2.2.15 Laboratory : Biomass Morphogenesis and Information

Member :	Professor	Sugiyama, Junji, D. Agric.Sci
	Associate Professor	Imai Tomoya, D. Agric.Sci
	Assistant Professor	Baba, Kei'ichi, D. Agric.Sci
	KU Visiting Professor	Gril, Joseph, Ph D.
	Doctor's program	2
	Master's Program	6
	Post-Doctoral fellow	1
	Program-Specific Researcher	4

A. Research Activities (2009.4-2010.3)

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. Studies toward structural biology of cellulose synthase is in progress as well.

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

- K. Irie, K. Kitagawa, H. Nagura, T. Imai, T. Shimomura and Y. Fujiyoshi : Comparative study of the gating motif and C-type inactivation in prokaryotic voltage-gated sodium channels. J.Biol.Chem. 285; 3685-3694, 2010
- K. Baba, Y. W. Park, T. Kaku, R. Kaida, M. Takeuchi, M. Yoshida, Y. Hosoo, Y. Ojio, T. Okuyama, T. Taniguchi, Y. Ohmiya, T. Kondo, Z. Shani, O. Shoseyov, T. Awano, S. Serada, N. Norioka, S. Norioka and T. Hayashi : Xyloglucan for generating tensile stress to bend tree stem. Molecular Plant 2; 893-903, 2009
- Y. Horikawa, J. Sugiyama : Localization of crystalline allomorphs in cellulose microfibril. Biomacromolecules 10; 2235-2239, 2009
- R. Kaida, T. Kaku, K. Baba, S. Hartati, E. Sudarmonowati and T. Hayashi : Enhancement of saccharification by overexpression of poplar cellulase in sengon. Journal of Wood Science 1-6, 2009
- R. Kaida, T. Kaku, K. Baba, M. Oyadomari, T. Watanabe, S. Hartati, E. Sudarmonowati and T. Hayashi : Enzymatic saccharification and ethanol production of Acacia mangium and Paraserianthes falcataria wood, and Elaeis guineensis trunk. Journal of Wood Science 55; 381-386, 2009
- R. Kaida, T. Kaku, K. Baba, M. Oyadomari, T. Watanabe, K. Nishida, T. Kanaya, Z. Shani, O. Shoseyov and T. Hayashi : Loosening xyloglucan accelerates the enzymatic degradation of cellulose in wood. Molecular Plant 2; 904-909, 2009
- T. Kaku, S. Serada, K. Baba, F. Tanaka and T. Hayashi : Proteomic analysis of the G-layer in poplar tension wood. Journal of Wood Science 55; 250-257, 2009
- H. Miyamoto, C. Yamane, M. Mori, K. Okajima and J. Sugiyama : Cross-sectional distribution of crystalline and fibril orientations of typical regenerated cellulose fibers in relation to their fibrillation resistance. Text.Res.J. 79; 694-701, 2009

- Y. Wang, J. Gril and J. Sugiyama : Variation in xylem formation of Viburnum odoratissimum var. awabuki: growth strain and related anatomical features of branches exhibiting unusual eccentric growth. Tree Physiol. 29; 707-713, 2009
- Y. Wang, J. Gril C. Bruno, K. Minato and J. Sugiyama : Wood properties and chemical composition of the eccentric growth branch of Viburnum odoratissimum var. awabuki.. Trees - Struct. Func. 10; 2235-2239, 2009
- M. Yokoyama, J. Gril, M. Matsuo, H. Yano, J. Sugiyama, B. Clair, S. Kubodera, T. Mistutani, M. Sakamoto , H. Ozaki, M. Imamura, S. Kawai, Mechanical characteristics of aged Hinoki wood from Japanese historical buildings, C. R. Physique, 10, 601-611, 2009
- R. Tominaga-Wada, M. Iwata, J. Sugiyama, T. Kotake, T. Ishida, R. Yokoyama, K. Nishitani, K. Okada, Wada , The GLABRA2 homeodomain protein directly regulates CESA5 and XTH17 gene expression in Arabidopsis roots, The Plant Jounal, 60, 564-574, 2009

Reports

- J. Sugiyama, H. Sorimachi, Wood Identification of Hyakuman-To retored at Wakayama University, Bull. Inst. Kishu, Wakayama Univ., 30, 40-42, 2009
- J. Sugiyama, H. Sorimachi, Wood Identification of restored cultural properties (wooden articles), Bull Nara Nat. Museum, 11, 67-76, 2009

b) Conference and seminar papers presented

- The 60th Annual meeting of the Japan Wood Research Society: 16 presentations
- The 16th Annual meeting of the Cellulose Society of Japan: 3 presentations
- The 26th Annual meeting of the Japan Society for Science Study on Cultural Properties: 2 presentations
- Annual meeting of the Society of Eco-Engineering 2009: 2 presentation
- The 82nd Annual Meeting of the Japanese Biochemical Society: 1 presentation
- The 48th Annual Meeting of the Biophysical Society of Japan: 1 presentation
- The 46th Japanese Peptide Symposium: 1 presentation
- The 51st Annual Meeting of the Japanese Society of Plant Physiologists: 1 presentation
- The1st Inernational Symposium of Indonesia Wood Research Society: 2 presentations
- XXXVI th International Union of Physiological Sciences: 1 presentation

- INTERNATIONAL ACADEMY OF WOOD SCIENCE ANNUAL PLENARY MEETING AND CONFERENCE 2009: 2 presentation
- The 9th International Conference of the East and Southeast Asia Federation of Soil Science Societies (1)
- The 6th Plant Biomechanics Conference: 1 presentation
- The meeting place of Korean Society of Wood Science and Technology : 1 presentation
- The 39th Symposium of Forest Tree Breeding: 1 presentation
- The 26th Space Utilization Symposium: 1presentation

A-3.Off-campus activities

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)

Research grants

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

- Scientific Research (A) : Sugiyama, Junji, Dr. Agric. Sci. : In vitro synthesis of cell wall polysaccharides and their characterization

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)
- NEDO: Medium- and Long-Term Development Technology : Fukushima, Kazuhiko, Dr. Agric. Sci. : Development of Highly Efficient Saccharification of Unused Woody Biomass (Bark).
- NEDO: Funding for the practical application of the university outcomes : Yano, Hiroyuki, Dr. Agric. Sci. : Development of the technology for the production of modified bio-nanofibers and their utilization
- Industrial-University Comprehensive Alliance : Yano, Hiroyuki, Dr. Agric. Sci. : Grant for the production of organic electronics devices

- NEDO: Medium- and Long-Term Development Technology：Hayashi, Takahisa：Converting Fast-Growing Tropical Trees into Feedstock for Cellulosic Ethanol

A-4.International cooperation and overseas activities

Membership in academic societies

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

Visiting Research Scholars

- Professor　1（France）
- Research Fellow　2（France）
- Professor　3（China）
- Graduate School Students　1（China）

B.Educational Activities(2009.4-2010.3)

B-1.On-campus teaching

a) Courses given

- Graduate level：　Biomass Morphogenesis and Information II (Imai), 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: Symposium of Kansai-Branch of the Japanese Society of Micorscopy, Speaker

Open Lecture for Foreset Science of Kyoto University 2009, by Reserahc Instiotute for Sustaionable Humanosphere & Graduate School of Agricultrue, Kyoto University, Committee member

- Sugiiyama, Junji: Memorial Symposium of cooperation between Tokyo University of the Arts and RIKEN, intersection of the sciences and the arts, Coorganized by　Tokyo University of the Arts and RIKEN, Panelist

B-3.Overseas teaching

International students

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