2.2 DIVISION OF FOREST AND BIOMATERIALS SCIENCE

1. Outline of the Division

Forests play a very important role in the environment of the earth and provide wood resources that are continuously renewable in contrast with fossil resources such as petroleum and coal. Research and educational activities of this division cover not only preservation, cultivation, and continuous production of forest resources, but also utilization of forest products for our life and culture with the aim of coexistence of forest and human beings

This division consists of 20 laboratories, including 2 laboratories of Field Science Education and Research Center and 5 laboratories of Research Institute for Sustainable Humanosphere (renamed Wood Research Institute reconstructed in April, 2005), and their activities are international and interdisciplinary

2. Number of students

There are 83 students (41 freshmen and 52 2nd year students) in the Master's program and 60 students in the doctor's program of this division

3. Divisions and laboratories offering lectures

Division of Forest and Biomaterials Science: Laboratories of Forest Resources and Society, Forest Environment Planning, Tropical Forest Resources and Environments, Forest Utilization, Forest Biology, Landscape Architecture, Erosion Control, Biomaterials Design, Wood Processing, Biofibrous Materials, Tree Cell Biology, Composite Materials Chemistry, and Chemistry of Biomaterials

Field Science Education and Research Center:

Laboratories of Forest Information, and Silviculture

Research Institute for Sustainable Humanosphere:

Laboratories of Active Bio-based Materials, Sustainable Materials, Structural Function, Innovative Humano-habitability, Biomass Morphologenesis and Information

4. Event in 2007

The orientation course for freshmen on April 6 at the Graduate School of Agriculture in Kitashirakawa Campus offered a curriculum-guidance. On May 12, general profiles in our division and recent research activities in the belonging 20 laboratories were introduced at Kamigamo Experimental Station. After the introduction, a short Station-tour and subsequent welcome party were carried out.

Chair of Forest Resource Management

2.2.1 Laboratory of Forest Resources and Society

Staff Professor : Iwai, Yoshiya, Dr. Agric. Sci. Students and research fellows Doctor's program : (3)

A. Reseach Activities (2007.4-2008.3)

A-1. Main subjects

a) World forestry and global forest resources management

The topics include forest, forestry and forest industry in the world, and correlation between developed and developing countries through wood trade.

b) Production and uses of forest products

The topics include wood, paper and bamboo from the view point of historical development.

A-2. Publications and presentations

a) Publications

Books

Iwai,Y.: Economic history of bamboo, changes of bamboo industry in western part of Japan, pp.1-188, shibunkaku-shuppan, Kyoto (in print, in Japanese)

Original papers

Murakami, Y., Endo,Y,: Introduction of sizing technology to "washi paper" in middle period of Meiji Era. Journal of Forest Economics,Vol.54 No.1; 70-78, 2008(in Japanese)

b) Conference and papers presented

The 2008 Kansai branch meeting of Japanese Forest Economic Society (1)

The 118th meeting of Japanese Forest Society (1)

The 119th meeting of Japanese Forest Society (1)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

Undergraduate Level: World Forest Resources (Iwai)

Graduate level: Seminar in Forest Resources and Society (Iwai), Laboratory Course in Forest Resources and Society (Iwai)

C. Other remarks

Iwai, Y.: Commiteeman of Public Works Evaluation in Shiga Prefecture.

2.2.2 Laboratory of Tropical Forest Resources and Environments

Staff Professor : Ohta, Seiichi, D. Agric. Sci. Ass. Professor : Kanzaki, Mamoru, D. Sci. Assistant Professor : Kaneko, Takayuki Students and research fellows Doctor's program : (10)

> Master's program : (10) Undergraduate : (3)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

a) Elements cycling and sustainable management of industrial tree plantations in the tropics

To evaluate and predict the sustainability of industrial plantation rapidly expanding in the devastated land in the tropics, and to present the measures to solve the related problems, the researches have been initiated on budget of nutrient elements and GHEG in soil-plant systems of industrial tree plantation of leguminous species and also on the mechanism of their fluctuation with forestry practices. The soil management for the reduced emission of GHEG is also studied.

b) Soil ecology and forest distribution in the area of tropical seasonal forests

To elucidate the factors which controlling the distribution of evergreen forest and deciduous forest in tropical seasonal region, the soil physical characteristics as mechanical composition, pore distribution and hydraulic conductivity, and structure, species composition and leaf area index of forests for major soil-forest combinations are studied in Northeastern Thailand.

c) Carbon sequestration function of tropical seasonal forests and its fluctuation

For the quantitative evaluation of the carbon sequestration function of forest, members of the laboratory are studying at a tropical seasonal evergreen forest of Thailand and a mangrove forest of Myanmar with special reference to coarse woody debris (CWD) and long-term forest dynamics.

d) Maintenance and regeneration mechanism of tropical forests

For elucidating the maintenance and natural regeneration mechanisms of tropical forests, dynamics of seedlings and saplings and insect-plant interactions of several forest types are being studied. Furthermore, various disturbances to forests, such as fire and slash-and-burn activity of human beings in the areas of rainforest, seasonal forests and montane forests in Asian tropics are also being studied.

A-2. Publications and presentations

a) Publications

Original papers

- Toda T., Takeda H., Tokuchi N., Ohta S..., Wacharinat C. and Kaitpraneet: Effect of forest fire on the nitrogen cycle in a dry dipterocarp forest, Thailand, Tropics, 16 (1), 41-45, 2007
- Imaya A., Inagaki Y., Tanaka N., and Ohta S.: Free oxides and short-range ordered mineral properties of brown forest soils developed from different parent materials in the submontane zone of Kanto and Chubu districts, Japan. Soil Sci. Plant Nutr., 53, 621-633, 2007

- Toriyama J, Ohta S., Araki M, Kanzaki M, Khorn S, Pith P, Lim S, Pol S.: Comparison of soil physical properties in evergreen and deciduous forests in central Cambodia. J. For. Res., 13, 15-24, 2007
- Toriyama J, Ohta S., Araki M, Ito E., Kanzaki M, Khorn S, Pith P, Lim S, Pol S: Acrisols and adjacent soils under four different forest types in central Cambodia. Pedologist, 51, 35-49, 2007
- Sasaki A., Takeda S., Kanzaki M., Ohta S., Preechapanya P.: Population dynamics and land-use changes in a Miang (Chewing Tea) village, Northern Thailand. Tropics, 16, 75-85, 2007
- Naito Y., Kanzaki M., Numata S., Obayashi K., Konuma A., Nishimura S., Ohta S., Tsumura Y., Okuda T., Lee S. L. and Muhammad N,: Size-related flowering and fecundity in the tropical canopy tree species, Shorea accuminata (Dipterocarpaceae) during two consecutive general flowerings. J. Plant Res., 121, 33-42, 2008
- Yamashita, N., Ohta, S., Hardjono, A.: Soil changes induced by Acacia mangium plantation establishment: Comparison with secondary forest and Imperata cylindrica grassland soils in South Sumatra, Indonesia. Forest Ecology and Management, 254, 362-370, 2008
- Tatsuhiro OHKUBO, Masato TANI, Hideyuki NOGUCHI, Takuo YAMAKURA, Akira ITOH, Mamoru KANZAKI, Hua Seng LEE, Sylvester TAN, Peter S. ASHTON adn Kazuhiko OGINO.: Spatial and topographic patterns of canopy gap formation in a mixed dipterocarp forest in Sarawak, Malaysia. Tropics, 16(2), 151-163, 2007
- Noguchi H, Itoh A, Mizuno T, Sri-ngernyuang K, Kanzaki M, Teejuntuk S, Sungpalee W, Hara M, Ohkubo T, Sahunalu P, Dhanmanonda P, Yamakura T.: Habitat divergence in sympatric Fagaceae tree species of a tropical montane forest in northern Thailand. Journal of Tropical Ecology 23:549-558, 2007
- Maesako Y, Nanami S., Kanzaki M.: Spatial distribution of two invasive alien species, Podocarpus nagi and Sapium sebiferum, spreading in a warm-temperate evergreen forest of the Kasugayama Forest Reserve, Japan. Vegetation Science 24:103-112, 2007
- Hla Maung Thein, Kanzaki M, Fukushima M, Yazar Minn.: Structure and Composition of a Teak-bearing Forest under the Myanmar Selection System: Impacts of Logging and Bamboo Flowering. Southeast Asian Studies 45(3):303-316, 2007
- Fukushima M, Kanzaki M, Hla Maung Thein, Yazar Minn.: Recovery Process of Fallow Vegetation in the Traditional Karen Swidden Cultivation System in the Bago Mountain Range, Myanmar. Southeast Asian Studies 45(3):317-333, 2007
- b) Conference and seminar papers presented
- The 118th Ann. Meeting of Japanese Forest Society (14)
- The 17th Ann. Meeting of Japanese Society of Tropical Ecology (3)

The 54th Ann. Meeting of Ecological Society of Japan (1)

The 119th Ann. Meeting of Japanese Forest Society (11)

- 3rd International Conference on Mechanisms of Organic Matter Stabilisation and Destabilisation in Soils and Sediments (1)
- The Fifth Conference of the Pacific Rim Termite Research Group Bali, Indonesia (1)
- Workshop on Synthetic Evaluation of the Effect of Acidic Load on Material Flows in East Asian Catchments Areas (1)

A-3. Off-campus activities

Membership in academic societies (roles)

- Ohta, S.: The Japanese Forestry Society (Council member), Japanese Society of Forest Environment (Council member), Editorial board of The Pedorogist (Editor)
- Kanzaki, M.: The Japanese Association of Tropical Ecology (Council member, Secretary), The Society of Vegetation Science (Editor), Kansai Organization of Nature Conservation (Council member)

Research grants

- Ohta S.: JSPS research grant: Kiban-kenkyu A-2; Evaluation of the tropical fast growing species plantation as N2O emission source and mitigation options. (Rep. Ohta, Kaneko,), Kiban-kenkyu A; Field examination of the performance of genetic modified poplar for the industrial plantation (Ohta, Rep. Hayashi T,), Kiban-kenkyu B -2; Elucidation of the mechanism of the changes in species composition and the prediction of Carbon sink function of tropical forests under the effect of fire. (Ohta, Kanzaki. Rep. Y. Kiyono), Kiban-kenkyu A; Function in carbon, nutrients and water cycling within seasonally dry tropical forests. (Ohta, Kanzaki, Rep. A. Ishida)
- Kanzaki M.: JSPS research grant: Kiban-kenkyu B -2; Elucidation of the mechanism of the changes in species composition and the prediction of Carbon sink function of tropical forests under the effect of fire. (Ohta, Kanzaki. Rep. Y. Kiyono), Kibankenkyu-A; Ecological study of gregarious flowering of Melocannna baccifera in Mizoram, India. (Kanzaki. Rep. S. Shibata), Kiban-kenkyu A; Function in carbon, nutrients and water cycling within seasonally dry tropical forests. (Ohta, Kanzaki, Rep. A. Ishida), Kiban-kenkyu B-2; Geographic changes of multiscale distribution pattern of tree species of Fagaceae in Asian tropical montane forest. (Kanzaki, Rep. T. Ohkubo), Kiban-kenkyu C; Impact of deer and alien species on the dynamics of evergreen oak forest and biodiversity conservation. (Kanzaki, Rep. Y. Maesako).
- Kaneko T.: JSPS research grant: Kiban-kenkyu A-2; Evaluation of the tropical fast growing species plantation as N2O emission source and mitigation options. (Rep. Ohta, Kaneko,)
- Fukushima M.: Grant for Research Fellow DC1; Forest utilization pattern of Karen people under different forest management policies (M. Fukushima), Grant for Research Fellow
- Sugimoto M.: Grant for Research Fellow DC2; Asynchronism of Nitrogen budget and it's effects on soil elements dynamics in fast-growing tree plantations of Acacia mangium in the tropics (M. Sugimoto)

A-4. International cooperation and overseas activities

International joint researches, overseas research surveys

- Ohta, S.: Study on clarifying the soil acidification under leguminous fast-growing tree plantation in humid tropic (Indonesia), Survey for the Project of technical development for promoting CDM tree plantation (Indonesia), Carbon, nutrients and water cycling within seasonally dry tropical forests (Thailand)
- Kanzaki, M.: Carbon, nutrients and water cycling within seasonally dry tropical forests (Thailand), Stuty of Elucidation of the mechanism of the changes in species composition and the prediction of Carbon sink function of tropical forests under the effect of fire (Indonesia), Study of bamboo flowering (India), Biomass growth and soil carbon of

mangrove plantation in Myanmar (Myanmar)

Kaneko, T.: Study on clarifying the soil acidification under leguminous fast-growing tree plantation in humid tropic (Indonesia)

Scholars from abroad

Invited foreign scholar 1 (Thailand)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

- a) Courses given
- Undergraduate level: Forest Science I (Ohta, Kanzaki), Tropical Forest Environment (Ohta), Tropical Forest Resources (Kanzaki), Practice in Environmental Science (Ohta, Kanzaki), Laboratory Course in Biological and Environmental Science I (Kanzaki, Kaneko), Laboratory Course in Forest and Biomaterials Biology (Kanzak, Kaneko), Laboratory Course in Ecology (Kanzaki, Kaneko), Practice in University Forest I (Kanzaki, Kaneko). Practice in University Forest III (Kanzaki). Environmental Studies A (Kanzaki)
- Graduate level: Tropical Forest Environment (Ohta), Seminar in Tropical Forest Resources and Environments (Ohta, Kanzaki), Practice in Tropical Forest Environments (Ohta, Kanzaki), Scientific Writing and presentation in English (Kanzaki)

B-2. Off-campus teaching, etc.

