

# Preface

This book presents the solution of the problem of origin and evolution of the solar system based on Jacobi dynamics. The work's continuous study on the dynamics was published earlier (Ferronsky et al. 1978, 1979a, b, c, 1981a, b, 1982, 1984, 1987, 1996, 2011, Ferronsky 1983, 1984, 2005; Ferronsky and Ferronsky 2010).

By analysis of orbital motion of the Earth, the Moon, other planets, and their satellites, we discovered a common dynamical effect valid for all the solar system bodies. The effect demonstrates that all the planets and satellites have been orbited by the first cosmic velocity of their protoparents. Namely, the planets move in orbits with the first cosmic velocity of the protosun, the radius of which was equal to the semimajor axis of modern orbit of each planet. The satellites of each planet have mean orbital velocity equal to the first cosmic velocity of the corresponding planet having radius equal to the semimajor axis of modern orbit of each satellite. This effect holds for all the small planets of the asteroid belt and for all the comets.

We can state now that the discovered common dynamical effect of the celestial bodies' orbital motion with the first cosmic velocity of their protoparents demonstrates the nature of the forces, which initiate and govern this motion. The protoparental body originates these forces in the form of an integral effect of its constituting interacted elementary particles, which is the body's inner energy. In fact, this is Newton's gravitational force, which he searched for the solution of Kepler's problem. The Kepler's laws, in particular its third law, follow from the found dynamical effect of celestial bodies' orbital motion.

The found dynamical effect was used as a basis for more-detailed analytical consideration of the solar system's cosmogony. We demonstrate that all the solar system bodies have been formed, separated, and orbited from the upper weightlessness shells of their protoparents during the evolutionary process.

The details of the creation process like differentiation of the initial cloud into the shells, physics of the secondary body formation and first cosmic velocity orbiting, separation of the protosolar cloud itself from the protogalaxy, and other effects of the system origin and evolution are considered in the form of separate tasks solution.

The following basic physical principles were accepted for the problem solution. The Sun and other stars, their planets, and satellites are considered as

self-gravitating celestial bodies, which themselves generate the energy for the motion by means of their constituent elementary particle interaction. The particle interaction is considered as a process of their collision and scattering. Because of absence of hydrostatic equilibrium of celestial bodies, found by the artificial satellite studies, the condition of dynamical equilibrium was introduced. This condition is based on the analysis of the artificial satellite orbital motion and also on the observable fact of disagreement with the virial theorem regarding the relationship between the potential and kinetic energy. The condition was accepted not as assumption but proved by derivation of the generalized virial theorem for  $n$ -interacted particles as volumetric matter values. This fundamental principle also follows from the Jacobi dynamics. In this case the energy is accepted as the measure of the particle interaction. The energy action is developed in the form of its inner pressure and accomplishes by oscillations of the moment of inertia. The resulting dynamical effect of a self-gravitating body at its dynamical equilibrium results in the periodically repeated oscillations of all the fundamental parameters like the moment of inertia, potential and kinetic energy, and their frequency and period of oscillation. In the other words, the inner energy initiates all the body's dynamical effects. In this connection, for instance, the widespread opinion that the hydrostatic equilibrium of stars (equation of state) results in the form of equality between the gaseous and gravity pressure appears to be a meaningless idea. In the case of a self-gravitating body, its gaseous pressure is the dynamical effect of interaction of the constituting particles, that is, its gravitational pressure. The measure of the body's interaction of mass particles is the energy but not the force being its first derivative. For a celestial body, the gravitational effect of its interacted masses is determined by integration of the interacted particle effects over the whole volume, that is, obtaining its energy.

In contrast to the hydrostatic equilibrium where the outer forces are used for solving the problems of motion under force action, dynamical equilibrium is based on the inner energy or on the inner integral force field. Dynamical equilibrium of celestial bodies opens new possibilities for studying the nature of their motion. Their own inner and outer force field determines dynamics of a celestial body. Earlier, the inner force field was accepted to be the central symmetric field of vector forces, the sum of which is equal to zero. For dynamical equilibrium, the interacted particles form the volumetric field of pressure which cannot be equal to zero by definition. Such a field of pressure can be reduced to a resultant shell of pressure. For a sphere it will be a spherical shell and for an ellipsoid this is an ellipsoidal shell.

We demonstrate that the basic mode of a body motion is its oscillation. Interaction of the uniform in density body mass realizes all its kinetic energy in the form of oscillations. For a nonuniform body, the tangential component of the potential energy appeared. This component is responsible for the body's axial rotation (tangential oscillation). It is assumed up to now that in mechanics of the macroscopic bodies the wave properties of such nature for massive particles are unessential. It is shown in this work that virial oscillations of a body masses represent the main part of kinetic energy. In the theories based on the hydrostatic equilibrium, this energy is ignored. But in this case, the potential energy of celestial bodies by two or more orders exceeds the kinetic one presented by axial inertial rotation of the masses. This effect has a simple physical explanation. In the

beginning of the last century, the famous French physicist Louis de Broglie extended on the matter of the wave–particle duality theory of light. Later on, his theory was fully confirmed and becomes the basis for developing the present-day wave mechanics for matter on an atomic scale. The particles of greater mass, which are the subject of classical mechanics, have mainly corpuscular properties. The relationship between oscillation of the gravity field and the Earth moment of inertia, which was proved by artificial satellite data, shows that the interaction of its masses results on the level of elementary particles. The only form of motion of the interacted mass particles is their oscillation. The continuous “tremor” of the Earth’s gravity field fixed by changes of the gravity moments is one more conformation of the de Broglie’s idea for the mass interaction of celestial bodies.

Finally, the important effect of a body mass interaction is its outer force field. Its potential energy is changing according with the inverse square law (proportionally to the body’s surface shell area), and the fundamental parameter of the field is its frequency of oscillation. The outer force field fills in all the space of the universe including galaxies, stars, and other bodies. And the oscillation frequency in a given point of the space indicates the energy emitted by the corresponding celestial body during its stay there and velocity of its elementary particle interaction. The outer force field is an indicator of legitimacy of the energy conservation law for the universe as a whole.

Such are the main physical principles used for the solution of the solar system origin and evolution problem, which follows from our previous studies.

The last chapter of the work considers some aspects of application of the obtained results to the universe problems. In particular, the results are used for interpretation of the “dark matter,” “dark energy,” and “Big Bang.” The conclusion is made that our universe in framework of the accepted geometry is a closed pulsating system. During its expansion (present stage of evolution), the system’s decay results up to the matter, becoming like “dark matter” with “dark energy” (weightlessness discrete particle matter). During the contraction stage, the mass particles (electrons, protons, nucleus, atoms, and molecules) and bodies are created in the form of a common galaxy being in the force field (“dark energy”) of the universe. During the stage of expansion, the energy is emitted by the decaying bodies. During the stage of contraction, the “dark energy” is bounded into, what we say, “matter,” which, in fact, is a form of the compressed mass defect.

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