

*Department of Mathematics,  
University of California San Diego*

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## **Department Colloquium**

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### **Algebraically closed fields in higher algebra**

**Abstract:**

Spectra are among the most fundamental objects in algebraic topology and appear naturally in the study of generalized cohomology theories, algebraic K-groups and cobordism invariants. I will first explain that spectra define a homotopical enlargement of algebra known as “higher algebra,” where one has topological analogues of algebraic structures like rings, modules, and tensor products.

A striking feature of higher algebra is that there are additional “chromatic characteristics” interpolating between characteristic 0 and characteristic  $p$ . These intermediate characteristics have shed light on mod  $p$  phenomena in geometry, number theory, and representation theory. On the other hand, the extension of algebraic ideas to higher algebra has been fruitful within algebraic topology: I will discuss joint work with Robert Burklund and Tomer Schlank which proves a higher analogue of Hilbert’s Nullstellensatz, thus identifying the “algebraically closed fields” of intermediate characteristic. In addition to initiating the study of “chromatic algebraic geometry,” this work resolves a form of Rognes’ chromatic redshift conjecture in algebraic K-theory.

Dragos Oprea

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