

## GOALS OF THE NATIONAL INSTITUTE FOR BASIC BIOLOGY

The National Institute for Basic Biology (NIBB) sets five goals for its activities in pursuing the progress of biology. We contribute to the world-wide community of biologists through our efforts to accomplish these goals. This chapter briefly explains four of these goals. The last goal, the promotion of academic research, is accomplished through our research activities, which are introduced throughout this brochure.

### Promotion of Collaborative Research

#### ■ Collaborative Research Support

Research activities in collaboration with NIBB's divisions/laboratories using NIBB's facilities are solicited from external researchers. "Individual collaborative research projects" are the basic form of collaboration support which provide external researchers with travel and lodging expenses to visit NIBB's laboratories for collaborative research. "Priority collaborative research projects" are carried out as group research by internal and external researchers to develop pioneering research fields. "Collaborative research projects for model organism/technology development" and "Collaborative research projects for bioresource preservation technology development" are for developing and establishing new model organisms and new research technology. For these projects, research expenses in addition to travel expenses are provided. In 2016 two new projects, Collaborative research projects for integrative genomics and Collaborative research projects for integrative bioimaging, were initiated by reorganizing two former projects to facilitate more integrated use of the NIBB Core Research Facilities and to allow more intensive support through the planning, experimental, data analysis, and publication stages. Travel and lodging expenses are provided for these projects.

year	2013	2014	2015	2016
Priority collaborative research projects	2	1	2	2
Collaborative research projects for model organisms and technology development	4	2	3	2
Individual collaborative research projects	89	87	88	46
NIBB workshops	4	3	6	6
Collaborative experiments using the Large Spectrograph	15	12	10	10
Collaborative experiments using the DSLM	9	10	11	
Bioimage processing and analysis collaborative research projects			14	38*
Collaborative experiments using the next generation DNA sequencer	41	37	46	59**
Support for NIBB training courses	1	0	1	0
Collaborative research projects for bioresource preservation technology development	9	10	9	12
total	174	162	190	175

Collaborative Research Projects by Year

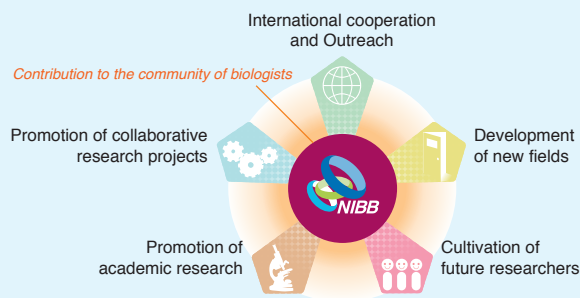
\*renovated as "Collaborative research projects for integrative bioimaging"

\*\*renovated as "Collaborative research projects for integrative genomics"

#### ■ NIBB Core Research Facilities

The NIBB Core Research Facilities support research in NIBB and also act as an intellectual hub to promote collaboration between NIBB and other academic institutions. They consist of three facilities that are developing and providing state-of-the-art technologies through functional genomics, bioimaging and bioinformatics (p. 76).

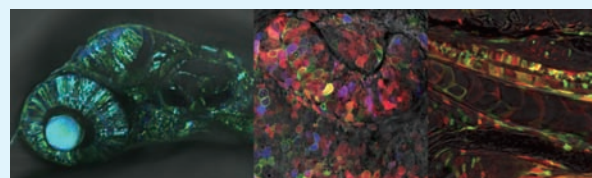
The Functional Genomics Facility maintains a wide array of core research equipment, including next generation DNA sequencers. The facility is dedicated to fostering NIBB's collaborative research by providing these tools as well as expertise. The current focus is supporting functional genomics works that utilize mass spectrometers and DNA sequencers, holding training courses as one of these undertakings (p.



96). The Spectrography and Bioimaging Facility manages research tools, such as confocal microscopes, DSLM and the large spectrograph, and provides technical support and scientific advice to researchers. These two facilities hold specially appointed associate professors, an expert in each field, with a mission to manage each facility as well as conducting his own academic research. The Data Integration and Analysis Facility supports analysis of large-scale biological data, such as genomic sequence data, gene expression data, and imaging data. For this purpose, the facility maintains high-performance computers with large-capacity storage systems.

#### ■ Bio-Resources

The National BioResource Project (NBRP) is a national project for the systematic accumulation, storage, and supply of nationally recognized bio-resources (experimental animals and plants, cells, DNA, and other genetic resources), which are widely used as materials in life science research. To promote this national project, NIBB has been appointed as a center for research on Medaka (*Oryzias latipes*) whose usefulness as a vertebrate model was first shown by Japanese researchers. The usability of Medaka as a research material in biology has drawn increasing attention since its full genome sequence recently became available. NIBB is also a sub-center for the NBRP's work with Japanese morning glory. The NIBB BioResource Center has equipment, facilities, and staff to maintain Medaka and Japanese morning glory safely, efficiently, and appropriately. The center also maintains other model organisms, such as mice, zebrafish, *Arabidopsis*, *Lotus japonicus*, and *Physcomitrella patens*, and provides technical support and advice for the appropriate use of these organisms (p. 83).



