

# Boğaziçi MATH COLLOQUIUM

## Vanishing of Tor, and depth properties of tensor products of modules

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**Abstract:** The torsion functors  $\text{Tor}_i^R(-, -)$ , originally invented by topologists, have become an important tool and a subject of research in commutative algebra.

Given finitely generated nonzero modules  $M$  and  $N$  over a commutative Noetherian local ring  $R$ , the tensor product  $M \otimes_R N$  of  $M$  and  $N$  typically has nonzero torsion. For example, if  $R$  is the ring of formal power series  $\mathbb{C}\llbracket X, Y \rrbracket$  in indeterminates  $X$  and  $Y$ , and  $I$  is the ideal of  $R$  generated by  $X$  and  $Y$ , then  $I \otimes_R I$  has nonzero torsion.

The assumption that the tensor product  $M \otimes_R N$  is torsion-free influences the structure and vanishing of the modules  $\text{Tor}_i^R(M, N)$ . In turn, the vanishing of  $\text{Tor}_i^R(M, N)$  imposes certain restrictions on the properties of  $M$  and  $N$ . These connections made their first appearance in Auslander's 1961 seminal paper "Modules over unramified regular local rings".

In this talk I will survey the literature on these topics with emphasis on recent progress. I will also state and discuss several open questions in this direction. The talk is aimed at graduate students.

**Date :** Wednesday, January 14, 2015

**Time:** 2pm

**Place:** TB 250, Boğaziçi University