## Contents

Part 1: Mechanical Conservation Principles, Variational Calculus and Engineering Applications from the $17^{\rm th}$ to the $20^{\rm th}$ Century	
The Origins of Mechanical Conservation Principles and Variational Calculus in the 17 <sup>th</sup> Century	3
Principles of Least Action and of Least Constraint  Ekkehard Ramm	23
Lagrange's "Récherches sur la libration de la lune"— From the Principle of Least Action to Lagrange's Principle  Hartmut Bremer	45
The Development of Analytical Mechanics by Euler, Lagrange and Hamilton – From a Student's Point of View Maximilian Gerstner, Patrick R. Schmitt, Paul Steinmann	61
Heun and Hamel – Representatives of Mechanics around 1900	73
The Machine of Bohnenberger	81
On the Historical Development of Human Walking  Dynamics	101

Part II: Material Theories of Solid Continua and Solutions of Engineering Problems	
On the History of Material Theory – A Critical Review Albrecht Bertram	119
Some Remarks on the History of Plasticity – Heinrich Hencky, a Pioneer of the Early Years	133
Prandtl-Tomlinson Model: A Simple Model Which Made History	153
A Historical View on Shakedown Theory  Dieter Weichert, Alan Ponter	169
Some Remarks on the History of Fracture Mechanics Dietmar Gross	195
Porous Media in the Light of History	211
Parameter Identification in Continuum Mechanics: From Hand-Fitting to Stochastic Modelling	229
Historical Development of the Knowledge of Shock and Blast Waves	249
The Historical Development of the Strength of Ships  Eike Lehmann	267
Part III: Theories, Engineering Solutions and Applications in Fluid Dynamics	
The Development of Fluid Mechanics from Archimedes to Stokes and Reynolds	299
The Millennium-Problem of Fluid Mechanics – The Solution of the Navier-Stokes Equations	317
On Non-uniqueness Issues Associated with Fröhlich's Solution for Boussinesq's Concentrated Force Problem for an Isotropic Elastic Halfspace	343

Essential Contributions of Austria to Fluid Dynamics Prior to the End of World War II	355
Part IV: Numerical Methods in Solid Mechanics from Engineering Intuition and Variational Calculus	
From Newton's Principia via Lord Rayleigh's Theory of Sound to Finite Elements	385
History of the Finite Element Method – Mathematics Meets Mechanics – Part I: Engineering Developments	399
History of the Finite Element Method – Mathematics  Meets Mechanics – Part II: Mathematical Foundation of  Primal FEM for Elastic Deformations, Error Analysis and  Adaptivity	443
Erwin Stein Author Index	479
Subject Index	481