

MR3760187 57S10 55P91

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Countable approximation of topological G -manifolds: compact Lie groups G .

(English summary)

Topology Appl. **235** (2018), 14–21.

In the paper under review it is proved that if G is a compact Lie group, then any topological G -manifold M is G -homotopy equivalent to a countable G -equivariant CW complex C . Furthermore, if the manifold M is compact, then the CW complex C can be chosen to be finite-dimensional. *Sergey A. Antonyan*

References

1. J.J. Andrews, M.L. Curtis, n -Space modulo an arc, *Ann. Math. (2)* 75 (1962) 1–7. [MR0139153](#)
2. Sergey Antonyan, Equivariant embeddings into G -ARs, *Glas. Mat. Ser. III* 22 (42) (1987) 503–533. [MR0957632](#)
3. R.H. Bing, A homeomorphism between the 3-sphere and the sum of two solid horned spheres, *Ann. Math. (2)* 56 (1952) 354–362. [MR0049549](#)
4. R.H. Bing, The Cartesian product of a certain nonmanifold and a line is E^4 , *Ann. Math. (2)* 70 (1959) 399–412. [MR0107228](#)
5. Armand Borel, Seminar on Transformation Groups, With contributions by G. Bredon, E.E. Floyd, D. Montgomery, R. Palais *Annals of Mathematics Studies*, vol. 46, Princeton University Press, Princeton, N.J., 1960. [MR0116341](#)
6. Glen E. Bredon, Introduction to Compact Transformation Groups, *Pure and Applied Mathematics*, vol. 46, Academic Press, New York–London, 1972. [MR0413144](#)
7. Glen E. Bredon, *Topology and Geometry*, Graduate Texts in Mathematics, vol. 139, Springer-Verlag, New York, 1997, Corrected third printing of the 1993 original. [MR1700700](#)
8. Stewart S. Cairns, Homeomorphisms between topological manifolds and analytic manifolds, *Ann. Math. (2)* 41 (1940) 796–808. [MR0002538](#)
9. Frank Connolly, James F. Davis, Qayum Khan, Topological rigidity and H_1 -negative involutions on tori, *Geom. Topol.* 18 (3) (2014) 1719–1768. [MR3228461](#)
10. Frank Connolly, James F. Davis, Qayum Khan, Topological rigidity and actions on contractible manifolds with discrete singular set, *Trans. Am. Math. Soc., Ser. B* 2 (2015) 113–133. [MR3427570](#)
11. Pierre Deligne, Extensions centrales non résiduellement finies de groupes arithmétiques, *C. R. Acad. Sci. Paris Sr. A–B* 287 (4) (1978) A203–A208. [MR0507760](#)
12. Jean Dieudonné, Une généralisation des espaces compacts, *J. Math. Pures Appl.* 9 (23) (1944) 65–76. [MR0013297](#)
13. James F. Davis, Wolfgang Lück, Spaces over a category and assembly maps in isomorphism conjectures in K - and L -theory, *K-Theory* 15 (3) (1998) 201–252. [MR1659969](#)
14. Erik Elfving, The G -homotopy type of proper locally linear G -manifolds, *Ann. Acad. Sci. Fenn., Math. Diss.* 108 (1996), 50 pp. [MR1413841](#)
15. Erik Elfving, The G -homotopy type of proper locally linear G -manifolds, II, *Manuscr. Math.* 105 (2) (2001) 235–251. [MR1846619](#)