Part-time Lectures

Kanzaki, M.: JICA Training Course: Conservation and Sustainable Management of Mangrove Ecosystem (Lecturer)

Open Lectures

Kanzaki, M.: NPO Senior Nature University: Global Environmental Ecosystem Science (Lecturer)

B-3. Overseas teaching

Students and research fellows from abroad

Master Course Student 1 (Myanmar)

C. Other remarks

Ohta, S.: UFJ Research Institute, the issues of forest carbon sink (Working group member); Japanese Center for Environment and Health, Acid Deposition and Oxidants Research Center, Soil and vegetation monitoring (Analyzing group member), Interior data verification group (Committee member), Working group for soil and vegetation (Committee member), Supporting group for soil and vegetation task force (Committee member), Group for methodological development of catchment analysis (Committee member); JIFPRO, Project of technical development for promotion of CDM tree plantation (Committee member); Ministry of Environment, Project of counter-measure for acid deposition (Committee member); Japanese Center for Overseas Plantation Promotion, Project of environmental impacts of artificial forest in developing countries (Committee member); Japan Forestry Technology Association, Project of system development for identification of carbon sink forests (Committee member); Forestry Agency, Monitoring of acid deposition and forest decline (Committee member); Japan Society for the Promotion of Science, funding for science research (Technical committee member)

Kanzaki, M.: Environmental Committee of Higashiomi City (Committee member)

2.2.3 Laboratory of Forest Environment Planning

Staff Professor : Ohta, Seiichi, Dr. Agric. Sci.

Associate Professor: Matsushita, Koji, Dr. Agric. Sci.

Students and research fellows

Master's program : (1) Undergraduate : (6)

A. Reseach Activities (2007.4-2008.3)

A-1. Main subjects

a) Forest planning system

Social demands for forest resources are multiple and changing. The most recent change is the increase of forest management problems related to global warming. To solve these current problems, we are conducting research to change the forest planning system and forest survey methods to include a broader range of public benefits.

b) Laws relating to forest management

The development of legal systems is necessary for forest management because the forest resources are connected to various public benefits. In our laboratory, the following laws relating to the forest are being examined: Forest Law, Basic Forest and Forestry Law, National Forest Management Law, Law to Promote the Modernization of the Rights for the Common Forest.

c) Sustainable forest tourism

The national forest has a protective forest system. The area of protective forest and the surroundings also have importance from the point of tourism. Protection forest for scenic beauty and recreational use are contributing to tourism. We conduct research on how to develop sustainable forest tourism.

A-2. Publications and presentations

a) Publications

Reports

- Matsushita, K.: Forest owners' association and ecotourism. Proceedings of Common Forest Society of Middle Japan 28; 44-46, 2008
- Taguchi, K., Matsushita, K. and Uno, H.: Old documents on forestry and forest products in Ohara, Kyoto, Japan (1). The Natural Resource Economics Review, Kyoto University 13; 112-124, 2008

A-3. Off-campus activities

Membership in academic societies (roles)

Matsushita, K.: Japanese Forest Economic Society (Awords Committee), Kansai Branch of the Japanese Forest Society (Editor), Common Forest Society of Middle Japan (Editor, Executive Committee of 28th Annual Meeting)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

Undergraduate Level: Exercises in Information Processing Basics (Matsushita), Forest and Biomaterial Science IV (Matsushita), Laboratory Course in Forest and Biomaterials Science IV (Matsushita), Laboratory Course in Applied Forest and Biomaterial Science (Matsushita), Forest Planning (Matsushita), Forest Law (Matsushita), Reading of Foreign Lieterature II (Matsushita), Seminar in Forest and Biomaterial Science (Matsushita)

Graduate level: Forest Management (Matsushita)

- b) Part-time Lectures
- Matsushita, K.: Faculty of Agriculture, Kyoto Prefectural University (Forest Policy I, Forest Policy II)

C. Other remarks

Matsushita, K.: Member of the management board of Shiga Prefectural Biwako Afforestation Corporation; Policy consultant of Nara Prefecture on the promotion of the effective utilization of common forests; Member of the advisory body of Kyoto Prefectural Forestry Workers Support Center; Member of the exploratory committee on Kyoto Prefectural Afforestation Corporation

Chair of Forest and Forestry Production

2.2.4 Laboratory of Forest Utilization

Staff Professor : Osawa, Akira, Ph.D. Associate Professor: Okada, Naoki, Dr. Agric. Sci. Instructor : Hasegawa, Hisashi, Dr. Agric. Sci. Students and research fellows

> Doctor's program : (5) Master's program : (5) Undergraduate : (3)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

a) Stand development and carbon dynamics of boreal forests

Stand development and carbon accumulation and dynamics after large-scale disturbances are studied in boreal forest ecosystems, particularly of high-latitude coniferous forests in the northern hemisphere. Chronosequence stands have been selected, their stand structures measured, and carbon dynamics patterns estimated by the ecological summation method in Gmelin larch forests of central Siberia in the continuous permafrost zone, and jack pine forests of northwestern Canada. Sum of fine-root ingrowth and mortality was estimated as 409, 454, and 203 gC/m²/year for the young, medium age, and old jack pine forests, respectively, indicating that 85%, 86%, and 74%, respectively, of NPP of these forest ecosystems goes to the fine-root compartment. Compared to published literature, these proportions are unusually large for a forest ecosystem. Generality of this estimate needs to be examined by further analyses.

b) Growth of tropical trees

Wood anatomical methods for detecting growth rings were applied to Dipterocarpaceae species in seasonally dry forests in Thailand, and crossconfirmed with the method of carbon isotope analysis. Vessel traits (mean lumen diameter, proportion of lumen area and vessel number per cross sectional area) showed cyclic changes along radius, indicating that the traits are under the influence of the growing environment. Mean lumen diameter and proportion of lumen area showed negative correlations with the carbon isotope ratio of xylem, whereas vessel density showed a positive one. The results indicated that the difference of soil moisture availability between the wet and dry seasons causes the variation of both carbon isotope ratio and vessel traits.

c) Structure and function of broad-leaved trees

Water relations and wood anatomy of five broad-leaved tree species growing in different soils were investigated to evaluate the effect of soil nutrient content on physiology and wood formation. Trees growing under a poor nutrient condition tended to form narrower vessels and to have thicker leaves than those under a better soil condition. However, the response was different species by species.

Resource allocation in current year shoot was compared based on Huber value (cross

sectional area of a shoot/ total leaf area) between ring-porous and diffuse -porous species. The former had lower HVs than the latter, indicating that ring-porous species can allocate more resources to the photosynthetic organ (leaves) than to the supporting organ (xylem). The reasons were attributable to higher mechanical strength of xylem and more efficient water conductivity of shoots in ring-porous species than those in diffuse-porous species.

d) Developing models of forest harvesting

We are required to study not only environmental sustainability but also economic sustainability for forest resource utilization. Then, we tried to develop a precise forest harvesting models using system dynamics based on observation of actual harvesting operations. We clarified that consideration of dbh distribution of trees to be felled is effective in the precise evaluation of productivity and production costs in applying system dynamics simulation to forest harvesting. Moreover, the addition of processing-time variations is also effective. The new model can estimate the differences in productivity and production costs involved in variations of the thinning method, such as low or crown thinning. Another advantage of using a model that considers diameter distribution and variations in processing time is that it can be applied to the evaluation of productivity and production costs in future harvesting through combination with a forest growth model. This model can therefore be used for long-term evaluation of forest harvesting including thinning methods.

e) Studies on precision forestry for sustainable use of forest resources

Site-adapted forest management with precision forestry technologies is essential for highly sustainable utilization of diverse forest functions. Therefore, (1) monitoring forest resources by using remote-sensing data, (2) GPS performance under tree canopies, (3) development of silvicultural process for extensive forestry with early intensive thinning, and (4) relationship between construction costs of forest roads and terrain, were discussed.

A-2. Publications and presentations

a) Publications

Original papers

Kajimoto, T., A. Osawa, Y. Matsuura, A.P. Abaimov, O.A. Zyryanova, K. Kondo, N. Tokuchi, and M. Hirobe: Individual-based measurement and analysis of root system development: case studies for Larix gmelinii trees growing on the permafrost region in Siberia. Journal of Forest Research 12; 103-112, 2007

Reports

- Okada, N.: Ecological wood anatomy of tropical trees. Report of the Grant-in-Aid for Scientific Research of the Ministry of Education, Science, Culture and Sport, Japan (No. 15255015)
- Hasegawa, H.: Developping system dynamics models of forest harvesting with consideration of tree size. Trans. J. For. Soc. 119, 2008 (in Japanese)
- Otsuka, K. and Hasegawa, H.: Caracteristics of seedlings of Japanese Cedar and Hinoki Cypress. Trans. J. For. Soc. 119, 2008 (in Japanese)
- Forest Management Project in Hyogo Prefecture (Hasegawa, Otsuka, Sugimoto, and Beppu): A handbook for constructing durable forest roads. 2008 (in Japanese)
- Forest Management Project in Hyogo Prefecture (Hasegawa, Otsuka, Sugimoto, and Beppu): Towards low-cost wood harvesting system in Hyogo Prefecture. 2008 (in Japanese)
- Osawa, A., T. Kajimoto, Y. Matsuura, A.P. Abaimov, O.A. Zyryanova, N. Tokuchi, M. Hirobe, K.

Kondo, Y. Nakai, H. Daimaru, A.S. Prokushkin, A.V. Volokitina, and M.A. Sofronov: Age sequence of stand structure, carbon accumulation and allocation, and net primary production in permafrost larch ecosystem in Siberia: current knowledge and future study. Proc. 7th International Conf. on Global Change: Connection to the Arctic; 208-211, 2007

- Tokuchi, N., M. Hirobe, K. Kondo, S. Hobara, E. Mizumachi, Y. Matsuura, T. Kajimoto, A.P. Abaimov, O.A. Zyryanova, and A. Osawa: Nitrogen cycling in larch forests on permafrost in central Siberia. Proc. 7th International Conf. on Global Change: Connection to the Arctic; 213-216, 2007
- Matsuura, Y., T. Kajimoto, Y. Nakai, A. Osawa, T. Morishita, O.A. Zyryanova, and A.P. Abaimov: Carbon budget in a larch (Larix gmelinii) ecosystem of continuous permafrost region in central Siberia. Proc. 7th International Conf. on Global Change: Connection to the Arctic; 258-261, 2007
- b) Conference and Seminar papers presented
- Third Conference of East Asian Federation of Ecological Societies (1 presentation)

The 22th Meet. Jpn. Assoc. Hist. Bot. (1 presentation)

The 54th Ann. Meet. Eco. Soc. Jpn. (1 presentation)

The 17th Ann. Meet. Jpn. Soc. Trop. Eco. (2 presentation)

The 119th Ann. Meet. Jpn. For. Soc. (2 presentation)

The 14th Ann. Meet. Jpn. For. Eng. Soc (1 presentation)

A-3. Off-campus activities

Membership in academic society (roles)

Hasegawa, H.: Society of Japan Forest Engineering (director), Society of Forest Spatial Utilization (executive), Society of Forest Production (executive)

Research grant

- Monbu-Kagakusho Research Grant: Scientific Research (A) (Overseas) Phosphorous limitation in the tropical forest in Borneo: bottom up effect and adaptation of plants (Okada), Scientific Research (A) (Overseas) Ecological researche on large-scale bamboo flowering in Mizoram, India. (Hasegawa), Monbu-Kagakusho Research Grant: Scientific Research (B) (Overseas) Inter-relationships between forest stand structure and nitrogen dynamics in Siberian taiga (Osawa PI)
- Others: Sumitomo Fundation Environmental Research Grant, Forest fire and vegetation changes in the tropical seasonal forests in Thailand (Okada PI), Ministry of Environment Global Environmental Research Fund (B-053) Carbon accumulation and sequestration in permafrost forest ecosystems (Osawa)

A-4. International cooperation and overseas activities

International meetings (roles)

Hasegawa, H.: IUFRO All-D3-Conference (Organizing Committee)

International joint researches and overseas research survey

- Osawa, A.: Inter-relationships between stand development and patterns of nitrogen dynamics in Siberian taiga (Russia),
- Osawa, A.: Carbon accumulation and carbon sequesteration in permafrost forest ecosystems (Russia)

Osawa, A.: Carbon budget of Canadian boreal forests (Canada),

Hasegawa, H.: Ecological research on the large-scale bamboo flowering in Mizoram, India (India)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

- a) Course given
- Undergraduate level: Measuring tropical forests (Okada), Social and environmental changes under sustainable development in Monsoon Asia(Okada), Basic Science for Forest and Biomaterials IV (Osawa), Forest Utilization (Osawa), Tree Physiology (Okada), Mushroom Science (Okada), Reading of Foreign Literature I (Osawa), Reading of Foreign Literature II (Osawa), Seminar in Forest Utilization (Osawa, Okada, Hasegawa), Introduction to Research (Osawa, Okada, Hasegawa), Comprehensive Practice in Forest (Okada, Hasegawa), Practice for Forest Utilization (Osawa, Okada, Hasegawa), Laboratory Course in Forestry and Biomaterial Science IV (Okada, Hasegawa),
- Graduate level: Scientific writing and presentation in English (Okada), Seminar in Forest Utilization (Osawa, Okada, Hasegawa), Laboratory course in Forest Utilization (Osawa, Okada, Hasegawa)

B-2. Off-campus teaching, etc.

Open Lecture

Hasegawa, H.: Training Lectures for Foresters in Hyogo (Lecturer), Technical Meeting for Thninning in Tokushima (Lecturer), Tecnician Training for University Forests in Japan (Lecturer)

C. Other remarks

- Osawa, A.: Preparatory committee on Arctic research (Member), Committee on Arctic research (Member)
- Hasegawa, H.: Preparatory Committee of Forest Database in North Okayama (Chairman), Forest Management Project Team in Hyogo, Low Cost Forestry Project Team in Wakayama

2.2.5 Laboratory of Forest Biology

 Staff
 Professor
 : Isagi, Yuji, Ph. D.

