

Global COE Programs

The Global COE (Centers of Excellence) Program was launched by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT), to provide funding support for research and education centers of the highest international standards. Thirteen projects among the diverse scientific fields Kyoto University were selected to receive support, and seven projects below are the projects still currently ongoing. These seven projects are in the forefront respective fields. This issue of *Research Activities* is an Global COE special edition, introducing the objectives and contents of the seven projects.



Center for Frontier Medicine



Reconstruction of the Intimate and Public Spheres in 21st Century Asia



Fostering Top Leaders in Mathematics - Broadening the Core and Exploring New Ground



Energy Science in the Age of Global Warming - Toward CO₂ Zero-emission Energy System



The Next Generation of Physics, Spun from Universality and Emergence



Sustainability/Survivability Science for a Resilient Society Adaptable to Extreme Weather Conditions



Global Center for Education and Research on Human Security Engineering for Asian Megacities

www.kyoto-u.ac.jp/en/research/capital/global_coe/global.htm



Center for Frontier Medicine

Category : Medical sciences (Since 2008)

Leader : Professor Shuh Narumiya, Graduate School of Medicine

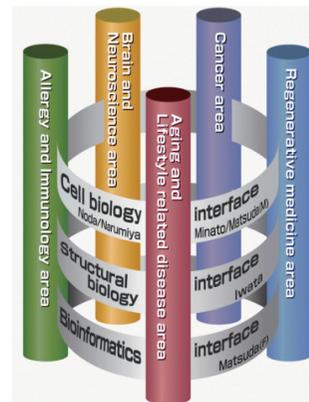


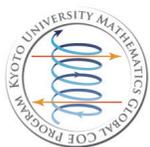
The Center for Frontier Medicine was established to create new medicine and cultivate a new generation of internationally active scientists. One of the main goals of this five-year project was to reorganize the old-style single-professor departments, referred to as *koza* in Japanese, into larger units, referred to as *Areas*, which would be comparable with departments in leading universities in the United States. The center operates on the principle that a mass of talented people sharing knowledge and expertise is important for productive medical research and education.

Another aim of the project is to improve the members' English communication skills. The center has established five *Areas* (virtual departments) wherein young members from basic and clinical departments meet regularly to hold discussions in English. The Conference Travel Awards provide opportunities for graduate students and young researchers to attend international meetings overseas, and bi-directional International Internships help young researchers learn innovative research techniques at international laboratories. It has also forged strong links with several of the world's leading medical institutions.

Although it will take some time for each *Area* to demonstrate its full potential, some *Areas* have already made significant discoveries. The center therefore views its current mission as to actively sustain this creative environment.

www.med.kyoto-u.ac.jp/GCOE/E/index.html





Fostering Top Leaders in Mathematics – Broadening the Core and Exploring New Ground

Category : Mathematics, physics, earth sciences (Since 2008)
 Leader : Professor Kenji Fukaya, Graduate School of Science



The GCOE Program *Fostering Top leaders in Mathematics (Broadening the Core and Exploring New Ground)*, is operated by Kyoto University’s Department of Mathematics and Research Institute of Mathematical Science. The program has two objectives: fostering the next generation of leaders in the field of core mathematics, and finding new fields in which graduates of the doctor’s course in mathematics can play an important role. International cooperation is very important in achieving both objectives, and so the program has forged new relationships with institutions around the world, organizes exchange activities for doctoral students and postdoctoral fellows, and co-organizes various programs and conferences with partner institutions. Each year, the program provides support for several activities organized by doctor’s course graduates, which involve cooperation between graduate students from universities throughout Japan. The program has significantly contributed to Kyoto University maintaining its position as one of the world’s top mathematics research centers. A new doctoral program in mathematics has been established which broadens the scope of activities beyond traditional mathematical research. The course features various types of lectures and seminars designed to appeal to the interests of young students.



