

RESEARCH SUPPORT FACILITIES

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| <i>Large Spectrograph Laboratory</i> | |
| <i>Professor (Adjunct):</i> | <i>WATANABE, Masakatsu</i> |
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| <i>Technical Assistant:</i> | <i>ICHIKAWA, Chiaki</i> |
| <i>Tissue and Cell Culture Laboratory</i> | |
| <i>Research Associate:</i> | <i>HAMADA, Yoshio</i> |
| <i>Technical Assistant:</i> | <i>TAKESHITA, Miyako</i> |
| <i>Computer Laboratory</i> | |
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| <i>Technical Assistants:</i> | <i>MAKIHARA, Nobuko</i> <i>YAMAMOTO, Kumi</i> |
| <i>Plant Culture, Farm, Plant Cell Laboratory</i> | |
| <i>Technical Staff:</i> | <i>NANBA, Chieko</i> |
| <i>Technical Assistant:</i> | <i>SUZUKI, Keiko</i> |

1. The Large Spectrograph Laboratory

This laboratory provides, for cooperative use, the largest spectrograph in the world, the Okazaki Large Spectrograph (OLS), dedicated to action spectroscopical studies of various light-controlled biological processes. The spectrograph runs on a 30kW Xenon arc lamp and has a compound grating composed of 36 smaller individual gratings. It projects a spectrum of a wavelength range from 250nm (ultraviolet) to 1,000nm (infrared) onto its focal curve of 10m in length. The fluence rate (intensity) of the monochromatic light at each wavelength is more than twice as much as that of the corresponding monochromatic component of tropical sunlight at noon (Watanabe *et al.*, Photochem. Photobiol. 36, 491-498, 1982).



Figure 1. The Large Spectrograph

The NIBB Cooperative Research Program for the Use of the OLS supports about 20 projects every year conducted by visiting scientists including foreign scientists as well as those in the Institute.

Action spectroscopical studies for various regulatory and damaging actions of light on living organisms, biological molecules, and artificial organic molecules have been conducted (Watanabe, *In* "CRC Handbook of Organic Photochemistry and Photobiology, 2nd ed.". pp. 115-1~115-16, 2004).

An advanced irradiation system composed of CW lasers (364nm, 390-410nm, 440-460nm, 532nm, 655nm, 752nm) and uniform-fluence-rate irradiation optics interconnected by optical fibers was constructed in 2003. An advanced observation system for cellular and intracellular photobiological responses utilizing a two-photon microscope (FV300-Ix71-TP with a MaiTai laser) and a microbial photomovement analyzer (WinTrack2000/Ecotox) was also introduced.

2. Tissue and Cell Culture Laboratory

Various types of equipment for tissue and cell culture are provided. This laboratory is equipped with safety rooms which satisfy the P2/P3 physical containment level. This facility is routinely used for DNA recombination experiments.

3. Computer Laboratory

The Computer Laboratory provides computation resources and the means for electronic communication. Currently, the main system consists of three servers and two terminal workstations: biological information analysis server (SGI Origin 2000), database server (Sun Enterprise 450), file server (Sun Enterprise 220R), data visualization terminal and molecular simulation terminal (both are SGI Octanes). Some personal computers and color/monochrome printers are also available. On this system we provide various biological databases and data retrieval/analysis programs, and support large-scale data analysis and database construction for the institute members. At the end of this year, a new computer system with enhanced performance will be introduced as a replacement for the current system. The new system will be available for use at the beginning of next year.

The Computer Laboratory also provides network communication services within the institute. Most of the computers in each laboratory, as well as all of the above service machines, are connected to each other by a local area network (LAN) which is linked to the high performance multimedia backbone network of Okazaki National Research Institute (ORION). Many local services including sequence analysis service, file sharing service and printer service are provided through this LAN. We also maintain a public World Wide Web server that contains the NIBB home pages (<http://www.nibb.ac.jp/>).

4. Plant Culture Laboratory

This laboratory contains a large number of culture boxes and a limited number of rooms with environmental control for plant culture. In some of these facilities and rooms, experiments can be carried out at the P1 physical

containment level under extraordinary environments such as strong light intensity, low or high temperatures, etc.

5. Experimental Farm

This laboratory consists of two 20 m² glass-houses with precise temperature and humidity control, three green houses (each 6 m²) at the P1 physical containment level, a small farm, and two greenhouses (45 and 88 m²) with automatic sprinklers. The laboratory also includes a building with storage and work space.

6. Plant Cell Laboratory

This laboratory is equipped with autotrophic and heterotrophic culture devices and equipment for experimental cultures of plant and microbial cells. Facilities for preparation of plant cell cultures, including an aseptic room with clean benches, are also provided.

Publication List:

Original Papers

- Hasegawa, E. (2005). Comparison of the spectral sensitivity of juvenile red sea bream investigated by the physiological technique and by the behavioral technique. *Fisheries Science* 71, 79-85.
- Ohnishi, N., Allakhverdiev, I.S., Takahashi, S., Higashi, S., Watanabe, M., Nishiyama, Y., and Murata, N. (2005). The two mechanism of photodamage to photosystem II: Step one occurs at the oxygen-evolving complex and step two occurs at the photochemical reaction center. *Biochem.* 44, 8494-8499.
- Okajima, K., Yoshihara, S., Fukushima, Y., Geng, X., Katayama, M., Higashi, S., Watanabe, M., Sato, S., Tabata, S., Shibata, Y., Itho, S., and Ikeuchi, M. (2005). Biochemical and functional characterization of BLUF-type flavin-binding proteins of two species of cyanobacteria. *Japanese Biochemical Society* 137, 741-750.
- Nagai, Y., Nakamura, D., Ueno, H., Matsumoto, N., and Ohishi, F. (2005). Photodegradation mechanisms in poly (2,6-butylenenaphthalate-co-tetramethyleneglycol) (PBN-PTMG). II: Wavelength sensitivity of the photodegradation. *Polymer Degradation and Stability* 88, 256-260.