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Black holes, hidden symmetry and complete integrability

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In physics and mathematics the symmetry allows one to simplify a problem, and often to make it solvable. According to the Noether theorem, symmetries are responsible for conservation laws. Besides evident (explicit) spacetime symmetries, responsible, for example, for the conservation of energy, momentum, and angular momentum of a system, there also exist what is called hidden symmetries, which are connected with higher order in momentum integrals of motion. A remarkable fact is that stationary black holes with spherical topology of the horizon in four and higher dimensions always possess a set ('tower') of explicit and hidden symmetries which make the equations of motion of particles and light in their spacetime completely integrable. The talk gives a general review of the recently obtained results.