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Robert L. Bryant* (bryant@math.duke.edu), Duke Mathematics Department, P.O. Box 90320, Durham, NC 27708-0320. *The Concept of Holonomy—Its History and Recent Developments*.

Inspired by the study of ‘rolling constraints’ in mechanics, the concept of *holonomy* was introduced into geometry to describe parallel translation in curved media. In the 1920s, it was applied by É. Cartan and his students to problems such as the classification of real forms of Lie groups. Riemannian manifolds with reduced holonomy made their first appearance in mainstream geometry as Kähler geometry, and, in the 1950s, this motivated M. Berger to classify the possible Riemannian holonomy groups, providing a fruitful taxonomy of geometries. S.-T. Yau’s solution of the Calabi Conjecture fits naturally into this framework and stimulated interest in the other ‘special holonomies’ on Berger’s list. Beginning in the 1980s, the final two ‘exceptional’ cases were shown to exist and to play an essential role in high-energy theoretical physics analogous to the role that Calabi-Yau spaces play in string theory and mirror symmetry. In recent years, many new results have extended our knowledge of these exceptional spaces and their remarkable properties, though much remains mysterious.

In this talk, I will describe this history, develop the basic concepts, and explain some of the recent advances and some of the challenging open problems in the study of holonomy. (Received September 24, 2017)