

SOME OPEN PROBLEMS IN MATHEMATICAL RELATIVITY

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Theoretical general relativity has developed to such an extent that over the next few decades we should expect rigorous mathematical arguments to replace many of the formal calculations and heuristic arguments of the past. Experience suggests that this symbiosis of mathematical and physical intuition will yield new insights for both disciplines, and it is in the hope of stimulating this process that this list was conceived. Thus, the basic criteria were that questions should admit a clear mathematical formulation, and be of interest both mathematically and physically. Of course, my own interests and tastes played a large part in the selection process, so there are many topics which are not represented here. In apology I can only say that our subject is too broad, and my knowledge too limited, for me to dare to venture any farther afield than I have already done.

The questions vary from the banal, which may already lie solved, implicitly or explicitly, in the literature, to the impossible. The references are intended to be representative only — much more is known about some of the questions than I am able to indicate here.

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Apparent Horizons

A closed oriented space-like 2-surface in a spacetime determines two future null vector fields, normal to the surface. If the future evolutions of the surface