 Lecturer
 : Takayanagi, Atsushi, Dr. Agric. Sci

 Assistant Professor : Yamasaki, Michimasa, Dr. Agric. Sci

 Students and research fellows

 Doctor's program : (4)

 Master's program : (6)

 Undergraduate : (4)

 Research student : (1)

 JSPS Research fellow : (1)

 COE Research fellow : (1)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

a) Regeneration and genetic structure of tree populations

Pollination is one of the most important processes for the reproduction of plants, and it directly influences reproduction success, fitness and genetic structure of plant population. We develoed a novel method that conducts genotyping of a single pollen grain, and the pollination efficiencies of insects that visited the flowers of *Magnolia obovata* (Magnoliaceae) were evaluated. Most of the pollen adhering to bumblebees was self-pollen suggesting that visitation by bumblebees may cause geitonogamous pollen flow and negatively affect the reproduction of *M. obovata*. In contrast, flower beetles transported large amounts of genetically diverse outcross pollen. Direct genetic analysis of pollen grains will advance our understanding of plant mating systems and may shed light on the mutualism and coevolution of plants and flower visitors.

b) Biological conservation of organisms of forests

In order to conserve biological diversity of forest, fine genetic markers were developed for a variety of plant species. Analyses of genetic structure and genetic diversity for endangered plant species were conducted. Analysis of genetoc diversity was also conducted for an endangered mammal species, Banteng, in Australia, and its conservation scheme was proposed.

c) Forest damage by big mammals

In order to know the mechanism of black bear bark stripping damage, we investigated the nutritional traits of inner-bark of *Cryptomeria japonica*, damages in natural forests. DNA analysis of hairs sticking on scars can identify black bear. Shoot breakage by Sika deer was happened mostly from April to July and strong relationships with phenology of plants. Vegetation change processes were compared between different browsing pressure at herbaceous community dominated by low-preference species. Biomass under several artificial *Cryptomeria japonica* stands were estimated.

d) Mass mortality of oak trees

The ambrosia beetle, *Platypus quercivorus*, causes mass mortality of oak trees by transporting pathogenic fungi from trees to trees. Studies on the number of flying male beetle and the number of beetle holes on *Quercus crispula* of various size revealed positive effects of tree size on the probability of the beetle flying to trees and the probability of the beetle boring holes on

trees. Previous infection history of trees had a significant negative effect on the probability of the beetle boring holes on trees. These results suggest that *P. quercivorus* disregards thinner trees, and flies away from trees with previous infection history after landing on trees.

A-2. Publications and presentations

a) Publications

Original papers

- Isagi, Y., D. Saito, H. Kawaguchi, R. Tateno and S. Watanabe: Effective pollen dispersal is enhanced by the genetic structure of an *Aesculus turbinata* population. Journal of Ecology 95; 983-990, 2007
- Shimatani, K., M. Kimura, K. Kitamura, Y. Suyama, Y. Isagi and H. Sugita: Determining the location of a deceased mother tree and estimating forest regeneration parameters using microsatellites and spatial genetic models. Population Ecology 49; 317-330, 2007
- Bradshaw, C.J.A., Y. Isagi, S. Kaneko, R. Frankham, B.W. Brook and D.M.J.S. Bowman: Low genetic diversity in the bottlenecked population of endangered non-native banteng in northern Australia. Molecular Ecology 16; 2998-3008, 2007
- Kaneko, S., Y. Isagi and N. Nakagoshi: Development of microsatellite markers for *Echinops setifer* (Asteraceae), an endangered grassland plant species in Japan. Conservatin Genetics 8; 1231-1233, 2007
- Katoh, S., S. Kaneko, Y. Isagi, N. Murakami and H. Kato: Isolation and characterization of microsatellite loci in *Melicope quadrilocularis* (Rutaceae), an endemic plant species of the Bonin Islands Japan, and cross-species amplification in closely related taxa. Conservation Genetics 8; 1487-1490, 2007
- Isagi, Y., R. Tateno, Y. Matsuki, A. Hirao, S. Watanabe and M. Shibata: Genetic and reproductive consequences of forest fragmentation for populations of *Magnolia obovata*. Ecological Research 22; 382-389, 2007
- Kaneko, S., Y. Isagi and F. Nobushima: Development of microsatellite markers for Metrosideros boninensis (Myrtaceae), an endangered endemic plant species from the Bonin Islands, Japan. Conservation Genetics 8; 753-755, 2007
- Yamasaki, M., A. Iwatake and K. Futai: A low *Platypus quercivorus* hole density does not necessarily indicate a small flying population. Journal of Forest Research 12; 384-387, 2007
- Ishihara, M.I., M. Yamasaki and J. Yoshikawa: Spatial distribution and abundance of bud galls caused by eriophyoid mites among host trees *Carpinus tschonoskii*. Journal of Applied Entomology 131; 585-587, 2007

Books

- Isagi, Y., R. Tateno, Y. Matsuki, A. Hirao, S. Watanabe and M. Shibata: Genetic and reproductive consequences of forest fragmentation for populations of *Magnolia obovata*. In Nakashizuka, T. (ed.), Sustainability and Diversity of Forest Ecosystems. Springer, pp. 25-32, 2007
- Takayanagi, A.: Reconstruction of human-wildlife relationship in mordern society. In Ohta, S. (ed.), Rediscover of forests. KUP, Kyoto, pp. 258-316, 2007
- b) Conference and seminar papers presented
- The Mammalogical Society of Japan 2007 Annual Meeting (4 presentations)

The 55th Annual Meeting of The Japanese Ecological Society (5 presentations) The 119th Annual Meeting of Japanese Forestry Society (5 presentations)

A-3. Off-campus activities

Membership in academic societies (roles)

Isagi, Y.: The Ecological Society of Japan (Ecological Research, Associate Editor-in-Chief; Journal of the Ecological Society of Japan, Editor; Committee for the Natural Conservation), The Japanese Forest Society (Journal of the Japanese Forest Society, Editor), The Society for the Study of Species Biology (Regional Secretary)

Takayanagi, A.: Mammalogical Society of Japan (Audit)

Research grants

- Isagi, Y.: JSPS research grant: Kiban-kenkyu B; Analyses of pollination processes of tree species based on genotyping of a single pollen grain (Rep.: Y. Isagi)
- Isagi, Y.: JSPS research grant: Kiban-kenkyu B; Evaluation of the effect of forest fragmentation in sub-tropical island ecosystems on species and genetic diversity (Y. Isagi, Rep.: K. Yoneda)
- Takayanagi, A.: JSPS research grant: Kiban-kenkyu C; Study on effects of habitat quality and protection fences on crop damage intensity by sika deer (Rep.: A. Takayanagi)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

- a) Courses given
- Undergraduate level: Basic Science for Forest and Biomaterials IV (Isagi), Reproductive Ecology in Forest Trees (Isagi), Wildlife Conservation Science (Takayanagi), Laboratory Course in Forest and Biomaterials Science I (Takayanagi), Laboratory Course in Forest and Biomaterials Biology (Takayanagi, Yamasaki), Laboratory Course in Ecology (Takayanagi, Yamasaki), Practice in University Forests II (Takayanagi), Seminar in Forest and Biomaterials Science (Isagi, Takayanagi, Yamasaki)
- Graduate level: Forest biology II (Takayanagi), Seminar in Forest Biology (Isagi, Takayanagi), Laboratory Course in Forest Biology (Isagi, Takayanagi)

B-2. Off-campus teaching, etc.

Part-time lecturer

Isagi, Y.: Graduate School of Science, Kobe University (Molecular Ecology), Faculty of Integrated Arts & Sciences, Hiroshima University (Conservation Biology), Graduatge School of Integrated Arts and Scinences (Symbiotic Microbial Biology)

Takayanagi, A.: Kyoto Gakuen University (Wildlife Conservation)

Yamasaki, M.: Faculty of Engineering, Doshisha University (Life Science II, Animal Behavior)

Open seminar

Takayanagi, A.: Open Seminar of Field Science Education and Research Center, Kyoto University (Lecturer)

C. Other remarks

Isagi, Y.: Research Institute for Humanity and Nature (project researcher), Hiroshima Prefecture

(landscape adviser).

Chair of Forest Environment Conservation

2.2.6 Laboratory of Landscape Architecture

Staff Professor : Morimoto, Yukihiro, Dr. Agri. Sci. Assistant Professor : Imanishi, Junichi, Dr. Agri. Sci.

Students and research fellows

Doctor's program : (4)Research fellow : (1)Master's program : (8)Research student :(1)Undergraduate : (4)(4)

A. Research Activities (2007.4-2008.3) A-1. Main subjects

a) Theory and history of landscape design

History and theory of modern landscape design have been researched continuously. The purpose of the studies is to clarify the social significance of public open spaces through the researches on economic and political backgrounds.

b) Habitat restoration and conservation research

Technological studies on conservation of forest and wildlife habitat have been researched through works in urban forest.

c) Landscape and land-use planning research

Landscape and land-use preference studies on open space in urban and urban fringe areas are conducted in order to get landscape and land-use planning theory.

d) Practice in landscape design

This laboratory has participated in the practical processes of several projects such as parks and urban planning.

A-2. Publications and presentations

a) Publications

Books

- Hong, S, Nakagoshi, N., Fu, B. Morimoto, Y. eds.: Landscape Ecological Applications in Man-Influenced Areas, Dordrecht, Springer, 535pp., 2007.1
- Morimoto, Y.: Kyoto as a Garden City: A landscape Ecological Perception of Japanese Garden design., in Hong, S. et al. Eds. Landscape Ecological Applications in Man-Influenced Areas, Dordrecht, Springer, 375-388, 2007.1.
- Morimoto, Y., Shirahata, Y. eds.: Environmental Design: Conservation and Creation of Landscapes, Tokyo, Asakura Shoten, 212pp., 2007.4.
- Imanishi, J., Morimoto, Y.: Assessment of Natural Environment. in Morimoto, Y., Shirahata, Y.

eds., 199pp, Environmental Design: Conservation and Creation of Landscapes, Tokyo, Asakura Shoten, 212pp. (pp.190-208), 2007.4.

- Morimoto, Y., Kobayashi, T. eds.: The New Environmental Revegetation Technology, Tokyo, Asakura Shoten, 234pp., 2007.4.
- Morimoto, Y.: The Original Landscape of Kyoto: Wildlife in a City Fostered by Culture. In in Ohta, S. ed. Re-discovery of Forests. Kyoto, Kyoto University Academic Press, Kyoto, 401pp. (pp.317-348), 2007.11.

Original papers

- Horikawa M., Demeyeva L., Oyabu T., Tsuyama I., Morimoto Y. and Ishida N.: Evaluation of wetland changes in lower Syrdarya region, the Aral Sea and possibility of ecological rehabilitation, Proceedings of Barsakelmes Nature Reserve. (Tethys, Almaty), 2nd issue; 95-103, 2007 (in Russian)
- Murakami, K., Matsui, R. and Morimoto, Y.: Northward invasion and range expansion of the invasive fern Thelypteris dentata (Forssk.) St. John into the urban matrix of three prefectures in Kinki District, Japan. American Fern Journal 97(4); 186–198, 2007
- Imanishi, A., Murakami, K., Imanishi, J., Hashimoto, H., Morimoto, Y., Satomura, A.: Conservation of isolated urban green spaces for plant species: Characteristics of shrine and temple forests and precincts. Landscape Ecology and Management 12(1); 23-34, 2007.
- Yoshida, H., Imanishi, J., Shibata, S., Morimoto, Y.: A method for predicting the required seedling density in seeding work. J. Jpn. Soc. Reveget. Tech. 33(2); 369-379, 2007
- Sasaki, T., Morimoto, Y., Imanishi, J.: The stand structure and soil properties of the forested area in a large scale reclamation site for 30 years after construction. Landscape Research Japan 70(5); 413-418, 2007.
- Fujita, Y., Morimoto, Y.: Case studies of mitigation banks in the USA. J. Jpn. Reveget. Tech 33(1); 266-269, 2007.
- Tabata, K., Hashimoto, H., Morimoto, Y., Maenaka, H.: Dead forms of canopy trees and regeneration process in Tadasu-No-Mori Forest. J. Jpn. Reveget. Tech 33(1); 53-58, 2007.
- Ukai, K., Oku, H., Sasaki, Y., Morimoto, Y.: Understanding of a stork and "stork rice farming" by the "stoke rice" purchasers. Papers on Env. Info. Sci. 21; 19-24, 2007.
- Ooishi, Y. and Morimoto, Y.: Changes in the bryophyte flora in an urban afforested woodland: Journal of the Japanese institute of Landscape architecture71 (5): 577 -580
- Ooishi, Y. and Yamada, K. : Liverwort and Hornwort from Is. Rishiri studies(27); 63-72
- Horiuchi, M., Fukamachi, K., Oku, H. and Morimoto, Y.:Change of the use of forest resources in satoyama landscape in the western part of Shiga Prefecture between the late Meiji Period and the Taisho Period. LRJ 70(5);563-568
- Horiuchi,M. and Oku,H.:Carrying-Method using Wheels and Use of Forest Resources in the Eastern Foot of Hira Mountains.MINGU-KENKYU 136;1-12,2007
- Mori, C., Fukamachi, K., Horiuchi, M. and Oku, H.: Environment Consciousness and Consumption Behavior of University Students in Relation to their Perception of Fair Trade. Papers on Environmental Information Science 21; 189-194,2007

Reports

Morimoto, Y.: Biodiversity and Satoyama: from the viewpoint of landscape. Env. Res. 148; 41-49, 2008

Morimoto, Y.: Conservation of Landscape Ecology. School Management 552; 16-19, 2007.

Imanishi, J.: Urban green space as a place for integrated medicine. J. Jpn. Soc. Reveget. Tech. 33(3); 445-447, 2008.

Imanishi, J., Imanishi, J.: Why is integrative medicine needed?. Biotherapy 21(6); 373-380, 2007.

