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The Mystery of Absolute Galois Groups

Finding the roots of polynomials has fascinated humans from the beginning of our civilization. However only in the sixteenth century amidst dramatic events during the Italian Renaissance, the solutions of cubic and biquadratic equations were discovered. É. Galois, after some previous work of J.-L. Lagrange, A.-L. Cauchy, P. Ruffini, N. H. Abel, and others; discovered that certain permutations of the roots of polynomial equations hold the secrets for polynomials of all degrees. His investigations eventually led to the flourishing of Galois theory which has become one of the central topics in current algebra, number theory, and in a more general setting, the theory of symmetries in a number of other areas. Yet one key notion – the notion of absolute Galois groups - still possesses considerable mystery. Absolute Galois groups are profinite groups, and a major open problem in current Galois theory is the characterization of absolute Galois groups among profinite groups.

On the other hand, some spectacular results have been obtained. This lecture is a survey of some of these developments including the Rost-Voevodsky theorem and recent progress in the n-Massey vanishing conjecture. I will try and preserve the drama and the beauty of the subject and make the topic accessible to a general audience.