



HONORABLE MENTION (TIE)

MÖBIUS TRANSFORMATIONS REVEALED

Douglas N. Arnold and Jonathan Rogness, University of Minnesota, Minneapolis

ANY REAL NUMBER CAN BE PLOTTED ON A LINE THAT RUNS FROM NEGATIVE TO POSITIVE infinity, but throw in an imaginary component and the line becomes a plane, where complex numbers are plotted on both the real and the imaginary axes. Möbius transformations are mathematical functions that send each point on such a plane to a corresponding point somewhere else on the plane, either by rotation, translation, inversion, or dilation. It may sound confusing, but after watching this simple and elegant explanation of Möbius transformations created by Douglas N. Arnold and Jonathan Rogness of the University of Minnesota, Minneapolis, everything becomes clear. Set to classical music, the video demonstrates the transformations in two dimensions but then backs away and adds a third—placing a sphere above the plane and shining light through it. As the sphere moves and rotates above the plane, suddenly all the transformations become linked, in a way that conveys visually in minutes what would otherwise take “pages of algebraic manipulations” to explain, says Rogness.



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TOWERS IN THE TEMPEST

Gregory W. Shirah and Lori K. Perkins, NASA/GSFC

THE CENTER OF A HURRICANE’S eye may be calm, but its walls are anything but. As NASA’s Tropical Rainfall Measuring Mission satellite orbited above the Caribbean in 1998, it captured radar images of vast clouds dubbed “hot towers,” stretching up nearly 18 kilometers into the sky, in the eye wall of Hurricane Bonnie as the hurricane moved northwest along the northern edge of the Bahamas. In “Towers in the Tempest,” Gregory W. Shirah, Lori K. Perkins, and their colleagues at NASA’s Goddard Space Flight Center in Greenbelt, Maryland, use satellite imagery and supercomputer simulations to reveal these hot towers as the hurricane’s “express elevators,” intensifying the storm as they launch swirling air from the storm’s base up all the way to the edge of the stratosphere at 18,000 meters.