Morimoto, Y., Miyamae, Y., Serita, A., Fukamachi, K., Imanishi, J.:

Report on the 40th Anniversary Open Symposium of the JILA West of 2006 "For inheritance of old landscape of Kyoto". Landscape Research Japan 71(1); 41-46, 2007.

b) Conference and seminar papers presented

Annual meeting of JALE (1)

Annual meeting of the Ecological Society of Japan (2)

Annual meeting of the Kinki Branch Meeting of the Ecological Society of Japan (1)

Annual meeting of the Bryological Society of Japan (2)

Annual meeting of JILA (3)

Annual meeting of JILA Kansai Branch (2)

Annual meeting of the Japanese Society of Revegetation Technology (5)

IALE World Congress 2007 (4)

IUFRO (1)

International Symposium Preservation and Restoration of Environmental Ecology (2)

A-3. Off-campus activities

Membership in academic societies

- Morimoto, Y.: Japanese Institute of Landscape Architecture (Head of Kansai Branch), Japanese Society of Revegetaion Technology (President), Japanese Society of Landscape Ecology (Vice President), Environmental Information Center (Councilor), Science Council of Japan (cooperation member), International Consortium for Landscape and Ecological Engineering (Vice President), International Federation of Landscape Architects – Japan (board member)
- Imanishi, J.: International Consortium for Landscape and Ecological Engineering (Editorial Office), Japanese Institute of Landscape Architecture (Editorial Board Member for Techinical Report), Japanese Institute of Landscape Architecture Kansai Branch (Secretary and Branch Office), Japanese Association for Landscape Ecology (Expert Member), Japanese Society of Revegetation Technology (Editorial Bord Member), Annual Meeting of JSRT (Working Member)

Research grants

- Morimoto, Y.: JSPS Grants-in-Aid for Scientific Research. (A) (1) Studies on ground design of hierarchical nature restoration. (delegate: Morimoto, Y., member: Imanishi, J.)
- Morimoto, Y.: JSPS Grants-in-Aid for Exploratory Research. Landscape architectural basic study on realization of a plant garden in outer space. (delegate: Matsui, S., member: Morimoto, Y.)
- Morimoto, Y.: JSPS Grants-in-Aid for Scientific Research. (A) (1) Interdisciplinary studies on extracting prioritized ecosystems, practical techniques and scientific assessment for nature restoration. (delegate: Morimoto, Y., member: Imanishi, J.)
- Morimoto, Y.: Funded Research. Surveys for the Independent Forest in Expo'70 park. (Commemoratove Organization for the Japan World Exposition '70)

Morimoto, Y.: Funded Research. Spiritual care for cancer patients by integrated medicine in Expo'70 park. (Integrated Medicine Planning)

Morimoto, Y.: JSPS Bilateral Joint Research Projects.

Imanishi, J.: JSPS Grants-in-Aid for Young Scientists (B). Assessing vigor conditions of cherry trees using a hyperspectral sensor. (delegate: Imanishi, J.)

A-4. International cooperation and overseas activities

International meetings

- Imanishi, J., Shimabayashi, Y., and Morimoto, Y.: Physiotope analysis for biodiversity conservation planning. The 4th International Symosium on Preservation and Restoration of Environmental Ecology, July 14-17. Yanji, China. 2007
- Imanishi, A., Kitagawa, C., Nakamura, S., Imanishi, J., Murakami, K. and Morimoto, Y.: The characteristics and problems of an artificial urban ecological environment from the viewpoint of herbaceous flora, The 4th International Symposium Preservation and Restoration of Environmental Ecology. Yanji, China. 2007
- Imanishi, J., Imanishi, A., Natuhara, Y., and Morimoto, Y.: A conceptual model for restoration site selection based on a review of reserve selection procedures. Proceedings of the 7th IALE World Congress, July 8-12. Wageningen, the Nethrelands. 125. 2007
- Imanishi, A., Yoshida, S., Imanishi, J., and Morimoto, Y.: The factors that affected forest landscape change of the World Heritage Shimogamo Shrine, Kyoto, Japan after the Middle Ages. Proceedings of the 7th IALE World Congress, July 8-12. Wageningen, the Nethrelands.744. 2007
- Sasaki, T., Morimoto, Y., and Imanishi, J.: Development of trees and soils of the forested area in Expo'70 Park 30 years after reclamation. Proceedings of the 7th IALE World Congress, July 8-12. Wageningen, the Nethrelands. 269. 2007
- Hashimoto, H., Imanishi, J., and Morimoto, Y.: Airborne laser scanning data provide three-dimensional information for analyses of woodland bird habitats. Proceedings of the 7th IALE World Congress, July 8-12. Wageningen, the Nethrelands. 349. 2007
- Horiuchi M: The use and management of forest resources in satoyama landscape by local people after the Meiji Period (1868-1912) in the western part of Shiga Prefecture, Japan. IUFRO Conference Woodland Cultures in Time and Space: tales from the past, messages for the future, 2007
- Tabata K., Hashimoto H, Morimoto Y.: Tree population dynamics of large-scale mature urban forest in Kyoto city, Japan. Proceedings of the 3rd Int. workshop on LITER Ecological Information Management in the East Asia-Pacific Region.46-52, Oct. 16-21. Seoul, Korea. 2007.

B. Education Activities (2007.4-2008.3) B-1. On campus teaching

a) Courses given

Undergraduate level: Landscape Architecture Part I, II (Morimoto, Y.), Planting Design for Landscape (Imanishi, J. and Morimoto, Y.), Landscape Planning (Hayashi, M.), Practice in Landscape Planning and Design Part I, II (Morimoto, Y. and Imanishi, J.), Laboratory Course in Applied Forest and Biomaterials Science (Morimoto, Y. and Imanishi, J.), Laboratory Course in Forest and Biomaterials Science IV (Morimoto, Y. and Imanishi, J.), Forest and Biomaterials Science, IV (Morimoto, Y.), Information Technology in Forest and Biomaterials Science (Imanishi, J. and others)

- Graduate level: Seminar in Landscape Architecture (Morimoto, Y.), Laboratory Works in Landscape Architecture (Morimoto, Y.)
- Graduate School of Global Environmental Studies: Landscape Ecology and Planning (Morimoto,
 Y.), Seminar in Landscape Ecological Conservation (Morimoto, Y.), Theory of Ecological Impact Mitigation (Morimoto, Y.), Internship in Environmental Management (Morimoto,
 Y.), Seminar on Environmental Management (Morimoto, Y. and Imanishi, J.)

B-2. Off-campus teaching, etc.

Part-time lecturer

Morimoto, Y.: Kyoto Prefecture University (Landscape Design, Forest Management)

Imanishi, J.: Kyoto Seika University (Landscape Design)

Open seminar

Morimoto, Y.: Instructor of Temple Visits (Tango)

Imanishi, J.: Lecture for Field Trip of University of Kentucky, U.S.A., "Japanses Gardens", 2007.5.9, at Kyoto University

B-3. Overseas teaching

Students and research fellows from abroad

(GSGES) Doctor course (1) (Korea), Master course (2) (Malaysia, Korea)

C. Other remarks

Morimoto, Y.: Central Environmental Council (Temporary Members of the Natural Environment Group), Expert Comittee for Environmental Research and Technology Promotion of Ministry of Environment, Commitee Member of Environment of Osaka Prefecture, Kyoto City Scenice Beauty Committee, Kyoto City Scenic Beauty Consultant, Kyoto City City Planning Board Member, Kyoto City Environment Board Member, Committee Member of City Planning of Osaka Prefecture, Committee Member of the Council of Park and Greenery of Kobe City, Executive Board Member of the Council of Urban Greenery Initiative of Kyoto City, Director of the Promotive Society of Urban Greenery Initiative of Kyoto City, Councilor of Japan Highway Landscape Association, Committee Member of Public Association for Forests and Greenery of Kyoto Prefecture, Chair of Committee of Utilization and Conservation of Yodo Main River, Research Advisor of Organization for Landscape and Urban Greenery Technology Development, Committee Member of Satochi Satoyama Model Projects (Ministry of Environment), Committee Member of Natural Environment of Makioo River Dam (Osaka Prefecture), Committee Member of Town Planning of Kizu District (Academic Research City Promotion Institution), Executive Board Member of NPO Green Environment, Executive Board Member of Natural **Environment Restoration Society**

2.2.7 Laboratory of Erosion Control

Staff Professor : Mizuyama, Takahisa, Dr. Agric. Sci. Associate Professor: Satofuka, Yoshifumi, Dr. Eng. Assistant Professor : Kosugi, Ken'ichirou, Dr. Agric. Sci.

Students and research fellows

Doctor's program : (5) Master's program : (8) Undergraduate : (4)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

a) Mechanism of sediment movement

Basic research has been carried out on debris flow, flash flood, and shallow landslide. The relationship between shallow landslide and underground pipe flow and the flow in bedrock are studied particularly.

b) Countermeasures to prevent or reduce sediment disasters and the Sabo-planning being compatible with environmental concerns. More effective permeable dams are experimentally investigated in order to store the excessive sediment and, at the same time, not to damage the eco-system established in the streams. A function of a series of slit sabo dams was studied by flume experiments and computer simulation.

c) Hydrologic cycle in forested slopes

Elements controlling hydrologic cycle in forest are studied. Effects of forest soil hydraulic properties on water discharge from forested watersheds are analyzed by laboratory experiments, field measurements, and numerical simulation methods. Seepage into bed rock and seepage along tree trunks and tree roots were observed. Simulation models to explain these phenomena were developed.

d) Sediment movement and integrated sediment management in river system

Sediment production process and sediment movement process in mountain region are investigated. A numerical model for calculating sediment routing is also developed. Using these results, the sediment management for mitigating sediment-related disaster and providing better natural environment from mountains to seashore is studied.

e) Bedload measurement with hydrophone and pits

New bedload measurement methods; hydrophone and a pit bedload sampler were developed. They have been applied in the field. The data were collected and analized.

f) Debris flow disasters were surveyed in Tarumizu city. Damages of houses and people's reaction were mainly focused.

g) Buffer green belt against sediment hazards

The effects of trees against debris flow and landslide are studied to design buffer green belts. Infiltration and water storage characteristics are studied in different tree kinds.

h) Development a debris flow simulator equipped with GUI

A simulator 'Kanako' is developed, that evaluate several types of debris flow control structues.

A-2. Publications and presentations

a) Publications

Books

Mizuyama, T., Y. Satofuka, Kosugi, K.: 4. Rediscover of Forest, 6. Disaster prevention functions. Agriculture for the 21st C. from Bio-resources (edited by S. Ohta), 2007(in Japanese)

Original papers

- Chiba, M., T. Mori, T. Uchikawa, T. Mizuyama, Y. Satofuka : Bursting process of a landslide dam caused by Typhoon 0514 (Nabi) in the Mimi River, Miyazaki Prefecture, Japan, and suggesting evacuation procedures when a landslide dam bursts. Journal of the Japan Society of Erosion Control Engineering 60-1, 43-47, 2007 (in Japanese)
- Sadeghi, S.H.R., T.Mizuyama, S.Miyata, T.Gomi, K.Kosugi, S.Mizugaki, Y.Onda: Is MUSLE apt to small steeply reforested watershed? J For Res,12:270-277, DOI 10, 1007/s10310-007-0017-9, 2007
- Nakatani, K., Y. Satofuka, T. Mizuyama: Development of 'KANAKO,' a wide use debris flow simulator equipped with GUI, 32nd IAHR Proceedings (CD) Paper 202, 2007
- Oda,A., T.Mizuyama, Y. Hasegawa: An experiment on a landslide dam outburst, Jour. of the JSECE 60-2, 33-38, 2007 (in Japanese)
- Takanashi, K., T.Mizuyama, Y.Nakano: A method for delineating restricted hazard areas due to debris flow. 4th International Workshop Debris Flow Hazard Mitigation, Chengdu, 2007
- Ishikawa, N., T. Hoshikawa, M. Beppu, T. Mizuyama: Impact response and safty check of steel pipe check dam. 7th Conference on Shock and Impact Load on Structures, 2007
- Sadeghi, S. H. R., T. Mizuyama: Applicability of the Modified Universal Soil Loss Equation for prediction of sediment yield in Khanmirza watershed, Iran. Hydrological Sciences-Journal, 52(5) 1068-1075, 2007
- Ikeda,A., T.Mizuyama, K.Haraguchi: A study on critical rainfalls triggering off debris flow. Jour. of the JSECE 60-3, 26-31, 2007 (in Japanese)
- Mori,T., K.Inoue, T.Mizuyama, T.Ueno: The Tobata landslide dam and outburst floods at the Azusa River in1757, Jour. of the JSECE 60-3, 44-49, 2007 (in Japanese)
- Hung,K.C., K.Kosugi, T.H.Lee, T.Mizuyama: The effects of rock fragments on hydrologic and hydraulic responses along a slope, Hydrol. Processes, 21, 1354-1362, 2007
- Miyata,S., K.Kosugi, T.Gomi, Y.Onda, T.Mizuyama: Surface runoff as effected by soil water repellency in a Japanese cypress forest, Hydrol. Processes, 21, 2365-2376, 2007
- Yosuke YAMAKAWA, Ken'ichirou KOSUGI, Weili LIANG, Takahisa MIZUYAMA: Improvements of the combined penetrometer-moisture probe (CPMP). Jour. of the JSECE 60-4,34-39, 2007 (in Japanese)
- Wei-Li Liang, K.Kosugi, T. Mizuyama: Heterogeneous Soil Water Dynamics around a Tree Growing on a Steep Hillslope. Vadose Zone J. 6-4, 879-889, 2007
- Kosugi, K., S. Katsura, T. Mizuyama, S. Okunaka, T. Mizutani : Anomalous behavior of soil mantle groundwater demonstrates the major effects of bedrock groundwater on surface hydrological processes, Water Resources Research, 44, W01407, p.14, 2008
- Sadeghi, S.H.R., T. Mizuyama, S. Miyata, T. Gomi, K. Kosugi, T. Fukushima, S. Mizugaki, Y. Onda: Development, evaluation and interpretation of sediment rating curves for a Japanese small mountainous reforested watershed, Development, evaluation and interpretation of sediment rating curves for a Japanese small mountainous reforested

watershed GEODERMA 144, 1-2 (2008) 198-211, 2008

- Oda, A., T.Mizuyama, J.B.Laronne, M. Nonaka, M. Matsuoka: Flume experiments to examine hydrophone characteristics, Jour. of the JSECE,60-5, 66-71, 2008 (in Japanese)
- Zhang, Z., T. Fukushima, Y. Onda, T. Gomi, T. Fukuyama, R. Sidle, K. Kosugi, and K. Matsushige, Nutrient runoff from forested watersheds in central Japan during typhoon storms: implications for understanding runoff mechanisms during storm events, Hydrol. Processes, 21, 1167-1178, 2007.
- Kosugi, K.: Effects of soil layer and permeable bedrock on flood and base flow discharges from a forested watershed, J. Jpn. Soc. Hydrol. & Water Resour., 20, 201-213, 2007. (in Japanese)
- Zhang, Z., T. Fukushima, Y. Onda, S. Mizugaki, T. Gomi, K. Kosugi, S. Hiramatsu, H. Kitahara, K. Kuraji, T. Terajima, and K. Matsushige, Characterization of diffuse pollutions from forested watersheds in Japan during storm events its association with rainfall and watershed features, Sci. Total Environ., 390(1), 215-226, 2008.
- Katsura, S., K. Kosugi, and T. Mizuyama, Application of a coil-type TDR probe for measuring the volumetric water content in weathered granitic bedrock, Hydrological Processes, 22, 750-763, DOI: 10.1002/hyp.6663, 2008.

