



## COLLOQUIUM

Friday, August 17, 2018

4:00 p.m. - 5:00 p.m.

315 Armstrong Hall

### **Lech's inequality, the Stuckrad-Vogel conjecture, and uniform behavior of Koszul homology**

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Let  $(R, \mathfrak{m})$  be a Noetherian local ring, and let  $M$  be a finitely generated  $R$ -module of dimension  $d$ .

We prove that the set  $\left\{ \frac{l(M/IM)}{e(I, M)} \right\}_{\sqrt{I}=\mathfrak{m}}$  is bounded below by  $1/d!e(\bar{R})$ , where  $\bar{R} = R/\text{Ann}(M)$ . Moreover, when  $\hat{M}$  is equidimensional, this set is bounded above by a finite constant depending only on  $M$ . The lower bound extends a classical inequality of Lech, and the upper bound answers a question of Stückrad-Vogel in the affirmative. As an application, we obtain results on uniform behavior of the lengths of Koszul homology modules.

This is joint work with Patricia Klein, Linqun Ma, Pham Hung Quy, and Ilya Smirnov.