16. Michael H. Freedman, Frank Quinn, *Topology of 4-Manifolds*, Princeton Mathematical Series, vol. 39, Princeton University Press, Princeton, NJ, 1990. [MR1201584](#)
17. David Gale, The teaching of mathematics: the classification of 1-manifolds: a take-home exam, *Am. Math. Mon.* 94 (2) (1987) 170–175. [MR1541035](#)
18. Adel A. George-Michael, On locally Lipschitz locally compact transformation groups of manifolds, *Arch. Math. (Brno)* 43 (3) (2007) 159–162. [MR2354804](#)
19. Sze-tsen Hu, *Theory of Retracts*, Wayne State University Press, Detroit, 1965. [MR0181977](#)
20. Sren Illman, The equivariant triangulation theorem for actions of compact Lie groups, *Math. Ann.* 262 (4) (1983) 487–501. [MR0696520](#)
21. Jan W. Jaworowski, Extensions of G -maps and Euclidean G -retracts, *Math. Z.* 146 (2) (1976) 143–148. [MR0394550](#)
22. J. Jaworowski, G -Spaces with a finite structure and their embedding in G -vector spaces, *Acta Math. Acad. Sci. Hung.* 39 (1–3) (1982) 175–177. [MR0653689](#)
23. Sawomir Kwasik, Kyung Bai Lee, Locally linear actions on 3-manifolds, *Math. Proc. Camb. Philos. Soc.* 104 (2) (1988) 253–260. [MR0948910](#)
24. Robion C. Kirby, Laurence C. Siebenmann, *Foundational Essays on Topological Manifolds, Smoothings, and Triangulations*, Princeton University Press, Princeton, NJ, 1977, With notes by John Milnor and Michael Atiyah, *Annals of Mathematics Studies*, vol. 88. [MR0645390](#)
25. Casimir Kuratowski, Quelques problmes concernant les espaces mtriques non-sparables, *Fundam. Math.* 25 (1935) 534–545.
26. Kuranishi Masatake, On conditions of differentiability of locally compact groups, *Nagoya Math. J.* 1 (1950) 71–81. [MR0038355](#)
27. Sawomir Kwasik, On the homotopy type of G -manifolds and G -ANRs, *Bull. Acad. Pol. Sci., Sr. Sci. Math.* 28 (9–10) (1981) 509–515, 1980. [MR0629026](#)
28. Sawomir Kwasik, On the equivariant homotopy type of G -ANRs, *Proc. Am. Math. Soc.* 83 (1) (1981) 193–194. [MR0620011](#)
29. Lloyd Lininger, On topological transformation groups, *Proc. Am. Math. Soc.* 20 (1969) 191–192. [MR0235544](#)
30. Michael Mather, Counting homotopy types of manifolds, *Topology* 3 (1965) 93–94. [MR0176470](#)
31. Takao Matumoto, On G -CW complexes and a theorem of J.H.C. Whitehead, *J. Fac. Sci., Univ. Tokyo, Sect. IA, Math.* 18 (1971) 363–374. [MR0345103](#)
32. Takao Matumoto, Equivariant cohomology theories on G -CW complexes, *Osaka J. Math.* 10 (1973) 51–68. [MR0343259](#)
33. John Milnor, *Morse Theory*, Based on lecture notes by M. Spivak and R. Wells *Annals of Mathematics Studies*, vol. 51, Princeton University Press, Princeton, N.J., 1963. [MR0163331](#)
34. Edwin E. Mose, Affine structures in 3-manifolds, V. The triangulation theorem and Hauptvermutung, *Ann. Math. (2)* 56 (1952) 96–114. [MR0048805](#)
35. Takao Matumoto, Masahiro Shiota, Unique triangulation of the orbit space of a differentiable transformation group and its applications, in: *Homotopy Theory and Related Topics*, Kyoto, 1984, in: *Adv. Stud. Pure Math.*, vol. 9, North-Holland, Amsterdam, 1987, pp. 41–55. [MR0896944](#)
36. James Munkres, *Topology*, 2nd edition, Prentice Hall, Upper Saddle River, NJ, 2000. [MR3728284](#)
37. Montgomery Deane, Leo Zippin, Examples of transformation groups, *Proc. Am. Math. Soc.* 5 (1954) 460–465. [MR0062436](#)
38. Montgomery Deane, Leo Zippin, *Topological Transformation Groups*, Interscience Publishers, New York–London, 1955. [MR0073104](#)

39. Richard S. Palais, On the existence of slices for actions of non-compact Lie groups, *Ann. Math. (2)* 73 (1961) 295–323. [MR0126506](#)
40. Lev Pontrjagin, *Topological Groups*, Princeton Mathematical Series, vol. 2, Princeton University Press, Princeton, 1939, Translated from the Russian by Emma Lehmer. [MR0000265](#)
41. Frank Quinn, Ends of maps, II, *Invent. Math.* 68 (3) (1982) 353–424. [MR0669423](#)
42. Rad Tibor, ber den Begriff der Riemannschen Flche, *Acta Sci. Math. (Szeged)* 2 (2) (1925) 101–121.
43. Ian Richards, On the classification of noncompact surfaces, *Trans. Am. Math. Soc.* 106 (1963) 259–269. [MR0143186](#)
44. C.P. Rourke, B.J. Sanderson, *Introduction to Piecewise-Linear Topology*, *Ergebnisse der Mathematik und ihrer Grenzgebiete*, vol. 69, Springer-Verlag, New York–Heidelberg, 1972. [MR0350744](#)
45. Duan Repov, Evgenij epin, A proof of the Hilbert–Smith conjecture for actions by Lipschitz maps, *Math. Ann.* 308 (2) (1997) 361–364. [MR1464908](#)
46. Atle Selberg, On discontinuous groups in higher-dimensional symmetric spaces, in: *Contributions to Function Theory*, *Internat. Colloq. Function Theory*, Bombay, 1960, Tata Institute of Fundamental Research, Bombay, 1960, pp. 147–164. [MR0130324](#)
47. Tammo tom Dieck, *Transformation Groups*, *De Gruyter Studies in Mathematics*, vol. 8, Walter de Gruyter & Co., Berlin, 1987. [MR0889050](#)
48. John von Neumann, Die Einfhrung analytischer Parameter in topologischen Gruppen, *Ann. Math. (2)* 34 (1) (1933) 170–190. [MR1503104](#)
49. Andr Weil, L’intgration dans les groupes topologiques et ses applications, *Actual. Sci. Ind.*, vol. 869, Hermann et Cie, Paris, 1940. [MR0005741](#)
50. James E. West, Mapping Hilbert cube manifolds to ANRs: a solution of a conjecture of Borsuk, *Ann. Math. (2)* 106 (1) (1977) 1–18. [MR0451247](#)
51. M. Wojdysawski, Rtractes absolus et hyperspaces des continus, *Fundam. Math.* 32 (1939) 184–192.

Note: This list reflects references listed in the original paper as accurately as possible with no attempt to correct errors.