Reviews

- Mizuyama, T.; Past, present and future of the Japan Society of Erosion Control Engineering. Jour. of JSECE 59-2, 1-2 and 2006
- Mizuyama, T.: Hazard maps for sediment disaster, 3. Technical development of hazard maps. Foundation Engineering 55-11,p.38-44, 2007 (in Japanese)
- Mizuyama, T.: Technical development in Sabo. Base design materials 136, p.23-26, 2008 (in Japanese)
- Mizuyama, T.: Sabo in the Seta river basin. Biwako Lectures 12, p.385-436, 2008 (in Japanese)
- Mizuyama, T.: Characteristics of sediment disasters and alarm and evacuation. JSECE 60-6, p.56-57, 2008 (in Japanese)
- Kosugi, K.: Reviewing classical studies in soil physics "A new model for predicting the hydraulic conductivity of unsaturated porous media" By Y. Mualem, Water Resources Research, Vol. 12, No. 3, 513–522 (1976) and "A closed-form equation for predicting the hydraulic conductivity of unsaturated soils" By M. Th. van Genuchten, Soil Science Society of America Journal, Vol. 44, No. 5, 892–898 (1980), J. Jpn. Soc. Soil Phys., 106, 47-60, 2007. (in Japanese)
- Kosugi, K.: Effects of weathered granitic bedrock on runoff processes in a small headwater catchment, 65-74, In T. Tanaka (ed) Proceedings of International Workshop on Integrated Watershed Management for Sustainable Water Use in a Humid Tropical Region, ISSN 1346-3381, 31 Oct. Tsukuba, Japan, 2007.
- b) Conference and seminar papers presented

The 118th annual meeting of Japanese Forestry Society (5 presentations)

2007 annual meeting of Japan Society of Erosion Control Engineering (29 presentations)

Bedload Measurement Workshop (2 presentations)

International Hydraulic Engineering (1 presentation)

International Association of Hydrological Science Conference (4 presentations)

A-3. Off-campus activities

Membership in academic societies (roles)

- Mizuyama, T.: Japan Society of Erosion Control Engineering (director, president), Japanese Geomorphological Union (member of committee)
- Satofuka, Y.: Japan Society of Erosion Control Engineering (member of editorial committee), Japan Society of Civil Engineering (member of committee), Japan Society for Natural Disaster Science (member)
- Kosugi, K.: Japan Society of Erosion Control Engineering (member of committee), Japanese Forestry Society (member), Japan Society of Hydrology & Water Resources (member)

Research grants

Monbusho research grant:

- General scientific research (B) (2); Joint Research on control of floods and sediment movement in Semalang, Brantas and Toba Basins (Fujita and Satofuka)
- General scientific research(C) (2); Sediment Run-off from sabo dams and its impact on river environment (Head: Fujita, Mizuyama)
- General scientific research (A) (1); Development of a combined rock-soil-plan-atmosphere model, and flood and draught predictions at ungauged mountainous watersheds (Head: Tani, Member: Kosugi et al.)
- General scientific research (B); Physical analyses on critical rainfall to trigger shallow landslides (Head: Kosugi, Member: Mizuyama et al.)

A-4. International cooperations and overseas activities

International Meetings

Mizuyama, T: Bedload measurement workshop (Chairman, presentation), International Hydraulic Engineering Research (Presentation)

Kosugi, K: International Association of Hydrological Science Conference (Presentation)

Membership in international academic societies

Mizuyama, T.: Editor of Journal of Hydrological Sciences (editor), International Workshop on Debris Flow Hazard Mitigation (member of the International Committee)

Satofuka, Y.: IAHR

Kosugi, K.: SSSA, IAHS, IUFRO-J, AGU

International joint researches, overseas research surveys

- Satofuka, Y.: Joint Research on control of floods and sediment movement in Semalang, Brantas and Toba Basins (Indonesia)
- Kosugi, K.: Joint Research on Integrated Watershed Management for Sustainable Water Use in a Humid Tropical Region (Indonesia)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Theory of Erosion Control 1,2 (Mizuyama), Practice in Erosion Control (Mizuyama, Satofuka), Planning of Erosion Control (Mizuyama, Satofuka), Reading of Foreign Literature II (Mizuyama, Satohuka), Special Seminar on Erosion Control 1,2 (Mizuyama, Satofuka), Basic Science for Forest and Biomaterials III (Mizuyama), Forest and Biomaterial Science III (Satofuka), Laboratory Course in Forest and Biomaterials Science III (Mizuyama, Satofuka, Kosugi)

Graduate level: Theory of sediment induceddisaster control (Satofuka), Advanced theory of Erosion Control (Mizuyama), Advanced experiment of Erosion Control (Mizuyama, Satofuka), Seminar of Erosion Control (Mizuyama, Satofuka)

B-2. Off-campus teaching, etc.

Part-time lecturer

Mizuyama, T.: Fac. Agriculture, Kyoto Prefectural Univ. (Materials and constructive methods), Fac. Agriculture, The University of Tokyo (Sabo works), Fac. Agriculture, Kobe University (Environmental Engineering), Japan International Cooperation Agency (Infrastructure)

Satofuka, Y.; Fac. Engineering, Ritsumeikan Univ. (Hydraulic experiment)

B-3. Overseas teaching

Students and research fellows from abroad

Students from abroad: 2 (Taiwan, Indonesia) JICA trainee: 1 (Cameroon)

Chair of Biomaterials Technology

2.2.8 Laboratory of Biomaterials Design

Staff Professor : Nakano, Takato, D. Agric. Sci. Lecturer : Nakamura, Masashi, D. Agric. Sci. Assistant Professor : Murata, Koji, D. Agric. Sci.

Students and research fellows

Doctor's program : (3) Master's program : (6) Undergraduate : (4)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

a) Characterization of physical properties of wood: Pysical properties of wood such as relaxational behavior, fatigue properties, and water adsorption are affected by ultrastructure and various factors, for example moisture content, temperature and so on Effects of theie factors on physical properties are thermodynamically researched by relating to ultra-structure of wood. Prediction of fatigue life of wood is analytically examined on the basis of various factors associated in fatigue life. Additionally, relationship between adsorption water and the above

properties is also researched.

b) Swelling mechanism of cell wall and physical properties: Swelling behaviour of cell wall with water adsorption is tightly related to physical properties of wood and gives many information. Relationship between adsorption water and swelling behaviour is examined using a model of cell wall. Swelling behaviour of wood and wood cell walls is also visualized and analyzed by using digital image correlation method.

c) Fracture mechanics of anisotropic materials, and strength designing for wooden structural elements: Metal and plastics are isotropic materials but wood is an anisotropic material. Strength of wood parallel to the grain is extremely high because of its cellulose filament winding around the cell walls. This is the reason why wood is light and strong. Because of this reason wood is consequently used for building and furniture in large quantities. Mechanics of anisotropic material is necessary for designing of these structural elements. Real stresses-strains curve is measured using image correlation technique.

d) Nondestructive grading of lumber: Wood has large deviation in strength like as other natural products. Since strength of fifth percentile exclusive limit is generally used for strength designing, nondestructive grading is important for effective use of wood resources. Thermal changes during repeated bending are tried to use for detecting defects (knot and others), and deflection distribution curves and optical properties are also used for evaluating strength.

e) Properties of wood as sensory stimuli to human: Wood is one of the most friendly and comfortable material for human. Dominant factors of such effects are investigated scientifically and its application to interior designing are studied. For example; i) Investigation on characteristics of wood as visual stimuli, especially, grain figure, color and glossiness, and its application to the designing of interior space and furniture. ii) Generation of wood grain figures by computer graphics. iii) Formulation of relations between psychological impressions, especially 'natural' and 'comfortable' images and physical characteristics of visual images. iv) Evaluation of visual inducement of wood by using eye-tracking method.

A-2. Publications and presentation

a) Publications

Books

Nakano T.: 2.1 Wood and water, 3.2 Rheological property of wood. Wood physics (edited by the Japan Wood Research Society), pp.19-47, 113-140, Buneido Publishing, Tokyo, 2007 (in Japanese)

Nakamura M.: 6.2 Visual and tactile sensation. Wood physics (edited by the Japan Wood Research Society), pp.236-244, Buneido Publishing, Tokyo, 2007 (in Japanese)

Original papers

- J. Miyazaki, T. Nakano: Fracture behavior of laminated wood bonded with aqueous vinyl polymer-isocyanate resin and resorcinol-formaldehyde resin under impact fatigue. J. Appl. Polym. Sci., 109; 276-281, 2008.
- Y. Ishikura and T. Nakano: Contraction of the microfibrils of wood treated with aqueous NaOH. J. Wood Sci., 53; 175-177, 2007.
- M. Nakamura, T. Kondo: Quantification of visual inducement of knots by eye-tracking. J. Wood Sci., 54; 22-27, 2008.
- M. Nakamura, T. Fuwa, K. Inoue, F. Iwasaki, S. Kudo, H. Sako, M. Sato, Y. Shimomura: Prospect

of manufacturing and design based on physiological polymorphism. J. Physiological Anthropology, 26; 507-511, 2007.

- M. Nakamura, M. Kawasaki: Characterization of Eye Fixation Pause Distribution in Observation of Forest Scenery. Japanese Journal of Physiological Anthropology, 12 (Special issue 2); 86-87, 2007 (in Japanese).
- K. Miyauchi, K. Murata: Strain-softening behavior of wood under tension perpendicular to the grain. J. Wood Sci., 48; 463-469, 2007.
- K. Murata, T. Kanazawa: Determination of Young's modulus and shear modulus by means of deflection curves for wood beams obtained in static bending tests. Holzforschung, 61; 589-594, 2007.
- Nagai, H., Murata, K., Nakamura, M.: Defect Detection of Lumber Including Knots Using Bending Deflection Curve, Journal of The Society of Materials Science, Japan, 56(4), 326-331, 2007 (in Japanese).
- Murata, K., Nakao, S.: Transverse Compression Behavior of Softwood and Alternately Laminated Lumber of Rubbewood Veneer and Falcata Veneer, Journal of The Society of Materials Science, Japan, 56(4), 316-320, 2007 (in Japanese).

Patents

Patent granted

- Patent No. 401288 'Laminated composite wooden material and method of manufacturing material', Inventors: Yokoo, K., Masuda, M., Murata, K., Patentee: Uni-wood Corporation, Registration date: Sep. 14, 2007
- b) Conference and seminar papers presented
- The 56th Annual Conference of the Society of Material Science Japan, Nagoya, May 19-20, 2007: 1 presentaions (Murata)
- The 57th Annual Meeting of Japan Wood Research Society, Hiroshima, Aug. 8-10, 2007: 9 presentations (Nakano, Nakamura, Murata)
- The 25th Annual Meeting of Japan Wood Technological Association, Asahikawa, Sep. 26-28, 2007: 2 presentations (Nakamura)
- The 57th Annual Meeting of Japan Society of Physiological Anthropology, Fukuoka, Oct. 20-21, 2007: 1 presentation (Nakamura)
- The 51st Japan Congress on Materials Research, Kyoto, Nov. 27-29, 2007: 3 presentations (Murata)
- The 58th Annual Meeting of Japan Wood Research Society, Tsukuba, Mar. 17-19, 2008: 6 presentations (Nakano, Nakamura, Murata)

A-3. Off-campus activities

Membership in academic societies

- Nakano, T.: The Japan Wood Research Society (Member of the scrrening committee for the awards, Member of the editorial board)
- Nakamura, M.: The Japan Wood Research Society (Member of the committee for information processing, Secretary of the Division of Living Comfort, Member of the working committee for annual meetings); Japan Society of Physiological Anthropology (Trustee for homepage); Wood Technological Association of Japan (Member of the planning committee of Kansai Branch, Member of the editorial board)

Murata, K.: The Society of Matreials Science, Japan (Committee member of the Division of Wood Based Materials, Editorial board member of the journal, Member of the planning committe); Wood Technological Association of Japan (Member of the planning committee of Kansai Branch, Member of the committee for fast growing trees of Kansai Branch), The Japan Wood Research Society (Editorial board member of the journal).

Research grants

- Nakano, T.: JSPS Grant-in-Aid for Scientific Research (C), Water in wood substance and Swelling properties of Cell wall (Head)
- Murata, K.: JSPS Grant-in-Aid for Exploratory Research, Fatigue of wooden blade for vertical axis wind turbines (Head)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

- a) Courses given
- Under graduate level: Basic Science for Forest and Biomaterials III (Nakano), Forest and Biomaterials Science III (Nakano), Properties of Biomaterials (Nakano), Wood and Timber Construction (Nakamura), Practice in Biomaterials Design (Nakano, Nakamura, Murata), Information Technology in Forest and Biomaterials Science (Nakamura, Murata), Laboratory Course in Forest and Biomaterials Science III (Nakamura, Murata), Laboratory Course in Physics of Forest and Biomaterials (Nakamura, Murata), Laboratory Course in Wood Technology (Nakamura, Murata)
- Graduate level: Biomaterials Design II (Nakamrua), Seminar in Biomaterials Design (Nakano, Nakamura, Murata), Laboratory Course in Biomaterials Design (Nakano, Nakamura, Murata)

B-2. Off-campus teaching, etc.

Part-time lecturer

Nakano, T: Graduate school of Nagoya University (Wood physics; An intensive lecture)

Nakamura, M.: Graduate school of the University of Tokyo (Wood properties II; An intensive lecture)

Open seminar, etc.

