This book is devoted to problems and results related to the equation $\dot{\kappa}^2 = P_4(\kappa)$, where κ is the curvature of a plane curve, and $P_4(\kappa)$ is a polynomial of fourth degree with real coefficients. The authors have been faced with this polynomial in considerations related to the shape of cylindrical membranes and the corresponding equation was named generalized equation of Elastica. It turned out that many others problems can be viewed as images obtained by appropriate lighting of the Elastica. Hence the name of the book.