.
- [Pe1] E.K. Pedersen, *On the  $K_{-i}$  Functors*, J. of Alg., 90 (1984), 461-475.

- [Pe2] E.K. Pedersen,  *$K_{-i}$ -Invariants of Chain Complexes*, Topology Proceedings, Leningrad, 1982, Lecture Notes in Math. 1060, Springer-Verlag, Berlin, Heidelberg, New York, 1984, 174-186.
- [Pe3] E.K. Pedersen, *On the Bounded and Thin  $h$ -Cobordism Theorem Parametrized over  $\mathbb{R}^k$* , Transformation Groups, Poznan 1985, Lecture Notes in Math. 1217, Springer-Verlag, Berlin, Heidelberg, New York, 1986, 306-319.
- [PW1] E.K. Pedersen and C. Weibel, *A Nonconnective Delooping of Algebraic  $K$ -theory*, Algebraic and Geometric Topology, Lecture Notes in Math. 1126, Springer-Verlag, Berlin, Heidelberg, New York, Tokyo, 1984, 166-181.
- [PW2] E.K. Pedersen and C. Weibel,  *$K$ -theory Homology of Spaces*, preprint.
- [Po] N. Popescu, *Abelian Categories with Applications to Rings and Modules*, Academic Press, London and New York, 1973.
- [Q1] D. Quillen, *Higher Algebraic  $K$ -Theory I*, Algebraic  $K$ -Theory I, Lecture Notes in Mathematics 341, Springer-Verlag, Berlin, Heidelberg, New York 1973, 85-147.
- [Qn1] F. Quinn, *Ends of Maps, I*, Ann. of Math. 110 (1979), 275-331.
- [Qn2] F. Quinn, *Ends of Maps, II*, Inv. Math. 68 (1982), 353-424.
- [RS] C.P. Rourke and B.J. Sanderson, *Introduction to Piecewise-Linear Topology*, Springer-Verlag, Berlin, Heidelberg, New York, 1972.
- [Sc] H. Schubert, *Categories* (E. Gray, translator), Springer-Verlag, Berlin, Heidelberg, New York, 1972.
- [Si] L.C. Siebenmann, *Infinite Simple Homotopy Types*, Indag. Math. 32 (1970), 479-495.
- [Sp] E.H. Spanier, *Algebraic Topology*, McGraw-Hill, New York, 1966.
- [SW1] M. Steinberger and J. West, *Equivariant  $h$ -cobordisms and Finiteness Obstructions*, Bull. Amer. Math. Soc. 12 (1985), 217-220.

- [SW2] M. Steinberger and J. West, *Equivariant Handles in Finite Group Actions*, in *Geometry and Topology* (C. McCrory and T. Shifrin, eds.), Marcel Dekker, New York and Basel, 1987, 277-295.
- [Wh] G. Whitehead, *Elements of Homotopy Theory*, Springer-Verlag, New York, Heidelberg, Berlin, 1978.

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