Nakamura, M.: "Wood and living environment" in wood science seminar of wood technological association Japan Kansai branch, Osaka, 1 Nov. 2007 (lecture); "Visual characteristics of wooden interior" in Symposium on "Good utilization of wood and bamboo materials in our home", Tokyo, 14 Nov., 2007 (lecture, secretary); "Why do we feel 'warmth' to wood?", Serial seminar for wooden constructions produced by Kyo-Sanzan, Kyoto, 9 Dec. 2007 (lecture); "Visual characteristics of wood grain patterns" in the 30th memorial meeting of Japan natural wood fancy veneer and plywood association, Osaka, 12 Mar., 2008 (lecture).

C. Other remarks

Nakano, T. : [Inside campus] Vice Director of Divisionof Forest and Biomaterials Science, Committee for Educational Affairs of Graduate School of Agriculture, Committee for General Affairs of Students of Department of Agriculture. Nakamura, M.: [Inside campus] Advisory Board for Information Systems in Faculty of Agriculture; Committee for Computer Literacy in Center of Information and Multimedia Studies; Committee for Environment, Security and Hygiene in Faculty of Agriculture.

2.2.9. Laboratory of Wood Processing

Staff	Professor	: Okumura, Shogo, Dr. Agric. Sci.
	Associate Professor	: Fujii, Yoshihisa, Dr. Agric. Sci.
	Assistant Professor	: Sawada, Yutaka, M. Agric. Sci.
	Assistant Professor	: Yanase, Yoshiyuki, M. Agric. Sci.
	Research Assitant(part time)	: Fujiwara, Yuko, Dr. Agric. Sci.
Student	s and research fellows	

Doctor's program :(1)

Master's program : (3) Undergraduate : (2)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

a) Fundamental problems in wood machining

The main subjects are concerned with solution of cutting mechanism of wood and wood based materials and of phenomena in wood cutting, by thermographic measurement and analysis of tool-chip-work system in wood cutting. For the evaluation of the surface roughness of wood, the novel filtering method and 2D and 3D roughness parameters that coincide with tactile sensation are proposed. Influence of machine surface finishing on the performance of painted surface is also studied.

b) Improvements of woodworking machines and cutting tools and automatization of machining process. For the improvements of accuracy, efficiency and safety of the wood cutting and grinding, following subjects are studied: analysis of deformation and vibration of tool using FEM, analysis of stress generated on the tool, and prediction of concentration of airborne dust in the woodworking chamber using computer simulation and the optimization of a condition of dust collection. An algorithm of pattern recognition of the processing sound to simulate the auditory sense of the skilled worker and its master process is developed. It is also applied to the control of the grinding machine of band saw tooth to realize fully automatic control using artificial intelligence technique. Another subjects are pattern recognition of the transient signals from wood using wavelet analysis, simulation of distribution of temperature and stress during drying wood, and simulation of roll pressing of wood using FEM as an application of CAE to the woodworking process.

c) Scanning of wood and wood based materials

The subjects on this field are use of acoustic emission (AE) for prediction of checks and for solution of mechanism of AE generation during the drying of wood, thermographic detection of starved joints of wood and the grain direction and recognition of blue stained wood with image anlysis and pattern recognition technique. Movement of free water in wood tissues under drying is also evaluated by a micro-focus X-ray CT system. Fundamental researches for the analysis of biology of wood-destroy insects and practical application for detection of termite attack using AE monitoring are studied, including developments of portable AE detector, new AE sensor using PVDF film, waveguides, and AE monitoring system for wooden house. Detection of metabolic gas components from termite colony such as H_2 , CH_4 and CO_2 are also studied. Development of physical barrier using crushed cement-stabilized sludge for termite attack. Fact-findings of the damages by termite and other wood-destroy insects in the houses and cultural properties, and research of damage using AE monitoring. Detection of cavity and deterioration points in the material using radar for the non-destructive inspection of decay and damage by wood-destroy insects in the wooden house.

d) Noise and vibration of wooden house

Application of simulation of vibration property using FEM to the optimization of floor-wall structure with consideration of a measure of floor impact sound. Modal analysis of string musical instruments such as violin using FEM.

A-2. Publications and presentations

a) Publications

Original Papers

- Okumura, S.: 1.1 Basics of wood cutting, 1.4 Heat generation in wood cutting : Textbook on Wood Science 6. Wood cutting 2nd ed. (edited by Banshoya, K. et. al). pp.9-15, 30-36, Kaiseisha, Otsu, 2007
- Fujii, Y.: 4.1 Sensing technology in wood cutting : Textbook on Wood Science 6. Wood cutting 2nd ed. (edited by Banshoya, K. et. al). pp.143-147, Kaiseisha, Otsu, 2007
- Fujiwara, Y.: 2.3.2 Sourface roughness and glossiness of machined surafce : Textbook on Wood Science 6. Wood cutting 2nd ed. (edited by Banshoya, K. et. al). pp.59-64, Kaiseisha, Otsu, 2007
- Fujii, Y., S. Okumura, et.al.:1. PEG impregmination process in wood : Basic and applied techniques of impregmination for advanced nano-technology (edited by Koishi, N.). pp.329-340, Technosusytem corp., Tokyo, Japan

Original Papers

- Indrayani, Y., T. Yoshimura, Y. Yanase and Y. Imamura: Feeding responses of the western dry-wood termite *Incisitermes minor* (Hagen) (Isoptera: Kalotermitidae) against ten commercial timbers. J. Wood Sci., 53; 239-248, 2007
- Fujii, Y., Y. Fujiwara, Y. Yanase, S.Okumura, K. Narahara, T. Nagatsuma, T. Yoshimura and Y. Imamura: Nondestructive detection of termites using a millimeter-wave imaging technique. Forst Products J., 57(10) ;75-79, 2007
- Tsuchiya, A., S. Okumura, Y. Fujii, Y. Fujiwara: No sanding before painting by using CrN coated tool. Proc. 18th Int. Wood Machining Seminar, Vancouver, May 7-9, 2007. Vol. 1, p.323-328
- Fujiwara, Y., Y. Fujii, S. Okumura: Effect of visual information on tactile evaluation of wood surface roughness. Proc. 18th Int. Wood Machining Seminar, Vancouver, May 7-9, 2007. Vol. 2, p.91-96
- Fujii, Y.; Nondestructive evaluation of biodegradation in historic wooden buildings, Proc. of 2007

International Syposium on Conservation of Cultural Heritage in Ease Asia (Souel, Nov. 11.1-2, 2007, p.99-104

Reviews

Okumura, S. and Y. Fujiwara ; Roughness evaluation o fmachined surfaces of wood. MokuzaiGakkaishi, 53(4); 173-179, 2007

Reports

- Fujii, Y.: Recent technologies for detection of decay and termite attack in wood. Shiroari, No.148 ; 31-36, 2007
- Fujii, Y.: Biodegradation in wooden temple buildings and maintenance techniques. J. of the Society of Architechtural Study, No.14 ; 8-15, 2007
- Fujii, Y. (part): Report on attack of dry-wood termites and preseavation technique. (Spcial Committee on dry-wood termite, the Japan Termite Control Association, Shiroari, No. 147; 11-24, 2007
- Fujii, Y.:Suitable maintenance techniques for control of biodegradation in wooden house. "Wisdom and Techniques for Surviving Traditional Wood Houses from Earthquake Disasters" (edited by Saito, Y.). p.44-52, Disaster Prevention Research Institue, Kyoto University, 2008.3
- Yanase, Y.(part) : Survey on damage and biological deterioration of houses in Niigataken Chuetsu-Oki Earthquake in 2007, Shiroari, No.149 ; 11-19, 2008
- b) Conference and seminar papers presented
- The 56th Annual Meeting of Japan Society of Materials Scienece (Nagoya, 2007.5.19-20): 1 (Yanase)
- The 57th Annual Meeting of Japan Wood Research Society (Hiroshima, 2007.8.8-10) :4 (Okumura, Fujii, Sawada, Yanase, Fujiwara)
- The 58th Annual Meeting of Japan Wood Research Society (Tsukuba, 2008.3.17-19) : 5 (Okumura, Fujii, Sawada, Yanase, Fujiwara)
- 2007 International Syposium on Conservation of Cultural Heritage in Ease Asia (Souel, 2007.11.1-2): 1 (Fujii)

The 51th Japan Congress on Materials Research (Kyoto, 2007. 11. 27-29): 1 (Yanase)

A-3. Off-campus activities

Membership in academic societies (roles)

- Okumura, S.: The Japan Wood Research Society (director, chairperson of Information Committee), Wood Technological Association of Japan (councilor, director of Kansai Branch)
- Fujii, Y.: Wood Technological Association of Japan (Kansai branch, organizing committee), The Society of Materials Science, Japan (director, councilor, editorial committee), Japan Wood Preserving Association (director, committee chair of wood degradation inspector)
- Sawada, Y.: Wood Technological Association of Japan (Kansai branch, organizing committee)

Reserach grants

Grant-in-Aid for Scientific Research (KAKENHI)

- Fujii, Y: Grant-in-Aid for Scientific Research (A),Nondestrutive testing of wood and wood based materials using millimeter wave imaging (Representative)
- Fujii, Y.:JST Grant for feasibility Study, Development of particulate material from natural minerals as a physical termite bariler and humidity controler

A-4. International co-operations and overseas activities

International meetings (roles)

Okumura, S.: The 17th International Wood Machining Seminar (member of Advisory Committee)

B. Educational Activities (2006.4-2007.3)

B-1. On-Campus teaching

a) Courses given

- Undergraduate level: Forest and Biomaterials Science III (Okumura), Basic Forest and Biomaterials Science III (Fujii), Wood Processing I (Okumura), Wood Processing II (Fujii), Laboratory Course in Physics of Forest and Biomaterials (Fujii, Sawada, Yanase), Laboratory Course in Wood Processing (Fujii, Sawada, Yanase), Seminar for Forest Products Engineering (Okumura, Fujii), Reading of Foreign Literature II (Okumura)
- Graduate level: Wood Processing II (Fujii), Seminar in Wood Processing (Okumura, Fujii), Laboratory Course in Wood Processing (Okumura, Fujii, Sawada, Yanase)

B-2. Off-campus teaching, etc.

Part-time lecturer

- Okumura, S.: Graduate School of Agricultural and Life Science, Tokyo University (Special Lecture for Material and Housing Sciences III)
- Fujii, Y.: Symposium on health monitoring techniques against earthquake and maintenance techniques for historic buildings, by the Society of Architectural Study, 2007.6.12 and 11.1 (Lecturer)
- Fujii, Y.: Workshop on preservation of wooden cultural properties against biodegradation, by National Research Institue for Cultural Properties, Tokyo, 2007.11.19 (Lecturer)
- Fujii, Y.: Syposium on reinforcement and maintenance technology for wooden buildings, by Japan Association for Earthquake Engineering, 2007.11.20 (Lecturer)
- Fujii, Y.: Program for building technology of wooden houses, by Hyogo Prefecture, 2007.3.7 (Lecturer)

Open seminar

Sawada, Y: Kyoto University Open Seminar, "Eat The Forest" (Committee)

B-3. Overseas teaching

Students and research fellows from abroad

Studuent (Doctor course) 1 (Ghana)

C. Other Remarks

Okumura, S.: Councilor, Education and Research Council, Kyoto University; Dean, Graduate School and Faculty of Agriculture, Kyoto University; Technical Development Adviser, Hyogo Prefecture

Yanase, Y., Fujii, Y., Okumura S.: JSMS Award for Scientific Papers 2007

2.2.10 Laboratory of Fibrous Biomaterials

StaffProfessor: Kimura Tsunehisa, Dr. Eng. SciAssociate Professor: Yamauchi, Tatsuo, Dr. Agric. Sci.Students and research fellowsDoctor's program : (1)Research fellow : (1)(1)

Master's program : (2) Undergraduate : (2)

A. Research Activities (2007.4-2008.3) A-1. Main subjects

a) Processing of Cellulosic Materials Using Magnetic Fields

Using the technique of magnetic processing, we are trying to create novel cellulosic materials in which the alignment and pattern are finely controlled. These materials could show novel properties having mechanical, optical, thermal, and piezoelectric anisotropies.

- (i) Filler-in-cellulosic matrix: we prepare 2-dimensional composite materials in which organic, inorganic, and metal particles are precisely aligned and patterned magnetically in cellulosic materials such as paper, cellophane, and films of cellulose derivatives. These composites are expected to exhibit anisotropic mechanical, optical, thermal, and electrical properties.
- (ii) Cellulose-as-filler: the sizes of cellulose fibers are controlled from millimeter to nanometer sizes. Depending on their size, they exhibit various physical properties. In addition, by introducing nano particles onto the fiber, further functionalization of fibers can be achieved. By alignment of these fibers using magnetic field, 2-dimensional functional composites will be created.
- b) Development of the technique of pseudo-single crystals and its application to diffraction method.

