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Black hole hair: from no-hair theorems to scalarization

In general relativity black holes are fully characterised by their mass, spin, and electromagnetic charge. No-hair theorems indicate that scalar fields cannot affect black hole spacetimes. However, the devil is on the details and, in practice, no-hair theorems allow us to identify a list of interesting exceptions in which scalar fields leave their imprint on black holes. Such scenarios are of particular interest to gravitational wave searches for new fundamental physics. I will give an overview of how new fundamental scalars affect black hole spacetimes and of how this can be imprinted on gravitational wave observations.

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