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THE FUNDAMENTAL DEVELOPMENTS BRANCH  
“COGNITIVE MODELING IN THE EXACT SCIENCES” (“OEMMPU”)  
OF “SRI “SFA CMT” OF “RA(N)S” N. A. VENIAMINOV V.N.”

The developed “The fundamental developments branch “Cognitive modeling in the exact sciences”” (“OEMMPU”) treats to the fundamental developments divisions of “The scientific-research institute “System and financial analysis based on cognitive modeling technology” of “RA(N)S” named after Veniaminov V.N.” (“SRI “SFA CMT” of “RA(N)S” n. a. Veniaminov V.N.” – SRI) as the first SRI in the structure of “SIO “Academy of cognitive natural sciences”” (“SIO “ACNS””) and the add. component of the system of science and education of the modern country for the creation, distribution and use of the main and derivative scientific results of the cognitive modeling technology (CMT) (www.vetrovan.(spb.)ru) [see the fundamental developments branches and departments of SRI]:

- 1) it is executed by the principle of “administrative-economy submission”;
- 2) works in the several main directions, which allow to provide the development of the fundamental main and derivative scientific results (my second report on SRW from 2006-2008(9) y. was submitted to “SPbSETU “LETI”” and “The Government of RF” for the translation, carrying out of int. action and receiving of “The Nobel prize”);
- 3) includes the several various main divisions:  
I. “The fundamental developments department “Theory of (theoretical) mechanics and gyroscopes”” (“SM”) (\*)  
*[the fundamental developments in the area “Theoretical mechanics” (\*)* – theoretical bases, general problems and methods of theoretical mechanics, theory of general mechanics, theory of mechanics of liquid and gas, theory of mechanics of deformable firm body, theory of the complex and special sections of theoretical mechanics, theoretical bases of the cognitive modeling technology in theoretical mechanics, theoretical bases of formation of the parametrical cognitive models block for the complex system analysis of the objects, processes and phenomena of theoretical mechanics, theory of the ways of representation of the structure of the cognitive models and problem environments: the formal classical of the 0<sup>th</sup> generation (the logical and production models), the nonformal classical of the 0<sup>th</sup> generation (the semantic network, the frame network and ontology), the formal new of the 0<sup>th</sup> generation (the calculus of theory of sets and corteges on domains and the innovative calculus of theory of sets and graphs), the nonformal new of the 0<sup>th</sup> generation (the multi-level structural scheme and the multi-level encapsulated pyramids combining theory of graphs and theory of sets), the flat of the 1<sup>st</sup> generation (the cognitive circle and the cognitive disc), the volumetric of the 1<sup>st</sup> generation (the cognitive cylinder, the cognitive cone and the cognitive sphere), the flat and volumetric of the 2<sup>nd</sup> generation (the one-, two-, three-, four-, five- and more cognitive circle, cognitive disc, cognitive cylinder, cognitive cone and cognitive sphere), the hybrid of the 3<sup>rd</sup> generation (the combinations of the existing cognitive models), theory of the adaptive automation means of research of the objects, processes and phenomena of theoretical mechanics, theory of the technical means of support of the complex system analysis of the difficult objects, processes and phenomena of theoretical mechanics (the automation means of formation and research based on the cognitive circle, cognitive disc, cognitive cylinder, cognitive cone, cognitive sphere, one-, two-, three-, fore-, five- and more cognitive sphere and others), theory of the statistical substantiation of practical use of the received results, theory of the factors influencing to the efficiency of functioning of the objects, processes and phenomena of theoretical mechanics, theory of organization and plan of carrying out of the experiment, theory of the research of parameters of the parametrical cognitive models block, theory of preliminary processing of a posteriori results of diagnostics, theory of choice of the statistical analysis methods of the generated data sets, theory of the analysis of dynamics of the resultativity of functioning of the objects, processes and phenomena of theoretical mechanics, theory of the dispersion, regression, discriminant, cluster analysis, multidimensional scaling, factor analysis and bibliographic lists;

*the fundamental developments in the area “Theoretical mechatronics”* – theoretical bases, general tasks and methods of theoretical mechatronics, theory of general theoretical mechatronics, theory of mechatronics of liquid, gas and deformable firm body, theory of the complex and special sections of theoretical mechatronics, theory of the automation means and devices of mechatronics, theory of the cognitive modeling technology in the theoretical mechatronics (theory of hygroscope-building)].