An example of a medaka strain in NBRP, Gaudi strain, in which individual cells in the brain and the retina are fluorescently labelled using Brainbow system.

#### ■ NIBB Center of the Inter-University Bio-Backup Project (IBBP Center)

To prevent damage to important biological resources by natural disasters, NIBB established the IBBP Center in 2012 in collaboration with seven national universities for multiple preservation of genetic libraries and other invaluable

bioresources under cutting-edge research (p. 86).

## International Cooperation and Outreach

### ■ Collaborative Programs with Overseas Institutes

NIBB takes a leading role in the collaborative research programs between the European Molecular Biology Laboratory (EMBL) and the National Institutes of Natural Sciences (NINS) and promotes personal and technological exchange through joint meetings, exchange between researchers and graduate students, and the introduction of experimental equipment.

NIBB formed an agreement with the Temasek Life Sciences Laboratory (TLL) of Singapore, Princeton University, and the Max Planck Institute for Plant Breeding Research (MPIPZ) to promote joint research projects, collaborative symposia, training courses and student exchange programs.

### ■ NIBB Conference

The NIBB Conferences are international conferences on hot topics in biology organized by NIBB's professors. Since the first conference in 1977 (the year of NIBB's foundation), NIBB Conferences have provided researchers in basic biology with valuable opportunities for international exchange. The 64<sup>th</sup> conference "Evolution of Seasonal Timers" was held in April, 2016 (p. 93).

### ■ International Practical Course

With the cooperation of researchers from Japan and abroad the NIBB international practical course is given at a laboratory specifically prepared for its use. The 9<sup>th</sup> course "Genetics and Imaging of Medaka and Zebrafish" was held jointly with TLL in August, 2016 at NIBB (P. 94). Graduate students and young researchers from various areas including Argentina, Korea, Singapore, Germany, India, Taiwan, UK, and Japan, were provided with training in state-of-the-art research techniques. International conferences and courses are managed by the International Cooperation Group of the Research Enhancement Strategy Office.

### ■ Outreach

NIBB's outreach activities aim to present cutting edge research results to the public via mass media through press releases or directly through the internet, such as web pages, Facebook, and Twitter. Our triannual open campus event was held in October, 2016 at which we welcomed more than 4,700 local citizens. NIBB also cooperates in the education of undergraduate and younger students through lectures and workshops. Outreach activities are mostly managed by the Public Relations Group of the Research Enhancement Strategy Office.

## Development of New Fields of Biology

### ■ Bioimaging

NIBB aims to maximize the application of modern light microscopes and biophotonic probes for real time visualization of biological phenomena and to develop new imaging techniques. As part of our collaborative work with EMBL, NIBB introduced a DSLM, which is effective for the three-dimensional observation of living organisms, and has developed an improved model using two-photon optics (p. 73).

The application of the adaptive optics to microscopy is under way in collaboration with the National Astronomical Observatory of Japan. The Advisory Committee on Bioimaging, comprised of leading researchers in the bioimaging field in Japan, is organized to formulate advice on NIBB's imaging research. The Bioimaging Forum provides an opportunity for researchers and company engineers to frankly discuss practical difficulties and needs regarding imaging. The 10<sup>th</sup> Forum "Pioneering Bioimaging in the New Era" was held in February, 2016 (p. 96). A training course in bioimage analysis was also held in 2016 (p. 97).

### ■ Okazaki Biology Conferences

NIBB holds Okazaki Biology Conferences (OBC) that, with the endorsement of the Union of Japanese Societies for Biological Science, aim to explore new research fields in biology and support the formation of international communities in these fields. Dozens of top-level researchers from Japan and abroad spend nearly one week together for intensive discussions seeking strategies for addressing future critical issues in biology. Past Conferences have promoted the formation of international researcher communities.

## Cultivation of Future Researchers

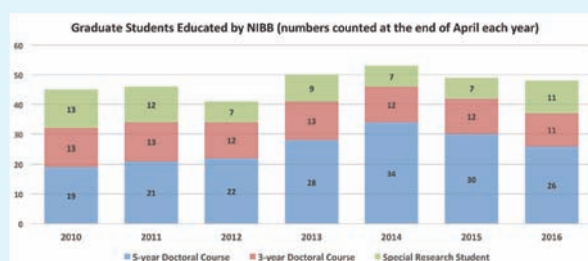
NIBB constitutes the Department of Basic Biology in the School of Life Science of the SOKENDAI (Graduate University for Advanced Studies). The department provides a five-year course for university graduates and a three-year doctoral course for graduate students with a master's degree.

Graduate students enrolled in other universities and institutions can apply to be special research students eligible to conduct research under the supervision of NIBB professors.

In both cases above, graduate students can receive financial support from NIBB based on the research assistant (RA) system from the beginning of the five-year course.

Due to the international collaboration with EMBL, graduate students are encouraged to attend PhD student symposia held at EMBL and provided an opportunity to give oral and poster presentations, at least once during their master's and doctoral program.

Students from Japan and abroad can also come to NIBB through our Internship Program. Internships give students an excellent way to build international connections while experiencing hands on research in a world class research institute (p. 98).



Graduate students educated by NIBB