

### Biomedical Computation Review

Simbios A NATIONAL CENTER FOR BIOMEDICAL COMPUTING

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318 Campus Drive

Clark Center Room S231

Stanford, CA 94305-5444

# seeing science

## SeeingScience

BY KATHARINE MILLER

## The Envelope Please...

They may not own tuxedos or Dolce & Gabbana gowns, but computational scientists can nevertheless win Oscars.

In February, **Ron Fedkiw, PhD**, associate professor of computer science at Stanford University, together with two scientists at Industrial Light and Magic, **Frank Losasso Petterson, PhD** (a former doctoral student of Fedkiw's), and **Nick Rasmussen**, received a Science and Engineering Award from the Academy of Motion Picture Arts and Sciences.

Their Oscars recognized the group's fluid simulation system which produced impressive and realistic fluid effects in multiple movies including *Terminator 3*, the *Pirates of the Caribbean* movies, *Star Wars: Revenge of the Sith*, and *Evan Almighty*.

The Oscar-winning program simulates water using the same equations others rely on, but, says Fedkiw, the algorithms do a particularly good job of accurately and robustly calculating the interface between water and air. In other words, the spray and bubbles in splashing waves look real-

istic, while smooth water reflects light in appropriate ways.

The Oscar work also has potential biomedical applications. As Fedkiw puts it, anywhere there's fluid—such as blood—the simulation of moving fluids can be useful. “Most recently we've developed some new solids-fluid coupling algorithms that allow rigid, deformable and even thin shells to be simulated in a two way coupled fashion with fluids,” he says. “This could be of use, for example, in simulating heart valves.” □



*Oscar-winning Water.* A 2008 Academy Award for Science and Engineering went to developers of a fluid simulation system used in a number of movies produced by Industrial Light & Magic. As shown here, the Oscar-winning program generates realistic-looking waves and splashes using the particle level set method and an additional method that simulates how the spray interacts with itself and the surrounding water. Courtesy of Ron Fedkiw