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[2004](#)

[2003](#)

[2002](#)

[2001](#)

[2000](#)

[1999](#)

[1998](#)

[1997](#)

[1996](#)

[1995](#)

[1994](#)

[1993](#)

[1992](#)

[1991](#)

[1990](#)

## Black Hole Merger Movie

Accurate calculations of the gravitational waveforms emitted during the collision of black holes can now be made. A new computer study of how a pair of black holes, circling each other, disturbs the surrounding space and sends huge gusts of gravitational waves outwards, should greatly benefit the experimental search for those waves with detectors such as the Laser Interferometer Gravitational-Wave Observatory (LIGO) and the planned Laser Interferometer Space Antenna (LISA).

The relative difficulty of computer modeling of complicated physical behavior depends partly on the system in question and on the equations that describe the forces at work. To describe the complicated configuration of charges and currents, one uses Maxwell's equations to determine the forces at work. In the case of black-hole binaries, the equations are those from Albert Einstein's theory of general relativity.

Black holes encapsulate the ultimate in gravitational forces, and this presents difficulties for computations attempting to model behavior nearby. Nevertheless, some physicists at the University of Texas at Brownsville have now derived an algorithm that not only produces accurate estimates of the gravity waves of the inspiraling black holes, even over the short time intervals leading up to the final merger, but also is easily implemented on computers (see figures and movie at [Physics News Graphics](#)).

"The importance of this work," says Carlos Lousto, one of the authors of the new study, "is that it gives an accurate prediction to the gravitational wave observatories, such as LIGO, of what they are going to observe." The new results are part of a larger study of numerical relativity carried out at the University of Texas, work referred to as the [Lazarus Project](#).

[Campanelli, Lousto, Marronetti, and Zlochower](#), Physical Review Letters, 24 March 2006

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Figures and movie at [Physics News Graphics](#)

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