A magnetic method that we have developed enables to fabricate a pseudo-single crystal (PSC) from a powder sample. The obtained PSC gives rise to XRD equivalent to that obtained from a real single crystal. This method (PSC method) will provide the third way, coming after the powder method and the single crystal method in the diffraction methods including X-ray and neutron method. Since the protein structure analysis is becoming important, encouraged by a current trend of biorefinery, we expect an increasing demand to our PSC technique.

c) Paper friction at different atmospheres

Friction of commercial papers under dry, moderate and humid atmospheres was examined, comparing with those of cellulose film and aluminum foil. The friction coefficient between different papers generally gave their intermediate value. The coefficient between equal cellulosic materials including paper increased with humidity, while that of aluminum against aluminum was constant irrespective of surrounding humidity. However the surface wetting with a slight amount of water on aluminum caused rapid increase in the coefficient. The capillary force may cause this phenomenon, and the sharp increase of friction between cellulose films in humid atmosphere was similar to that observed with aluminum foils which were wetted with a slight amount of water. These suggest that the capillary force by a slight amount of water may raise frictional force of cellulosic materials including paper at high humidity.

d) Role of the additives for new function development in paper materials

Laboratory handsheets made from lightly beaten hardwood kraft pulp containing various amounts of cationic type polyacrylamide (PAM) dry strength resin were prepared by both the internal and external application methods. The internal application was performed by adding a dilute aqueous PAM solution to pulp fiber suspension, while the external application was performed by dipping a dry paper (handsheet) into an aqueous PAM solution and further squeezing it out with/without the standard wet press. ATR-FTIR analysis combined with gradual etching method was used to clarify a difference in depth profile of PAM within a fiber wall between these application methods. For the internal application method, PAM existed, on the whole, mainly close to fiber surface and slightly distributed from fiber surface toward the center of fiber wall. On the other hand, in case of external application, PAM existed mainly on fiber surface and around fiber-to-fiber bonds. Dynamic mechanical properties of the papers containing PAM were measured at the temperatures ranging from 100°C to 300°C and at the various frequencies. In case of adding by internal method, no characteristic viscoelasticity of PAM appeared. On the other hand external method addition at the nearly same retention level of PAM gave the characteristic viscoelasticity. These findings suggest following things; when cationic type PAM dry strength resin is applied by the internal method, the PAM may distribute within a fiber wall in molecularly dispersed state. The induced state of PAM within a fiber wall, no existence of a phase of PAM, leads to disappearance of the viscoelasticity of the PAM. On the other hand the external application method brings about the PAM distribution around the fiber-to-fiber bonds as well as over the fiber surface. The induced state of PAM, existence of a kind of PAM phase, leads to appearance of the viscoelasticity of the PAM itself. Dynamic mechanical analysis could be a good method examining whether the PAM is molecularly distributed or making aggregates in paper and other polymer composites.

e) Characterization of recycled paper

In order to examine the sheet strength reduction and the net effect of simple dry-rewetting cycles, handsheets from softwood and hardwood bleached kraft pulps were repeatedly subjected to drying-and-rewetting cycle up to 30 times and were compared with those recycled through the drying-and-rewetting and disintegration processes. The decrease in coarseness of softwood pulp fibres both with and without disintegration was unexpectedly large. Decreases in density and tensile index of the sheets at early recycling were large, while the decreasing rate per cycle of those at over about five times recycling were getting small for both softwood and hardwood pulps except the density of the recycled sheets without disintegration. Although the decreases in density and tensile index of the sheets from recycled softwood pulp at early recycling were smaller than those for recycled hardwood pulp, the decrease in WRV (Water Retention Value) of softwood pulp at early recycling was larger than that from hardwood pulp. Furthermore, the decreases in density and tensile index of the recycled sheets without disintegration at early recycling were smaller than those from recycled pulp with disintegration, however the WRV of the former was larger than that of the latter. These results suggested that the hornification indicated by a decrease in WRV was questionable as the main mechanism for the tensile strength reduction on recycling. Observation of the freeze-dried wet sheets using scanning electron microscopy suggested that a decrease in external fibrillation with increasing of recycle number could affect on the changes in the CSF and WRV and further could partly cause the larger decrease in tensile strength of the sheet from recycled pulp with disintegration. Qualitatively, the

loss of external fibrillation on recycling of hardwood pulp was more significant than that of softwood pulp.

A-2. Publications and presentations

a) Publications

Books

Yamauchi, T.: Chap.9 Paper structure and the surface structure, its character and evaluation, Precise design of paper handling and its trouble shooting (edited by H. Hashimoto) pp.143-162, Triceps, Tokyo, 2008 (in Japanese)

Original papers

- Kimura, T., Okamoto, S., Uemura, T.: Magnetic Alignment of Magnetically Isotropic Diamagnetic Rod-Like Particle in Modulated Magnetic Field. Jpn. J. Appl. Phys. 46(2) 586-588 (2007).
- Piao, G., Kimura, F., Takahashi, T., Moritani, Y., Awano, H., Nimori, S., Tsuda, K., Yonetake, K., Kimura, T.: Alignment and Micropatterning of Carbon Nanotubes in Polymer Composites Using Modulated Magnetic Field. *Polymer J.* **39**(6) 589-592 (2007).
- Kimura, T., Kamioka, T., Kuga, S.: Filtration-Assisted Magnetic Micropatterning of Bacterial Cellulose. *Polymer J.*, 39(11), 1199-1201 (2007).
- Yasui, A., Kimura, F., Kiyoshi, T., Kimura, T., Yeonhwan, J., Sakurai, S.: Microdoman Orientaion in Cheleate-Doped Block Copolymers by a High Magnetic Field. *Kobunshi Ronbunshu*, 64(5), 317-323 (2007)
- Yamato, M., Kimura, T.: Size of Initail Structure Foumed During Melt Crystallization of Crystalline Polymer in Relation to the Magnetic Alignment. *Kobunshi Ronbunshu*, 64(7), 464-470 (2007)
- Yamauchi, T.: A method to determine lumen volume and collapse degree of Pulp fiber by using bottle-neck effect of mercury porosimetry. J. Wood Sci. 53; 516-519, 2007

Reviews

- Kimura, T.: Alignment of Powder Crystallites Under High Magnetic Field –Applications to Diffractometry and Spectroscopy–. Hamon (The Japanese Society for Neutron Science), 17 (1) 55-58 (2007)
- Yamauchi, T.: Study on tensile deforming process of paper through the detection of sound from micro failure (Application of acoustic emission method). J. JSNDI 56;(11) 556 -560, 2007 (in Japanese)
- Yamauchi, T.; Study on tensile deforming process of paper, its structural changes determined by optical measurement. J. JSNDI 56;(11) 567-570, 2007 (in Japanese)
- b) Conference and seminar papers presented

The 2nd Annual Meeting of the Magneto Science Society of Japan, 6 papers

The 51th The Clay Science Society of Japan, 1 paper (invited)

The 2nd workshop of the Magneto-Science Society of Japan, 1 paper (invited)

The 58th Annual Meeting of the Japan Wood Research Society, 1 paper (invited)

The 2007 IEEJ National Meeting, syposium, 1 paper (invited)

88th Spring Meeting of CSJ, symposium, 1 paper (invited)

The 2007 Autumn Research symposium of Fiber Science and Technology Japan, 2 papers

The 74th Symposium on Paper and Pulp Research, 1 paper

A-3. Off-campus activities

Membership in academic societies

- Kimura, T.: The Magneto Science Society of Japan (vice president), The Society of Polymer Science, Japan (Polymer Journal, Associate Editor), The Cellulose Society of Japan (Board member)
- Yamauchi, T.: The Japan Technical Association of Pulp and Paper Industry (committee member for wood science and technology), The society of Japan Packaging Science and Technology (councilor)

A-4. International cooperations and overseas activities

Kimura T.: Asia-research center((Nagoya University)

- Kimura T.: Japan-France Seminar (Nagoya University)
- Kimura T.: International Conference on Magneto-Science (ICMS2007), co-organizer
- Kimura T.: 3rd International Workshop on Materials Analysis and Processing in Magnetic Fields (MAP3), Scientific Committee member

International meetings (roles)

Kimura T.: Japan-France Seminar, 1 paper (invited)

Kimura T.: ICRIS 2007 (Kyoto), 1 paper (invited)

Kimura T.: International Cellulose Conference (ICC2007), 2 papers

Kimura T.: International Conference on Magneto-Science (ICMS) 2007: 6 papers including 1 invited

Yamauchi, T.: 2007 International Paper Physics Conference, Gold Coast Australia, (Presentation)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

- Undergraduate level: Forest Science II (Kimura) Physical Chemistry in Bio-materials (Kimura), Pulp and Paper (Yamauchi), Laboratory Course in Forest and Biomaterials Science II (Yamauchi), Laboratory Course in the Basic Forest and Biomaterials Chemistry (Yamauchi), Laboratory Course in the Biomaterials Chemistry II (Kimura, Yamauchi), Seminar in Forest and Biomaterials Science (Kimura, Yamauchi)
- Graduate level: Fibrous Biomaterials I (Kimura), Seminars in Fibrous Biomaterials (Kimura, Yamauchi), Laboratory Course in Fibrous Biomaterials (Kimura, Yamauchi)

B-2. Off Campus teaching, etc.

Open seminar,etc

Kimura T.: Seminar in Graduate School of Kyoto University (lecturer)

C. Other Remarks

Yamauchi, T: Representative of "Paper Science Forum"
Chair of Biomaterials Function

2.2.11 Laboratory of Tree Cell Biology

Staff Professor : Fujita, Minoru, Dr. Agric. Sci. Associate Professor: Takabe, Keiji, Dr. Agric. Sci. Assistant Professor : Yoshinaga, Arata, Dr. Agric. Sci. Assistant Professor : Awano, Tatsuya, Dr. Agric. Sci.

Students and research fellows

Doctor's program : (1) Master's program : (8) Undergraduate : (4)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

a) Formation and ultrastructure of plant cell walls

Many subjects on the formation and ultrastructure of plant cell walls were investigated as the basic studies on plant materials. Immuno-electron microscopic methods were applied to the investigations of cell wall formation in Populus, Eucalyptus and softwood species. Deposition and arrangement of cellulose microfibrils in differentiating fibers in Eucalyptus were studied by using a newly equipped apparatus for freeze fracture. Formation of cellulose microfibrils by Acetobactor in mediums containing xylan, mannan and pectin, and their crystalline structures using a transmission electron microscope, FT-IR were studied by and NMR. Immunocytochemistry revealed the distribution of enzymes involved in lignin biosynthesis. It also showed the deposition process and distribution of hemicelluloses and lignins.

b) Diversity of wood structure and the quantitative evaluation

Structures and properties of woods considerably vary between and within species. In order to use wood effectively, variations in structures and properties should be characterized in detail and evaluated quantitatively. Then, the variations are ordered on several levels such as macro, micro and chemical levels, and analyzed by proper methods. For instance, quantitative evaluation of wood cell structures became possible by the image processing, especially by the Fourier transform and soft X-ray and cell shaped and arrangements were analyzed. Also minute shape changes in the wood drying were evaluated by the method: Three dimensional graphics were applied to the investigation of vessels and cellular structure of wood during differentiation. As to the chemical components of the cell wall, particularly characteristics of lignin composition and its variation among cellular elements were examined by the combination of the microscopic spectrophotometry, chemical analysis and immunocytochemistry.

c) Structural studies on the formation, physiology and functions of the cells in vascular bundles in plants. Structures and behaviors of cell organellae, stored substances and walls in xylem and phloem cells are investigated mainly in trees, bamboos and grass in relation to their development, physiological events and functions. In relation to the physiological function and also utilization, distribution and structure of silica were investigated on bamboo, grass and also rice husk.

A-2. Publications and presentations

a) Publications

Original papers

Yoshinaga, A., Wada M., Fujita M., Chabbert B., Pilate G. : Modified lignification in the cell walls of CAD depressed poplars. IAWA Journal, 28 (4) ; 457-471, 2007

Nishikubo, N., Awano T., Banasiak A., Bourquin V., Ibatullin F., Funada R., Brumer H., Teeri T., Hayashi T., Sundberg B., Mellerowicz E. : Xyloglucan endo-transglycosylase (XET) Functions in Gelatinous Layers of Tension Wood Fibers in Poplar. A glimpse into the mechanism of the balancing act of trees. Plant Cell Physiol., 48; 843 – 855, 2007.

b) Conference and seminar papers presented

The 57th Annual Meeting of the Japan Wood Research Society: 7 papers

The 58th Annual Meeting of the Japan Wood Research Society: 5 papers

A-3. Off-campus activities

Membership in academic societies (roles)

Fujita, M.: International Academy of Wood Science (fellow)

Takabe, K.: International Academy of Wood Science (fellow)

Research grants

The Japan Society for the Promotion of Science Research Grants: Grant in Aid for Fundamental Research (C): Preparation of monoclonal antibody against lignin (Yoshinaga), Grant in Aid for Young Scientists (B): Comprehensive histochemistry of enzymes in hemicellulose biosynthesis using DNA aptamer (Awano)

A-4. International cooperation and overseas activities

International meetings (roles)

Takabe: Workshop on Xylogenesis, Korea (Invited speaker)

Yoshinaga : The 11th Cell Wall Meeting, Copenhagen (Participant)

Takabe, Yoshinaga, Awano : The Annual Meeting of International Academy of Wood Science (Local Organizing Committie)

International joint researches, overseas research survey

Awano: Using transgenic trees to elucidate the function of hemicelluloses (Sweden) Yoshinaga: Tension wood formation in transgenic trees with altered lignin metabolism (France)

B. Educational Activities (2007.4-2008.3)

B-1. On-Campus teaching

a) Courses given

Undergraduate level: Basic Forest and Biomaterials Science I (Takabe), Structural and Physiological Biology of Woody Plant Cells (Fujita, Takabe), Formation of Plant Cell Walls (Takabe), Mushroom Science (Awano), Information Technology in Forest and Biomaterials Science (Awano), Reading of Foreign Literature II (Yoshinaga, Awano), Laboratory Course in Forest and Biomaterials Science I (Takabe, Yoshinaga, Awano), Laboratory Course in Forest and Biomaterials Biology (Takabe, Yoshinaga, Awano), Laboratory Course in Ultrastructural Observation of Wood (Takabe, Yoshinaga, Awano), Practice in University Forests I (Takabe, Awano), Seminar in Forest and Biomaterials

Science (Fujita, Takabe)

Graduate level: Tree Cell Biology I (Fujita), Seminor on Tree Cell Biology (Fujita, Takabe), Laboratory Course in Tree Cell Biology (Fujita, Takabe)

B-2. Off-Campus teaching

Open seminar, etc

Takabe: Workshop on adhesion (Lecturer).

