

Department of Mathematical Sciences
Faculty and Graduate Research Colloquium

“A Potpourri of Mathematics Around Galois Theory”

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Abstract:

The absolute Galois group of the field $\mathbb{Q}$ of rational numbers, which is defined to be the group of automorphisms of the algebraic closure $\overline{\mathbb{Q}}$ is a large profinite group, having a topology much like that of a Cantor set, that encodes much of the arithmetic of number fields and algebraic varieties over those number fields. Getting an understanding of this group, the structure of which remains remarkably mysterious, and of the objects it acts on is thus of central importance in number theory. As this group is profinite, one way of studying it is by understanding the groups that show up as the finite quotients it is made up from. This is the Inverse Galois Problem, initially posed by Hilbert over a century ago. Equivalently stated it asks whether, for every finite group G , there is a finite Galois extension of $\mathbb{Q}$ isomorphic to G .

While there are many partial results to this foundational question, it is still far from being resolved. In this talk, we will give a background of the Inverse Galois Problem and illustrate some of the prominent approaches, drawing from diverse areas of mathematics, that have been made towards it. We will then give a survey of some of the work currently being done on it and of some of the wide-ranging conjectures it has given rise to.