Around and Around and Around They Go!

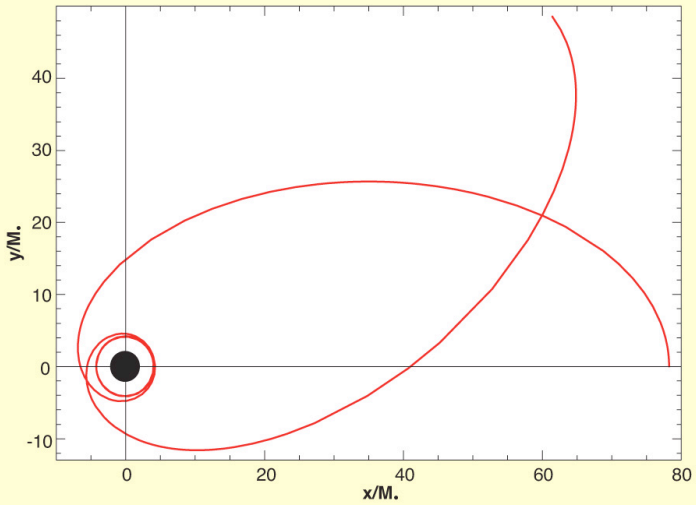
LISA, Little Stars and Big Black Holes

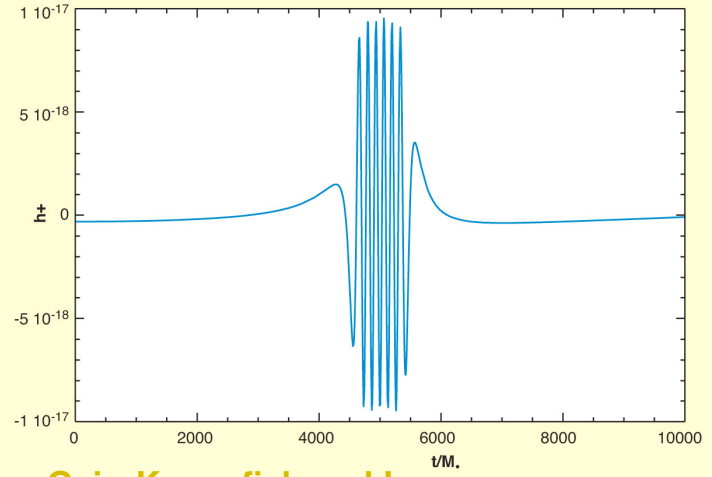
The space-based gravitational wave observatory LISA will be sensitive to signals from the extreme-mass-ratio inspiral (EMRI) of stellar-mass compact objects into massive black holes.

Detection of these gravitational waves will allow astronomers to directly probe populations of compact objects in the innermost orbits around black holes at the centers of Galaxies. In addition, gravitational waves from EMRI systems will provide a map of the geometry and structure of spacetime around the black hole itself!

Shane Larson of the *Center for Gravitational Wave Physics* and collaborators have recently published a computationally efficient method for computing the gravitational wave emission from compact objects orbiting massive black holes. These methods provide an improved technique for estimating the strength and duration of gravitational wave signals from these systems.

As seen at the right, a compact object that comes close to the black hole whirls around the black hole several times (top) before continuing in its orbit. This whirling motion produces a burst of gravitational waves (bottom) that should be detectable by LISA.





Gair, Kennefick and Larson
Physical Review D 72, 084009 (2005)

This work was supported in part by the NSF Center for Gravitational Wave Physics at The Pennsylvania State University cooperative agreement PHY 01-14375, L.S. Finn P.I.