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Autore	Koutsoyiannis, A.
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2. Record Nr.	UNINA9910254278903321
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Nota di contenuto

Basic aspects of growth -- Mechanics and growth -- Discrete computational models -- Growing on a line -- Elastic rods -- Morphoelastic rods -- Accretive growth -- Membranes and shells -- Growing membranes -- Morphoelastic plates -- Nonlinear elasticity -- The kinematics of growth -- Balance laws -- Evolution laws and stability -- Growing spheres -- Growing cylinders -- Ten challenges -- References -- Index.

Sommario/riassunto

This monograph presents a general mechanical theory for biological growth. It provides both a conceptual and a technical foundation for the understanding and analysis of problems arising in biology and physiology. The theory and methods is illustrated on a wide range of examples and applications. A process of extreme complexity, growth plays a fundamental role in many biological processes and is considered to be the hallmark of life itself. Its description has been one of the fundamental problems of life sciences, but until recently, it has not attracted much attention from mathematicians, physicists, and engineers. The author herein presents the first major technical monograph on the problem of growth since D'Arcy Wentworth Thompson's 1917 book *On Growth and Form*. The emphasis of the book is on the proper mathematical formulation of growth kinematics and mechanics. Accordingly, the discussion proceeds in order of complexity and the book is divided into fiveparts. First, a general introduction on the problem of growth from a historical perspective is given. Then, basic concepts are introduced within the context of growth in filamentary structures. These ideas are then generalized to surfaces and membranes and eventually to the general case of volumetric growth. The book concludes with a discussion of open problems and outstanding challenges. Thoughtfully written and richly illustrated to be accessible to readers of varying interests and background, the text will appeal to life scientists, biophysicists, biomedical engineers, and applied mathematicians alike.