II. “The fundamental developments department “Theory of mechanical-engineering, instrument-making and metrology” (“SPMPU”)

*[the fundamental developments in the area “Theoretical mechanical-engineering”* – theory of mechanical-engineering-science and details of machines, theory of machine-building materials, theory of technology of mechanical-engineering, theory of foundry manufacture, theory of forge-stamp manufacture, theory of assembly manufacture, theory of cutting of materials, theory of electrical-physical-chemistry processing, theory of thermal and strengthening processing, theory of furnish of surfaces and drawings of coverings, theory of manufacture of products from powder materials, theory of manufacture of nonmetallic products, theory of machine-tool construction, theory of robotics, theory of tool manufacture, theory of mining mechanical-engineering, theory of metallurgical mechanical-engineering, theory of reactor-construction, theory of turbine-construction, theory of special power-engineering installations, theory of chemical and oil mechanical-engineering, theory of locomotive-construction and carriage-building, theory of engine-construction, theory of motor-car-building, theory of ship-building, theory of aircraft-building, theory of space technics and rocket-building, theory of hoisting-transport mechanical-engineering, theory of building and road mechanical-engineering, theory of communal mechanical-engineering, theory of tractor and agricultural mechanical-engineering, theory of mechanical-engineering for the light industry, theory of polygraphic mechanical-engineering, theory of mechanical-engineering for the food-processing industry, theory of mechanical-engineering for the trade and public catering, theory of household machines and devices, theory of manufacture of weapon, theoretical bases of the other branches of mechanical-engineering, theory of the cognitive modeling technology in the theoretical mechanical-engineering;

*the fundamental developments in the area “Theoretical instrument-making”* – theoretical bases of instrument-making, theory of general technology of production and equipment in instrument-making, theory of designing and constructing of devices, theory of the devices for the measurement of electrical and magnetic sizes, theory of the devices for the measurement of mechanical sizes, theory of the devices for the measurement of time and frequency, theory of the devices for the measurement of composition (structure) and physical-chemical properties of the substances and materials, theory of the devices for the heating-technical and heating-physical measurements, theory of the devices for the measurement of acoustical sizes and characteristics, theory of the devices for the measurement of optical and lighting-technical sizes and characteristics, theory of the devices for the measurement of ionization radiations, theory of the devices of the non-destroying control of products and materials, theoretical bases of the general structural elements, the units of measuring devices and systems, the devices of interface and the means of office equipment (periphery), theory of the cognitive modeling technology in the theoretical instrument-making;

*the fundamental developments in the area “Theoretical metrology”* – theory of the scientific bases and technical means of theoretical metrology and metrological support, theory of the state, national and international systems and services of metrology, theory of the measurement of separate sizes and characteristics, theory of the standard samples of composition (structure) and properties of the substances and materials, theory of the cognitive modeling technology in the theoretical metrology (theory of measurement)].

III. “The fundamental developments department “Theory of power-engineering and electrical-engineering”” (“SE”)

*the fundamental developments in the area “Theoretical power-engineering”* – theory of power-resources, theory of power-engineering (energetic) balance, theory of electrical-power-engineering (energetics) (industry), theory of heating-power-engineering (industry), theory of heating-technics, theory of atomic power-engineering (industry), theory of hydro-power-engineering (industry), theory of helium-power-engineering (industry), theory of wind-power-engineering (industry), theory of the direct transformation of energy, theory of the cognitive modeling technology in the theoretical power-engineering;

*the fundamental developments in the area “Theoretical electrical-engineering”* – theory of electrical-engineering, theory of electrical-technical materials, theory of electrical machines, theory of electrical devices, theory of transformers and electrical reactors, theory of power electrical condensers, theory of power converting technics, theory of electrical drive, theory of electrical-thermy, theory of electrical-welding equipment, theory of wire and cable, theory of electrical isolators, theory of light-engineering, theory of the electrical-technical equipment of special purpose, theory of the cognitive modeling technology in the theoretical electrical-engineering].

The fundamental developments branches and departments of SRI allow to develop the main and derivative scientific results of CMT.