



# Variational Principles of Continuum Mechanics: I. Fundamentals (Interaction of Mechanics and Mathematics)

*By Victor Berdichevsky*

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This is a concise and understandable book about variational principles of continuum mechanics. The book is accessible to applied mathematicians, physicists and engineers who have an interest in continuum mechanics.

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### **Editorial Review**

#### **Review**

From the reviews:

“This new book goes far beyond anything currently available concerning variational principles in continuum mechanics. ... We have at hand a monument that all students and professionals in applied mathematics physics and engineering will praise and naturally keep handy on their bookshelf. Teachers will find in the book a wealth of pedagogical material for many one semester courses. They and their students will appreciate the clarity simplicity and ingenuity of many arguments offered without pedantry and sacrifice of rigour.” (Gerard A. Maugin, Mathematical Reviews, Issue 2011 a)

#### **From the Back Cover**

The book reviews the two features of the variational approach: its use as a universal tool to describe physical phenomena and as a source for qualitative and quantitative methods of studying particular problems.

Berdichevsky's work differs from other books on the subject in focusing mostly on the physical origin of variational principles as well as establishing their interrelations. For example, the Gibbs principles appear as a consequence of the Einstein formula for thermodynamic fluctuations rather than as the first principles of the theory of thermodynamic equilibrium. Mathematical issues are considered as long as they shed light on the physical outcomes and/or provide a useful technique for the direct study of variational problems. In addition, a thorough account of variational principles discovered in various branches of continuum mechanics is given.

In this book, the first volume, the author covers the variational principles for systems with a finite number of degrees of freedom; the variational principles of thermodynamics; the basics of continuum mechanics; the variational principles for classical models of continuum mechanics, such as elastic and plastic bodies, and ideal and viscous fluids; and direct methods of calculus of variations.

### **Users Review**

#### **From reader reviews:**

##### **Teddy Mendoza:**

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