Chair Wood Biomass Science

2.2.15 Laboratory : Biomass Morphogenesis and Information

Member :	Professor	Sugiyama, Junji
	Associate Professor	Imai, Tomoya
	Assistant Professor	Baba, Kei'ichi
	Doctor's program	3
	Master's Program	6
	Post-Doctoral fellow	3
	Program-Specific Resea	1

A. Research Activities (2010.4-2011.3)

A-1. Main Subjects

a) Structure, Formation and Function of Plant Macromolecules

Biogenesis, structure and function of plant macromolecules, especially cellulose, are studied by using state of art of electron microscopy together with molecular biology. Purification of cellulose synthesizing activity and in vitro synthesis of cellulose with it are conducted for understanding the mechanism of cellulose biosynthesis. Structural anaysis was already started with electron microscopy, and accumulation of the data about regulartory subunit GxCesB is in progress.

b) Fine structure in biomass

Structure of wood cell walls is understood not enough for thinking its formation, degradation, mechanical properties, and utilization. We are intensely studying its microstructure from the view of utilization as resources, which will leads to efficient energy conversion from biomass and development of new materials.

c) Physiology of Growth in Forest Trees

Trees are distinguished from herbs or grasses by their longer life, larger size and slower maturity. Physiological mechanisms characterizing trees are studied by the methods on anatomy, histochemistry, cytochemistry, biochemistry and molecular biology. Now, we are targeting the response of xylem differentiating tissue against inclination stimulus and formation of tension wood.

d) Wood/Human Science Based on Wood Anatomy

Identification of wood used in cultural assets like sculptures and constructions is carried out with conventional anatomical analysis using light microscopy. As well, novel techniques for wood identificaton are in operation: (i) X-ray CT for visualizing anatomical features in small wood pieces, (ii) computational identification by image analysis and (iii) odorant analysis by portable mass-spectrometry. Multidisciplinary researches are driven with the xylarium database: wood conservation, wood decaying, and the relation ship between tree-rings and earth/solar activities.

A-2.Publications and presentations

a) Publications

Original Papers(including book-reviews)

- Mizuno S, Torizu R, Sugiyama J: Wood identification of wooden mask using a synchrotron X-ray micro- tomography. Journal of Archaeological Science 37; 2842-2845, 2010

- Mizuno S, Sugiyama J: Wood identification of Maruoka castle in Fukui prefecture. Journal of the Society of Architectural Historians of Japan 55; 63-71., 2010

- Clair, B., Alm?ras, T., Pilate, G., Jullien, D., Sugiyama, J., Riekel, C.: Maturation stress generation in poplar tension wood studied by synchrotron radiation microdiffraction.. Plant Physiol. 155; 562-570, 2010

- Harada, E., Hokura, A., Takada, S., Baba, K., Terada, Y., Nakai, I., Yazaki, K. : Characterization of cadmium accumulation in willow as a woody metal accumulator using synchrotron radiation-based X-ray microanalyses.. Plant and Cell Physiology 51; 848-853, 2010

- Hayashi, T., Kaida, R., Kaku, T., Baba, K: Loosening xyloglucan prevents tensile stress in tree stem bending but accelerates the enzymatic degradation of cellulose. Russian Journal of Plant Physiology 57; 316-320, 2010

- Irie, K., Kitagawa, K., Nagura, H., Imai, T., Shimomura, T., Fujiyoshi, Y.: Comparative study of the gating motif and C-type inactivation in prokaryotic voltage-gated sodium channels.. Journal of Biological Chemistry 285; 3685-3694, 2010

- Nagura, H., Irie, K., Imai, T., Shimomura, T., Hige, T., Fujiyoshi, Y. : Evidence for lateral mobility of voltage sensors in prokaryotic voltage-gated sodium channels.. Biochem.Biophys.Res.Commun. 399; 341-346, 2010

- Nge, T.T., Nogi, M., Yano, H., Sugiyama, J. : Microstructure and mechanical properties of bacterial cellulose/chitosan porous scaffold.. Cellulose 17; 349-363, 2010

