



# Elasticity and Geometry: From hair curls to the non-linear response of shells

Basile Audoly, Yves Pomeau

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We experience elasticity everywhere in daily life: in the straightening or curling of hairs, the irreversible deformations of car bodies after a crash, or the bouncing of elastic balls in ping-pong or soccer. The theory of elasticity is essential to the recent developments of applied and fundamental science, such as the biomechanics of DNA filaments and other macro-molecules, and the animation of virtual characters in computer graphics and materials science. In this

book, the emphasis is on the elasticity of thin bodies (plates, shells, rods) in connection with geometry. It covers such topics as the mechanics of hairs (curled and straight), the buckling instabilities of stressed plates, including folds and conical points appearing at larger stresses, the

geometric rigidity of elastic shells, and the delamination of thin compressed films. It applies general methods of classical analysis, including advanced nonlinear aspects (bifurcation theory, boundary layer analysis), to derive detailed, fully explicit solutions to specific problems. These theoretical concepts are discussed in connection with experiments. The book is self-contained. Mathematical prerequisites are vector analysis and differential equations. The book can serve as a concrete introduction to nonlinear methods in analysis.



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