

## Master Lectures on the history of contemporary mathematics

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December 16: Lie Theory from Lie to Poincare

Abstract: Lie started to study what he called transformation groups in 1874, long before manifolds were defined by Hermann Weyl. I shall describe the work of Lie, Killing, Friedrich Schur, Campbell, who laid the foundations of Lie theory, ending with a brief summary of Poincares point of view.

December 18: Lie theory from Poincare to Elie Cartan

Although Lie theory represented only a small part of Poincares work, he proved an early version of Poincare-Birkhoff-Witt theorem. He used that to establish the Baker-Campbell-Hausdorff formula, which in turn implied Lies "third fundamental theorem". During Cartans time, the notion of manifold became formalized. Cartan used that to put Killings work on a solid foundation, he classified the simple real Lie groups, and studied their geometry.

December 20: Lie theory from Weyl to Weil

Hermann Weyl began the study of representations of compact Lie groups. This involved understanding the maximal tori in compact Lie groups, the action of a maximal torus on the Lie algebra, the Weyl character formula, and the theorem of the highest weight. Borel and Andre Weil first gave explicit, geometric constructions of the irreducible representations; their theorem was later extended to the Borel-Weil-Bott theorem on the cohomology of line bundles on complex flag varieties.