- Wang, Y., Gril, J., Clair, B., Minato, K., Sugiyama, J. : Wood properties and chemical composition of the eccentric growth branch of Viburnum odoratissimum var. awabuki.". Trees - Structure and Function 24; 541-549, 2010

- Yahya, R., Sugiyama, J., Silsia, D., Gril, J. : Some anatomical features of an Acacia hybrid, A. mangium and A. auriculiformis grown in indonesia with regard to pulp yield and paper strength. J.Trop.For.Sci. 22; 343-351, 2010

- Park, Y.W., Baba, K., Furuta, Y., Kojiro, K., Yoshida, M., Hayashi, T.: Characterization of poplar overexpressing xylanese.. Indonesian Wood Res. J. 1; 50-55, 2010

- Mizuno S, Sugiyama J: Wood identification of tea room “Housyusya” in Houkoku shrine in Kyoto. Japanese Society for Studies of Chanoyu 18; 1-9, 2011

- Mizuno S, Sugiyama J: 重要文化財知恩院集會堂における建築用材の樹種識別調査. Journal of the Society of Architectural Historians of Japan 56; 124-136, 2011

- Mizuno S, Sugiyama J: Synchrotron X-ray microtomography - wood identification for national heritages-. Archaeology and Natural Science 63; 1-11, 2011

- Mizuno S, Sugiyama J: Wood identification of building components of the tea room Hasso-seki of Konchi-In temple designated as an important cultural property. Mokuzai Gakkaishi 57; 14-19, 2011

- Horikawa, Y., Imai, T., Takada R., Watanabe, T., Takabe, K., Kobayashi Y., Sugiyama, J.: Near-Infrared Chemometric Approach to Exhaustive Analysis of Rice Straw Pretreated for Bioethanol Conversion. Applied Biochemistry and Biotechnology 164; 194-203, 2011

- Shimomura, T., Irie, K., Nagura, H., Imai, T., Fujiyoshi, Y.: Arrangement and Mobility of the Voltage Sensor Domain in Prokaryotic Voltage-gated Sodium Channels. Journal of Biological Chemistry 286; 7409-7417, 2011

- Ueda, M., Makino, A., Imai, T., Sugiyama, J., Kimura, S.: Transformation of peptide nanotubes into a vesicle via fusion driven by stereo-complex formation.. Chemical communications 47; 3204-3206, 2011

- Nakamura, I., Horikawa, Y., Makino A., Sugiyama, J., Kimura, S.: Enzymatic polymerization catalyzed by immobilized endoglucanase on gold.. Biomacromolecules 12; 785-790, 2011

- Yamamoto, M., Saito, T., Isogai, A., Kurita, M., Kondo T., Taniguchi, T., Kaida, R., Baba, K., Hayashi, T.: Enlargement of individual cellulose microfibrils in transgenic poplars overexpressing xyloglucanase. . J. Wood Sci. 57; 71-75, 2011

- Ueda, M., Makino, A., Imai, T., Sugiyama, J., Kimura, S.: Rational design of peptide nanotubes for varying diameters and lengths. Journal of Peptide Science 17; 94-99, 2011

- Nakashima, K., Nishino, A., Horikawa, Y., Hirose, E., Sugiyama, J., Satoh, N.: The crystalline phase of cellulose changes
under developmental control in a marine chordate. Cellular and Molecular Life Sciences 68; 1623-1631, 2011

- Ueda, M., Makino, A., Imai, T., Sugiyama, J., Kimura, S.: Temperature triggered fusion of vesicles composed of right-handed and left-handed amphiphilic helical peptides. Langmuir 27; 4300-4304, 2011

