Division of Mathematical and Physical Sciences	Research field	Computational Solid State Physics	Lab. ID MP19
Laboratory web site	http://cphys.s.kanazawa-u.ac.jp/		

Research subjects

We conduct research in computational science (computational materials science) based on theoretical physics (condensed matter theory). Various properties of materials are determined by the behavior of electrons (electronic states) according to quantum mechanics. Therefore, we design new useful materials through simulations using electronic structure calculation methods developed in the field of solid state physics, artificial intelligence (AI), machine learning, and other methods and materials informatics. We address a wide variety of materials such as topological insulators, semiconductors, magnetic materials, superconductors, thermoelectric materials, ferroelectrics, new carbon materials, spintronics materials, two-dimensional materials, and artificial superlattices. Furthermore, from a new perspective that focuses on the symmetry and topology of the electron wavefunction, we aim to discover materials with innovative physical properties that have never been discovered before, and to propose devices such as transistors, quantum computer devices, and devices that solve energy problems based on new principles.

Master/Doctor course: Education policy, curriculum, typical activity in the laboratory

In the master's program, students participate in laboratory seminars in addition to lectures. Students decide on a specific research theme, conduct research, and write a master's thesis. In the doctoral program, students write a doctoral thesis under the guidance of a primary supervisor. In both programs, students are required not only to conduct research, but also to cultivate presentation skills that will enable them to showcase their research. For this purpose, students are encouraged to make presentations not only in the laboratory but also at national and international conferences. In addition, we provide guidance in writing papers for international journals, especially for students in the doctoral program.

Daily life in the laboratory, etc.

Students use PCs to conduct their own research and prepare presentation materials. In addition, by using supercomputers at other universities via the Internet, large-scale simulations are conducted. In addition, depending on the research theme, students may participate in joint research with researchers inside and outside the university, and develop and release new computational methods and programs.

Message or comments by the laboratory faculty staffs

Computational science is the third science after experimental and theoretical science. We are conducting research on the application of this new science to the field of condensed matter physics, and we expect students who are willing to take on the challenges of such research. Computational science and condensed matter physics are interdisciplinary research fields, and students can choose a theme from a wide range of research topics.

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