gcoe.math.kyoto-u.ac.jp/english/

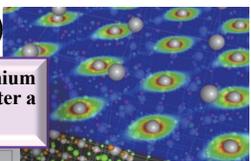
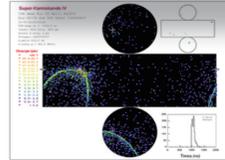
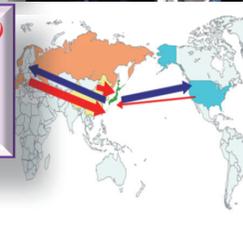


The Next Generation of Physics, Spun from Universality and Emergence

Category : Mathematics, physics, earth sciences (Since 2008)
 Leader : Professor Hikaru Kawai, Graduate School of Science



This program has been seeking and creating “universality” and “emergence” as key essentials of physics, and aims to further develop the next generation of physics. It is an explicit priority of the program to conduct cutting-edge frontier physics, and to seek as-yet-undiscovered types of emergent phenomena. By approaching research as a process of “spinning” the next generation of physics from the “threads” of the university and emergence physics, we aim to cultivate independent-minded researchers who are capable of opening new frontiers in the study of natural phenomena.

<p>Research</p>		<p>Teaching and Research Assistant (TRA) TA offers academic and educational experience. RA supports students in acquiring basic research skills to conduct frontier research, leading to an increased number of presentations at International conferences.</p>	<p>Education</p>
<p>The mystery of uranium compound discovered after a quarter century.</p>	 <p>The world’s first capture of electron neutrino emergence.</p>	<p>Bilateral International Exchange Program (BIEP) A one-to-three-month traineeship program for doctoral students. Fifty inbound students and fifty-eight outbound students are engaged in international cooperation and research.</p>	
 <p>Discovery of “BabyBoom” —the birth of a star in the center of the Milky Way.</p>			

scphys.kyoto-u.ac.jp/gcoe/index_e.html



Global Center for Education and Research on Human Security Engineering for Asian Megacities



Category : Mechanical, civil engineering, architectural and other fields of engineering (Since 2008)

Leader : Professor Yuzuru Matsuoka, Graduate School of Engineering

This Global COE Program aims to contribute to solving human security issues in Asian megacities by developing urban Human Security Engineering (HSE). To date the following achievements have been made.

1. Seven overseas bases have been established to pursue education, research, on-site training, joint research, and management via IT infrastructure.
2. The Human Security Engineering Education Program, a doctoral program, was established. Approximately 150 students have taken the program in five years, 82% of which were international students from Asian countries.
3. Over fifty joint research projects have been implemented in cooperation with Asian megacities, international organizations, and NPOs. The projects aim to verify the social effectiveness of human security engineering, foster young researchers, and make policy recommendations.
4. Approximately 200 international symposia and workshops have been held in English, both inside and outside Japan. Such events serve to globally disseminate information on the achievements of the program.

Even after the Global COE Program ends, the HSE Education Program and the network of overseas bases developed by the program are expected to continue and be further developed through joint management with international partners under subsequent programs.



Overseas bases and Hub center in Kyoto Univ.



Overseas internship by students.

hse.gcoe.kyoto-u.ac.jp/index.html



Reconstruction of the Intimate and Public Spheres in 21st Century Asia



Category : Social sciences (Since 2008)

Leader : Professor Emiko Ochiai, Graduate School of Letters

This GCOE project is reaching the final stage; the most visible and unique achievement of the five-year endeavor is surely the construction of a global network for research and educational collaboration. The project now has partners in 33 universities and research institutions around the world, of which 16 are in Asia, 12 in Europe, 4 in North America and 1 in Oceania. Together with these partners, the Research Consortium for the Intimate and the Public has been established to continue the collaboration, and the

Asian Research Center for the Intimate and Public Spheres at the Graduate School of Letters, Kyoto University, has been established as the office of the Consortium. The fruits of the GCOE project's academic achievement include various publications including two book series, one in English being published by Brill (16 volumes) and another in Japanese by Kyoto University Press (20 volumes). All the volumes are the outcome of international collaborative projects on topics such as intimate work, the labor market, migration, care regimes, art and law. A system of student and teaching staff exchange has also been established and named the "Asian ERASMUS pilot program." This program has definitely contributed to the development of transnational friendship and mutual understanding, together with the Next-Generation Global Workshop which it has been decided will continue even after the end of the GCOE. The GCOE will live on.



