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PRE-PRINCIPLES OF MECHANICS

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REVIEW

This book represents the synthesis of the author's views on the logical conception of the mechanics and the results of his research in the theory of mechanical motion over a period of several decades. The content is so divided that it corresponds to suggested logical structure made of: pre-principles, basic definitions, laws of dynamics, principles, theorems; analysis of solutions of differential equations, and stability of motion.

Pre-principles (statements evident by themselves) of existence, determinism and invariance indicate the origin of mechanics, its basic concepts, *a priori* prediction of the possibility to describe the motion, and independence of the natural characteristics of motion of the formal method of description.

Basic definitions include only four concepts (velocity, acceleration, impulse and inertial force), while the laws of dynamics involve only those formulations that determine certain forces.

The main part of the book is devoted to principles of mechanics. The principle of equilibrium is first presented (usually referred to as d'Alembert's principle), then, after necessary additional definitions are introduced, three variational principles are formulated, principle of work, action and constraint. The relations representing these principles are explained through the application to certain mechanical systems, particularly the rheonomic systems. The rheonomic coordinate is introduced, which implies abandoning the concepts of "freezing" the non-stationary, constraints, and extending the configurational and phase spaces. As a result, the systems of differential equations of motion are extended and number of formulas of analytical dynamics are modified. The theorem of change of impulse is given, as well as the theorem of change of kinetic energy, theorem of guided motion, and theorem of optimal control of motion. The concept of insufficiently developed covariant integration is briefly presented, while the covariant differential equations of perturbation and the author's general criterion of stability are derived in the closing part of the book.

Altogether, this book represents an original work which differs by many elements from the standards of analytical mechanics. As such, the book is an important and courageous contribution which will be received with interest among scientific community, certain statements and conclusions being affirmed or questioned.