Contribution ID: **51** Type: **not specified**

Hamilton Paths and Cycles in Vertex-transitive Graphs

A path (cycle) containing every vertex in a graph is called a Hamilton path (Hamilton cycle, respectively). A graph is called vertex-transitive if for any pair of vertices u and v there exists an automorphism mapping u to v. In 1969, Lovasz asked whether every finite connected vertex-transitive graph has a Hamilton path. With the exception of the complete graph on two vertices, only four connected vertex-transitive graphs that do not have a Hamilton cycle are known to exist. These four graphs are the Petersen graph, the Coxeter graph and the two graphs obtained from them by replacing each vertex by a triangle. The fact that none of these four graphs is a Cayley graph has led to a folklore conjecture that every Cayley graph has a Hamilton cycle. (A Cayley graph is a graph whose automorphism group admits a regular subgroup.) Both of these two problems are still open. However, a considerable amount of partial results are known.

I will survey some results about the topic with special emphasis given to results obtained using methods initiated by Brian Alspach and/or Dragan Marušič.

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