Brill book series



GCOE partner institutions

www.gcoe-intimacy.jp/



Energy Science in the Age of Global Warming – Toward CO₂ Zero-emission Energy System



Category: Interdisciplinary, combined fields (Since 2008)

Leader : Professor Takeshi Yao, Graduate School of Energy Science

Securing energy and conserving of the environment are the most important issues for the sustainable development of human beings. People have relied heavily on fossil fuels and have released large amounts of greenhouse gases (abbreviated to CO₂ below) such as carbon dioxide. The energy problem cannot simply be labeled as a technological issue, as it also deeply involves social and economic elements. It is necessary to establish the “low carbon energy science” as an interdisciplinary field by combining the social and human sciences with the natural sciences. Four departments in Kyoto University—the Graduate School of Energy Science, Institute of Advanced Energy, Department of Nuclear Engineering, and the Research Reactor Institute – have joined together to operate a program titled Energy Science in the Age of Global Warming – Toward a CO₂ Zero-emission Energy System. The program aims to establish an international education and research platform to foster educators, researchers, and policy makers who can develop technologies and propose policies to work towards establishing a CO₂ zero-emission society by the year 2100. The Scenario Planning Group sets out a CO₂ zero emission technology roadmap and establishes a CO₂ zero emission scenario. The Advanced Research Cluster promotes studies of socio-economic energies, renewable energies, and advanced nuclear energies following the road map. At the GCOE Unit for Energy Science Education, students undertake interdisciplinary group research through their own initiative, which spans the social and human sciences and the natural sciences. Through participation in scenario planning and interaction with researchers from other fields, the students acquire the ability to survey the whole “energy system,” and apply their observations to their own research. The program has a strong focus on international exchange activities, and is establishing a Network of Excellence (NOE) to promote international collaborative research.

www.energy.kyoto-u.ac.jp/gcoe/en/



Sustainability/Survivability Science for a Resilient Society Adaptable to Extreme Weather Conditions



Category: Interdisciplinary, combined fields (Since 2009)

Leader : Professor Kaoru Takara, Disaster Prevention Research Institute

The program (GCOE-ARS) provides interdisciplinary education and research opportunities through close cooperation between the Disaster Prevention Research Institute (DPRI), the Research Institute for Sustainable Humanosphere (RISH), and the Graduate Schools of Science, Engineering, Agriculture, Informatics and Global Environmental Studies.

Advanced research for resiliency and adaptation to extreme weather conditions, including water environment and disasters is pursued collaboratively through two mutually interactive themes:

Theme 1: Science-Engineering Interdisciplinary Research on the Monitoring and Prediction of Extreme Weather, Water Cycle and Disaster Contingency.

Theme 2: Integrated Social-Natural Sciences Research Towards the Creation of a Sustainable Society Adaptable to Global Environmental Change.

The students and young researchers pursuing these topics are provided with overseas on-the-job training opportunities related to their field of interest.

The GCOE-ARS Educational Unit, which operates under the Center for Promotion of Interdisciplinary Education and Research (C-PIER), provides students with the following modes of education and training: 1) Science/engineering or humanities/science-engineering integrated lectures, 2) Field studies, 3) Internships, 4) Interdisciplinary seminars, and 5) International schools. Upon fulfilling the requirements for all five components, students are awarded a GCOE-Program completion certificate and a Ph.D. degree from the relevant graduate school. So far, five students have graduated from the program: two from Japan, other one from Indonesia, one from Bangladesh, and one from Brazil.

The program has established an international network covering major research sites, such as Indonesia, Thailand, Vietnam, India, Fiji, Niger, Egypt and France. Students are able to visit these sites for field study or internships.

ars.gcoe.kyoto-u.ac.jp/index.php?id=3