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Justin Lyle* (justin.lyle@ku.edu), **Jonathan Montaña** and **Sean K. Sather-Wagstaff**.

Tor-persistence and related conjectures.

A commutative Noetherian ring R is said to be Tor-persistent if, for any finitely generated R -module M , the vanishing of $\mathrm{Tor}_i^R(M, M)$ for all $i \gg 0$ implies that M has finite projective dimension. An open question of Avramov, Iyengar, Nasseh, and Sather-Wagstaff asks whether every commutative Noetherian ring is Tor-persistent. We show that any local ring (R, \mathfrak{m}) with $\mathfrak{m}^3 = 0$ is Tor-persistent, and we provide some partial results in the graded case. Our main approach is to exploit properties of exterior and symmetric squares of both modules and complexes. We discuss connections between these problems and a well-known open conjecture of Tachikawa. (Received August 10, 2020)