Results and open problems on the vanishing of modules

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In this talk we shall discuss some homological problems, mostly motivated by the celebrated Auslander-Reiten Conjecture on the freeness of finitely generated modules over commutative Noetherian local rings by means of the vanishing of Ext modules. We shall give cohomological criteria for prescribed bound on the projective dimension of such a module, and we will present a recent extension of the generalized local duality theorem of Herzog-Zamani over Cohen-Macaulay rings to the much broader class of rings possessing a dualizing complex. We shall conclude with some Auslander-Reiten type freeness criteria and others open problems.