

The history of the birth of cosmic dynamics at St. Petersburg State University

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Abstract.

The history of the birth on the basis of the Departments of Theoretical Mechanics, Celestial Mechanics and Control Theory of the new Department of Controlled Motion Mechanics at the new Faculty of Applied Mathematics and Control Processes (PM-PU) of Leningrad University (LSU), which jointly developed analytical and computational capabilities for solving problems of cosmic dynamics.

Introduction. Stages of birth.

An account of the events of the next stage of development and the completion of K.E. Tsiolkovsky's fantasies and first solutions to problems, F.A. Zander's scientific projects [1, 2], as well as S.P. Korolev's practical developments of the main tasks of Cosmonautics, which laid the foundation and created the foundation for space exploration and flights to other planets of the solar system based on analytical methods of space exploration speakers.

There were departments of theoretical mechanics, control theory and celestial mechanics at Leningrad University, whose heads were professors Nikolai Nikolaevich Polyakhov, Vladimir Ivanovich Zubov and Viktor Sergeevich Novoselov [3-6]. They proposed to form the Faculty of Applied Mathematics and Management Processes at Leningrad State University.

They turned to academics and other University professors for help and support. And they received a government decision – "So be it."

And we have a Department of Controlled Motion Mechanics. It became related to other departments, and together they created the Faculty of Applied Mathematics and Management Processes (PM-PU) and even the Institute of Computational Mathematics and Control Processes, where scientific laboratories were formed with the participation of employees and graduates of the departments of mathematics, mechanics, and astronomy of Leningrad State University.

They invited their students and graduate students. And the backbone or the basis for the life and work of the new faculty and various departments was formed. Some of them were remarkable, who became candidates and doctors of sciences:

Ageev P.A., Alferov G.V., Babajanyants L.K., Kirpichnikov S.N., Kovalenko A.N.,
Korolev V.S., Martynova N.F., Pupyshev Yu.A., Shmyrov A.S.

They were joined by other active employees of PM-PU who were interested in scientific papers that they could find in libraries and scientific journals. Everything that was useful for his scientific work [7-11].

We note their efforts and efforts in scientific research when working with students in the process of learning sciences and practical application of the acquired knowledge for the benefit of their native University, Russia and their beloved city, which later became St. Petersburg again [12-23]. They had a huge range of tasks, problems, hypotheses and theories that turned into new achievements, solution methods and algorithms. It turned out that when the possibilities of theoretical, analytical and celestial mechanics were combined with control processes involving computer systems of machines and algorithms, a scientific direction appeared at the University: Cosmic Dynamics!

The mutual influence of astronomy, mathematics, and mechanics has been evident for a long time. Simple observations of the starry sky and theoretical justifications for the movement of celestial objects (such as the Moon, Sun and stars, planets and moons, comets and asteroids) led to the discoveries of Kepler's and Newton's laws, which make it possible to predict the motion and properties of orbits, determine the position at various points in time for the observed bodies or structures. The gravitational forces of all bodies, the pressure of the forces of the luminous flux, and many other effects were discovered.

The use of reactive forces for mechanical systems of variable composition in the process of their transformation makes it possible to describe and control the movement of artificial bodies (rockets, spacecraft, systems or structures). The influence of solar radiation forces [1, 2, 8, 11] on the surfaces of bodies led to the creation of a special photogravity field [24-27]. The appearance of a solar sail in spacecraft helped to organize management to create optimal orbits for interplanetary flights or to stabilize and steady trajectories.

Conclusion

The development of qualitative methods and applications of theory to computing systems and algorithms for solving complex problems allows us to obtain remarkable results in cosmic dynamics. The monograph "Analytical theory of optimization in gravitational fields" provides a general scheme for solving problems of optimizing the controlled motion of spacecraft [6]. The results were presented in a report at the XXIV Congress of the International Federation of Astronautics (1973).

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