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*Bridging the asymptotic behavior of solutions to hyperbolic equations with parabolic equations.*

The Cattaneo-Vernotte equation offers physical insight into the connection between the heat equation and the wave equation with linear damping. We show how one may use this insight to establish sharp energy decay rates for solutions to wave equations with linear damping and variable coefficients. The difficulty of dealing with operators with variable coefficients is eliminated by proving an abstract version of the diffusion phenomenon which allows one to transfer information from the parabolic to the hyperbolic problem as the time goes to infinity. The asymptotic estimates for the parabolic problem with variable coefficients are obtained by proving a weighted Nash-type inequality. (Received September 20, 2009)