scientific methods - theory and experiment (observation). But the nature of elementary particles and the phenomena involved in the Joint Institute for

Science is the branch of study engaged in approach starting from the basic equations. conducted nuclear calculations using quantum from fiscal 2016, we aim to create further uncovering laws hidden in nature and in The supercomputers have emerged as chromodynamics, simulations of neutron star research results. JICFuS dedicated to understanding, predicting, and reproducing essential tools for their investigation and mergers, and research on the generation of enhancement of the computational science phenomena. Over time, humankind has resolution, and computational science using density fluctuations in dark matter, under research and development through (1) strong, learned to express these laws in the form of the supercomputers has now joined theory MEXT SPIRE Field 5 "The origin of matter fine-grained equations through the use of two basic and experiment as the third scientific method. and the universe" implemented in fiscal 2015. computational scientists, (2) provision of a JICFuS had gained some noteworthy research venue for cooperation between fundamental JICFuS results, winning the ACM Gordon Bell Prize. computational scientists and computer

Computational evolution of the universe involve complexities Fundamental Science (JICFuS) is a computer" (Elucidation of the Fundamental research. that cannot be resolved through an analytical collaborative effort eight institutions. We had Laws and Evolution of the Universe) starts

The science of the Joint Institute for Computational Fundamental Science

Neutron

Elucidation of the Fundamental Laws and Evolution of the Universe

The ultimate purpose of computational science in the fields of particle physics, nuclear physics, and astrophysics is to elucidate the history of the creation of matter, in a manner that bridges the three fields. Our aim is to conduct precise large-scale calculations using a supercomputer in order to investigate phenomena on scales ranging from that of elementary particles to the universe itself. We will combine the results obtained with those of large-scale experiments and observational data, in an effort to elucidate the history of the creation of matter.

To realize these aims, MEXT as "Priority Issue on Post-K computer" (Elucidation of the Fundamental Laws and Evolution of the Universe), which will begin operation in fiscal about 2020, will develop simulation code to verify the Standard Model of particle physics, and investigate superstring theory, particle interactions, the structure of heavy nuclei, and stellar explosions, and so unlock the mysteries of the evolution of the universe.





We plan to perform large-scale simulations of lattice quantum chromodynamics (QCD) in order to calculate the physical quantities needed to interpret the experimental results obtained at large particle accelerators such as SuperKEKB and J-PARC.



Quest for the Ultimate Laws and the Birth of the Universe

Exploring the Origin and Evolution of Matter

The purpose of this project is to explore the unsolved issues in microscopic physics by larger-scale numerical computation. Specifically, the issues are to accurately determine the baryon-baryon interactions, nuclear structure and many-body reactions between nuclei, and the equation of state for high-density nuclear matter.

fundamental support of MEXT as "Priority Issue on Post-K scientists, and (3) creation of new fields of

Large-Scale Simulations and Astronomical Big Data

In the next ten years, a variety of large observational programs will be conducted. We will push the frontier of big data cosmology that combines observational data and large-scale simulations to elucidate the evolution of the universe and the formation of galaxies.

Promotion of Computational Fundamental Science

In order to accelerate the research and development of computational fundamental science, we promote user support, exploratory research support, and human network construction. To learn fundamental physics, we have developed "Quark Card Dealer" the Quantum Chromodynamics collectible card game.

