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Black holes with unusual horizons

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We give an overview on the possibile horizon geometries of black holes in four and five dimensions. In the four-dimensional case, we show that in presence of a cosmological constant or, more generally, of a scalar potential, there can exist actually more possibilities for the horizon geometry than the hitherto known spherical, hyperbolic or flat cases. In particular, there are black holes whose event horizons are noncompact manifolds with finite volume, which are topologically spheres with two punctures. In five dimensions, we discuss in some detail the case when the horizon is a homogeneous but not isotropic space.

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