



The Graduate School of Biological Sciences undertakes advanced research to elucidate various functions of microorganisms, plants and animals at the molecular and cellular levels, and clarifies basic phenomena of life and biological diversity.

In the 21st Century COE Program we elucidated the dynamic networks of molecules that comprise cells, using information science techniques in exhaustive analyses of genome and protein structure. Based on such advanced basic research, the School provides research and development that benefits human well-being, training researchers to play active roles in the international community.



■ *Global COE Program*

The “Global Program for Frontier Biosciences: Adaptation and survival strategies in a changing global environment” was adopted in 2007 as part of the Global COE Program commissioned by MEXT. We are vigorously developing this project with the goal of creating a globally pre-eminent center for training researchers capable of actively participating in the international community, while promoting world-leading advanced research in the biological sciences.

■ *Active and high-level faculty and staff*

Professors and associate professors, who are internationally active researchers, lead energetic research activities. The School is one of the top institutes in attracting funds such as Grants-in-Aid for scientific research and the COE Program from the Japan Society for the Promotion of Science and Japanese government ministries, showing that our faculty and staff are of high repute both inside and outside Japan.

■ *Abundant research facilities*

Each department is equipped with a variety of the latest equipment. Shared equipment, among the most advanced available for biological science research in Japan, is provided at various locations in the School.

■ *Graduate school education with a comprehensive curriculum*

We provide two courses to meet students’ needs for their future careers: a two-year Bio-Expert course, and a five-year Frontier Bio course. We offer a wide range of lectures covering the various fields of biological sciences.

■ *Support of students’ research and life*

We have a support system for students to enable them to engage in research without worrying about their basic needs. We offer Global COE funds as well as scholarships from the Japan Student Services Organization, plus TA and RA funds for distinguished students in the doctoral program.

■ *Support Program for Improving Graduate School Education*

The program “Bioscience Personnel Training Program Using a Two-Course-System: A pioneering approach to graduate school education emphasizing career design and process management” was adopted in 2007 as part of the Support Program for Improving Graduate School Education commissioned by MEXT, with the aim of im-





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Elucidating the Dynamic Behavior of Cells in Forming the Body

When the body of a vertebrate is formed, an integrally harmonized three-dimensional structure is built through the cooperation of individual somatic cells playing their predetermined roles. We are working on the mechanisms behind the behavioral patterns of these cells. Recently, we discovered an unexpected phenomenon in which quite a limited number of cells, “selected” to form blood vessels from a form of tissue known as “somites” for muscles and bones, migrate dynamically through the body to reach pre-determined sites of blood vessel formation. We have also revealed the role of the genes that enable this mysterious behavior on the part of the cells. Furthermore, it has been found that cells that form nerves are present in the vicinity of cells that form blood vessels, and the two types communicate closely with each other. If this fails, the morphogenesis of tissues and organs does not proceed well, resulting in unusual behaviors in the adult body such as those seen in cancer cells. Normally, the cells work to generate tissues and organs in an exquisite mechanism.

Our research area requires the capacity to observe the whole embryo or the whole body of a vertebrate. For example, the essential nature of a living organism cannot be understood simply by observing its blood vessels. To this end, we must always evaluate the available data from a broad range of viewpoints, a task that on the one hand represents the hardest aspect of our research but which also provides us with the greatest joy of exploring truth.

Researchers in my laboratory must be adept at communicating with each other. Another important requirement is a positive attitude to try anything that’s interesting, while also enjoying leisure activities. It may only be after the students and I have exhausted every possible avenue that we finally reveal an interesting biological phenomenon. There is no substitute for that sort of pleasure.

proving the new system of graduate school education.

■ Project for the Promotion of Plant Science Education

In 2005, our School began to function as a center for the networking of leading plant scientists nationwide to promote advanced education in plant science through collaboration between postgraduate-level educators.

Department of Cell Biology

- Structural Cellular Biology
- Cell Biotechnology
- Signal Transduction
- Intercellular Communication
- Plant Cell Biology and Organogenesis
- Metabolic Regulation of Plant Cells
- Gene Regulation Research
- Molecular Neuroscience
- Plant Molecular Biology
- Molecular and Cell Genetics
- Bioinformatics
- Medical Biology (Visiting Course)

Department of Molecular Biology

- Microbial Molecular Genetics
- Plant Molecular Genetics
- Animal Molecular Genetics
- Plant Molecular and Cellular Biology
- Gene Function in Animals
- Cell Proliferation and Differentiation
- Molecular and Developmental Biology
- Plant Molecular Morphogenesis
- Biophysics
- Biodynamics and Integrative Biology
- Systems Biology (Visiting Course)
- Functional Genomics (Visiting Course)

Collaborative Laboratories

- Molecular Microbiology and Genetics (Research Institute of Innovative Technology for the Earth)
- Molecular Genetics of Human Diseases (Research Institute, Osaka Medical Center for Cancer and Cardiovascular Diseases)
- Brain Development (RIKEN)

Plant Science Education Unit

- Plant Protein Analysis

Global COE Program Special Research Groups

- Developmental Morphology Research Group
- Plant Reproductive Genetics Research Group
- Developmental Genomics Research Group