- Ueda, M., Makino, A., Imai, T., Sugiyama, J., Kimura, S.: Tubulation onto peptide vesicle by phase-separation of a binary mixture of amphiphilic right-handed and left-handed helical peptides. Soft Matter 7; 4143-4146, 2011

b) Conference and seminar papers presented

- The 61th Annual meeting of the Japan Wood Research Society: 12 presentations
- The 17th Annual meeting of the Cellulose Society of Japan: 4 presentations
- Annual meeting of the Society of Eco-Engineering 2010: 2 presentation
- The 24th Annual meeting of Japanese Society for Biological Sciences in Space: 2 presentations
- The 54th United Symposium of the Space Sciences and Technologies: 2 presentations
- The 52nd Annual Meeting of the Japanese Society of Plant Physiologists: 2 presentation
- The 26th Space Utilization Symposium: 2 presentations
- The 24th Meeting of Cellulase Reaerches: 2 presentations
- The 27th Annual meeting of the Japan Society for Science Study on Cultural Properties: 1
- Annual Meeting of Plant Cell Wall Researchers Neowork in 2010: 1 presenattion
- The 62nd Annual Meeting of the Japan Society of Cell Biology: 1 presentaion
- The 59th Annual Meeting of the Japan Society of Polymer Science: 2 presentaion
- The 28th Symposium of the Japanese Association of Organic Geochemists: 1 presentations

A-3.Off-campus activities 1

Membership in academic societies

- Sugiyama Junji, D.Agric.Sci : Japan Wood Research Society (director, vise-chairman of education development committee, chairman of informatics committee), Cellulose Society Japan (director, secretary general, branch member, editorial board), Japanese Society of Microscopy (councilor, member of certifying examination of microsocpy, regional councilor)

- Imai, Tomoya, D.Agric.Sci : The Japanese Society of Microscopy (Committee member of Kansai-Branch), Japan Wood Research Society (a member of education development comitte, and research planning committe), The Cellulose Socieity of Japan (Committee member of Kansai-Branch), The 61st Annual Meeting of Japan Wood Research Society (a committee responsible for budget)

A-3.Off-campus activities 2

Research grants

1. Grants-in-aid for Scientific Research(KAKENHI)

- Scientific Research (B) : Sugiyama, Junji, Dr. Agric. Sci. : Identification of wooden cultural artifacts by novel analytical techniques

- Challenging Exploratory Research : Sugiyama, Junji, Dr. Agric. Sci. : Fundamental study toward functional analysis of cellulose biosynthesis

- Grant-in-Aid for Publication Scientific Research Results（Database) : Sugiyama, Junji, Dr. Agric. Sci. : Database for the Humanosphere in the field of Wood Science

- Scientific Research (C) : Takao , Itoh (Nara National Research Institute for Cultural Properties) : Construction of database on the microscopic features of Chinese wood

- Scientific Research (A) : Takahisa, Hayashi (Tokyo University of Agriculture) : Open-field test of transgenic poplars for industrial use

2.Other Research Grants

- NEDO: Accelerated Technology Development for Biofuel：Sugiyama, Junji, Dr. Agric. Sci.：Basic R&D on Enzymatic Saccharification of Cellulosic Biomass and Biofuel Production (Study Group of Material Structure)

A-4.International cooperation and overseas activities 1

Membership in academic societies

- Sugiyama, Junji, Dr. Agric. Sci.: Cellulose (Editorial Board), International Academy of Wood Science

A-4.International cooperation and overseas activities 2

Visiting Research Scholars

- Professor 3（China）
- Graduate School Students 1（China）
- Graduate School Students 1（Indonesia）

B.Educational Activities(2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

- Graduate level : Biomass Morphogenesis and Information I (Sugiyama),
Diagnostics and Control of the Humanosphere, Kyoto Sustainability Initiative (Sugiyama)

B-2.Off-campus teaching etc.

Part-time lecturer

- Sugiyama, Junji: GraduateSchool of The University of Tokyo, Biomass Chemistry II

Open lectures, etc.

- Imai, Tomoya: The 164th Symposium for Sustainable Humanosphere Science
"How to see the supermolecular structure in lignocellulosic material?"
by Prof. T. Umezawa (RISH, Kyoto University)
A speaker

- Imai, Tomoya: Public days in Kyoto Univeristy Uji-campus in 2010
by Working Committee for the public days
a member of the working committee

B-3.Overseas teaching 1

International students

- International students : Master 1 (China) Doctral 1 (China)