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Section:

6. Topology

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Rational Lusternik-Schnirelmann category of Poincaré complexes

A CW complex X has rational Lusternik-Schnirelmann (resp. strong) category n — notation : $\mathrm{cat}_0(X) = n$ (resp. $\mathrm{Cat}_0(X) = n$) — if its rationalization X_0 cannot be covered by less than $n+1$ open sets contractible in X_0 (resp. in themselves). If the rational cohomology of X satisfies Poincaré duality, we show that $\mathrm{cat}_0(X) = \mathrm{Cat}_0(X) = e_0(X)$, where the latter denotes the length of the (Milnor-Moore) filtration of $H^*(X;\mathbb{Q})$, induced by word length in the Sullivan minimal model. Both equalities are known to be false for arbitrary finite CW complexes. In addition, we observe that $\mathrm{cat}_0(X - x) = \mathrm{cat}_0(X) - 1$, i. e. the attachement of the top cell increases rational category by 1. These results are joint work with O. Cornéa, Y. Félix and S. Halperin.

Reference: O. Cornéa, Y. Félix and J. -M. Lemaire, Rational category and cone-length of Poincaré complexes, *Topology* **37 No.4** (1998), 743–748.