

## Strong Noether's Theorem: Applications in Astrodynamics

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Noether's theorem is one of the fundamental theorems relating conservation laws to spacetime symmetries (Fig. 1). A stronger version of Noether's theorem was given and its applications

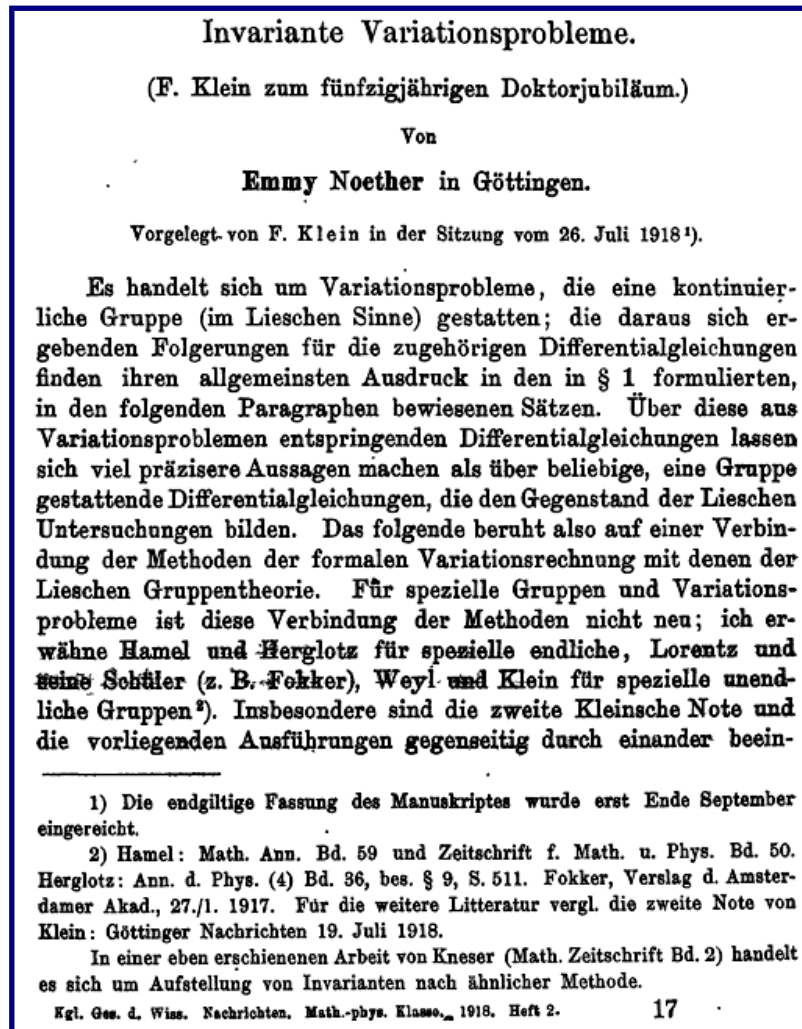


Fig. 1. First page of Emmy Noether's article "Invariante Variationsprobleme"(1918)

demonstrated in handling two-body problem of planetary motion. It essentially states that if one sets up a problem closer to natural symmetries of the system, one should discover additional constants of motion. Two-body problem was set-up in the elliptic-astrodynamical-coördinate mesh, and Kepler's equation was shown to be a particular solution of the equation of motion. This formulation yielded 3 constants of motion, instead of the customary 2.

**Keywords:** Conservation laws • Constants of motion • Elliptic-astrodynamical-coördinate mesh • Space-time symmetries • Two-body problem

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