2.2.12 Laboratory of Chemistry of Composite Materials

Staff Professor : Nishio, Yoshiyuki, Dr. Eng. Sci.
 Lecturer : Yoshioka, Mariko, Dr. Agrc. Sci.
 Students and research fellows
 Doctor's program : (2)
 Master's program : (7)
 Undergraduate : (4)

A. Research Activities (2007.4-2008.3) A-1. Main subjects

The major specialization of this laboratory is the chemical conversion of renewable natural resources such as wood and its constituents (cellulose, lignin, etc.), starch, chitin, lipids, and so forth into useful materials showing specific functions in some advanced applications and/or adequate conformity with the environment. Various kinds of chemical techniques are employed, including interfacial reactions in bulk, solvolysis, molecular modifications, and microscopic hybridization with supplementary compounds, to design and fabricate new types of biodegradable polymers and composites, liquid crystals, and intellectual polymer networks, and so on.

a) New Functionalization of Polysaccharides and Related Natural Compounds

Naturally occurring polysaccharides represented by cellulose and chitin, and a polyphenol lignin have been re-evaluated recently as renewable organic resources. They are environmentally benign substances and possess a high potential to be newly developed for industrial and medical applications in themselves or in combination with various synthetic compounds. Our current research is concerned with utilization of the inexhaustible natural polymers as new functional chemicals or high-performance materials. Efforts are also devoted to elucidating several fundamental problems on the molecular and supramolecular structures and physical properties of carbohydrate polymers and related natural compounds. Of particular interest are (1) the microscopic incorporation (including graft-copolymerization) of cellulose and chitin with other polymers or inorganic substances, (2) the liquid crystallinity and chiroptical properties of carbohydrate polymers and lignin derivatives, and (4) the molecular assembly of cholesterol-based lipids, each directed toward the design and fabrication of new, useful functional materials. Concretely, the material functionalities arousing interest include

highly controllable biodegradability coupled with easiness of processing, and further extensions for special uses demanding dynamic controls, e.g., in shape memory-recovery performance or in novel optical, electro-optical, and magnetic functions.

b) Thermoplasticization and Liquefaction of Plant Biomass, and their Applications to Highperformance, High-functional Materials

Wood can be converted to a thermally flowable material directly by chemical modifications in various structural levels, which may be termed "internal plasticization" of wood. In some cases, the thermoplastic property can be attained by blending the modified wood with supplementary plasticizers. By virtue of such plasticizing techniques, we can design and fabricate a variety of wood-based, melt-moldable composites, applicable to many articles of daily use, housing materials, and so on. Wood can also be liquefied through reaction and solvolysis in phenols or polyhydric alcohols. In addition to fundamental studies to elucidate the liquefaction mechanism, we are making efforts to apply the high reactivity of the liquefied wood and ingredients, e.g., to preparations of composites for adhesives, molding materials, foams, and coatings which are desirable to be environmentally friendly or biodegradable in view of practical uses. Studies directed towards utilization of other biomasses along the above-mentioned line are also in progress.

A-2. Publications and presentations

a) Publications

Original papers

- Takahiro Ohno and Yoshiyuki Nishio: Molecular Orientation and Optical Anisotropy in Drawn Films of Miscible Blends Composed of Cellulose Acetate and Poly(*N*-vinylpyrrolidone-*co*-methyl methacrylate), *Macromolecules*, 40 (9), 3468-3476 (2007).
- Ryuhei Morita, Fareha Zafar Khan, Shikazu Sakaguchi, Masashi Shiotsuki, Yoshiyuki Nishio, and Toshio Masuda: Synthesis, characterization, and gas permeation properties of the silyl derivatives of cellulose acetate, *J. Membr. Sci.*, 305 (1-2), 136-145 (2007).
- Fareha Zafar Khan, Masashi Shiotsuki, Yoshiyuki Nishio, and Toshio Masuda: Synthesis and Properties of Amidoimide Dendrons and Dendoronized Cellulose Derivatives, *Macromolecules*, 40 (26), 9293-9303 (2007).
- Dan Aoki, Yoshikuni Teramoto, and Yoshiyuki Nishio: SH-Containing Cellulose Acetate Derivatives: Preparation and Chracterization as a Shape Memory-Recovery Material, *Biomacromolecules*, 8 (12), 3749-3757 (2007).
- Ryosuke Kusumi, Yasuto Inoue, Masakazu Shirakawa, Yoshiharu Miyashita, and Yoshiyuki Nishio: Cellulose Alkyl Ester/Poly(e-caprolactone) Blends: Characterization of Miscibility and Crystallization Behaviour, *Cellulose*, 15 (1), 1-16 (2008).

Books

- Yoshiyuki Nishio and Yoshikuni Teramoto: "Exploring Novel Functions of Biomass" In "Agriculture in the 21st Century – In View of Bioresources – Vol. 4: Rediscovery of Forest" (S. Ohta, Ed.), Chap. 10, pp. 349-396, Academic Press of Kyoto University (2007).
- Yoshitaka Aranishi and Yoshiyuki Nishio: "New Cellulosic Fibers Produced by Melt-spinning", In "Advanced Technologies for Chemicals from Wood Resources" (Gyosuke Meshitsuka, Ed.), Chap. 3, Sec. 3, CMC Pub., Tokyo, pp. 148-154 (2007).

Yoshiyuki Nishio and Dan Aoki: "Varieties and Features of Chemical Reactions of Cellulose", In "Advanced Technologies of Cellulose Utilization" (Akira Isogai, Ed.), General & Basic Remarks, Chap. 3, pp. 148-154 (2008).

Reviews

Yoshiyuki Nishio: Basics and Applications of Cellulosic Materials II. Molecular Compositional Materials Based on Cellulosics, *Zairyo (J. Soc. Mat. Sci., Jpn)*, 57(2), 199-204 (2008).

Patents

- Patent granted
- Patent no. 2008-49177 'Biomass nanofiber reinforced UV curable water-based coatings, and the methods of production', inventors: Shiraishi, N., Yoshioka, M., patentee: AGRIFUTURE JOETS CO.,Ltd., application date: Feb. 29, 2008
- b) Conference and seminar papers presented

The 56th Annual Meeting of the Society of Polymer Science, Japan (Kyoto), 5 papers

The 14th Annual Meeting of the Cellulose Society of Japan (Shizuoka), 3 papers

The 57th Annual Meeting of the Japan Wood Research Society (Hiroshima), 2 papers

The 52nd Lignin Symposium (Utsunomiya), 1 paper

- The 58th Annual Meeting of the Japan Wood Research Society (Tsukuba), 3 papers
- 2nd International Cellulose Conference (ICC2007) (Tokyo), 6 papers (including 1 invited paper)
- European-Japanese Workshop on Cellulose and Functional Polysaccharides (Kyoto), 1 paper (invited)
- 33rd Meeting of the Research Association on Fiber Precessing Technologies (Osaka), 1 paper (invited)
- 53rd Summer College of the Society of Polymer Science, Japan (Hokkaido), 1 paper (invited)
- 51st Congress on Materials Research in the Science Council of Japan (Kyoto), 1 paper (invited)
- 71st Seminar of the Association of Organic Device Research (Nagoya), 1 paper (invited)
- Pre-symposium of ACS Cellulose & Renewable Materials Division Symposia (Uji), 1 paper (invited)
- Special Meeting on New Fiber Developments in the Japan Chemical Fibers Association (Tokyo), 1 paper (invited)
- The 3rd workshop and the seminar on environment, Research and Development Center of Bamboo Resource (Kyotanabe), 1 paper (invited)

A-3. Off-campus activities

Membership in academic societies (roles)

- Nishio, Y.: The Cellulose Society of Japan (Vise President), The Society of Fiber Science and Technology, Japan (Councilor), Wood Technological Association of Japan; Wood-Plastic Composite Materials Committee (Auditor; Academic Advisory Panel of Wood-Plastic Composite Materials Committee)
- Yoshioka, M.: The Japan Wood Research Society (Member of Editorial Board, Member of Committee for Strengthening and Setting up the Studies of The Japan Wood Research Society, Member of Working Group for Formulation of Educational Contents), The Society of Materials Science, Japan (General Organizer of Polymer Materials Section Committee), Wood Technological Association of Japan (Academic Advisory Panel of the Wood-Plastic Composite Materials Committee, Organizer of the Plywood Committee),

The Society of Polymer Science, Japan (Member of Steering Committee for Research Group of Ecological Materials)

Research grants

Monbu-Kagakusho/JSPS Research Grants:

- Grant-in-Aid for Scientific Research (B), Structural Relaxation Characteristics and Functions of Liquid-Crystalline Glasses of Polysaccharides and Lipids (Head, Nishio; Co-researcher, Yoshioka)
- Grant-in-Aid for Scientific Research (C), Nanostructure control and Function Expression of Sugar biomass derivatives / Clay composite materials (Head, Yoshioka; Co-researcher, Nishio)

Others:

Yoshioka, M: Trust Research via the Ministry of Agriculture, Forestry and Fisheries of Japan and Bio-oriented Technology Research Advancement Institution / Agrifuture Joetsu CO.,Ltd, Functional plasticization of biomass and its application.

A-4. International cooperations and overseas activities

International cooperations

Nishio, Y.: Member of Editorial Board of the Journal "Cellulose"

International meetings (roles)

Nishio, Y.: The 2007 International Symposium on Nano-fibers, Member of Organizing Committee; International Cellulose Conference 2007 (ICC 2007 Tokyo) (Member of Organizing Committee); European-Japanese Workshop on Cellulose and Functional Polysaccharides 2007 (Chairman of Organizing Committee & Chairman of Managing Committee); Pre-symposium of ACS Cellulose & Renewable Materials Division Symposia (Organizer); American Chemical Society, Cellulose & Renewable Materials Division, Anselme Payen Award Symposium (Organizer)

Yoshioka, M.: The 10th Pacific Polymer Conference (PPC 10), (Oral presentation)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

- Undergraduate level: Forest and Biomaterials Science II (Nishio), Polymer Synthetic Chemistry (Nishio), Physical Properties of Polymers (Nishio), Materials Chemistry of Biomass Composites (Yoshioka), Laboratory Course in Forest and Biomaterials Science II (in part; Nishio, Yoshioka), Laboratory Course in the Basic Forest and Biomaterial Chemistry (in part; Nishio, Yoshioka), Laboratory Course in the Biomaterials Chemistry II (in Part; Nishio, Yoshioka)
- Graduate level: Chemistry of Composite Materials II (Nishio), Laboratory Course in Chemistry of Composite Materials (Nishio, Yoshioka), Seminar in Chemistry of Composite Materials (Nishio, Yoshioka),

B-2. Off-campus teaching, etc.

Part-time lecturer

Nishio, Y.: Graduate School of Agriculture, Kyoto Prefectural University (Physical Properties of Polymers)

Yoshioka, M : Kyoto Study Center of The Open University of Japan (Materials Chemistry of Biomass Composites)

C. Other Remarks

Nishio, Y.: Committee Member of JSPS (Japan Society for the Promotion of Science) Yoshioka, M.: Committee Member of JSPS (Japan Society for the Promotion of Science)

2.2.13 Laboratory of Chemistry of Biomaterials

Staff Professor : Nakatsubo, Fumiaki, Dr. Agric. Sci. Associate Professor: Takano, Toshiyuki, Dr.Agric.Sci. Assistant Professor : Kamitakahara, Hiroshi, Dr. Agric. Sci. Students and research fellows Doctor's Program : (3) Master's Program : (8) Undergraduate : (4)

A. Research Activities (2007.4-2008.3) A-1. Main subjects

a) Chemical syntheses of oligo- and polysaccharides and their function

Research in our laboratory encompasses the development of photo-current cellulosic materials for a new artificial photosynthesis system, the synthesis of reducing end modified cellulose derivative and its properties, the syntheses of regio-substituted oligosaccharides and their surfactant abilities, the preparation of enzyme immobilized amino-cellulose and its properties, immobilization of tannin component to cellulose, and the evaluation system of peeling reaction using cello-oligosaccharides.

b) Reactivity of lignin

The elucidation of peculiar behavior of sinapyl alcohol in the dehydrogenative polymerization (lignin formation) using γ -substituted monolignol derivatives, and the analysis of the products in the dehydrogenative polymerization of alkyl ferulate are currently being investigated to obtain fundamental knowledge of the dehydrogenative polymerization of lignin. The electronic oxidation of lignin model compounds for pretreatment of Kraft pulping, the synthesis of β -5 type lignin oligomers are also being investigated.

c) Chemical syntheses of the extractive and their utilization

Other targets of current interest include preparation of condensed-tannin from taxifolin, which is one of the components in heart wood of Larix species, and evaluation of its anti-oxidant. We are developing a new functional polymer with galloyl group as a pendant.

d) Chemical modification of wood

A chemical modification method of wood using super-critical carbon dioxide as a green process is also being investigated.

A-2. Publications and presentations

a) Publications

Original papers

- Ifuku S., Nogi M., Abe K., Handa K., Nakatsubo F. and Yano H.: Surface modification of bacterial cellulose nanofibers for property enhancement of optically transparent composites: Dependence on acetyl-group ds. Biomacromolecules 8(6): 1973-1978, 2007.
- Kamitakahara H., Nakatsubo F. and Klemm D.: New class of carbohydrate-based nonionic surfactants: Diblock co-oligomers of tri-O-methylated and unmodified cello-oligosaccharides. Cellulose 14(5): 513-528, 2007.
- Renbutsu E., Okabe S., Omura Y., Nakatsubo F., Minami S., Saimoto H. and Shigemasa Y.: Synthesis of uv-curable chitosan derivatives and palladium(II) adsorption behavior on their uv-exposed films. Carbohydrate Polymers 69(4): 697-706, 2007.
- Sakakibara K., Kamitakahara H., Takano T. and Nakatsubo F.: Redox-active cellulose langmuir-blodgett films containing beta-carotene as a molecular wire. Biomacromolecules 8(5): 1657-1664, 2007.
- Sakakibara K., Ogawa Y. and Nakatsubo F.: First cellulose langmuir-blodgett films towards photocurrent generation systems. Macromolecular Rapid Communications 28(11): 1270-1275, 2007.
- Takano T., Ishikawa J., Kamitakahara H. and Nakatsubo F.: The application of microwave heating to the synthesis of 6-amino-6-deoxycellulose. Carbohydr. Res. 342(16): 2456-2460, 2007.
- Tobimatsu Y., Takano T., Kamitakahara H. and Nakatsubo F.: Azide ion as a quinone methide scavenger in the horseradish peroxidasecatalyzed polymerization of sinapyl alcohol. J. Wood Sci. 54(1): 87-89, 2008.
- Yoneda Y., Krainz K., Liebner F., Potthast A., Rosenau T., Karakawa M. and Nakatsubo F.: "furan endwise peeling" of celluloses: Mechanistic studies and application perspectives of a novel reaction. European Journal of Organic Chemistry(3): 475-484, 2008.
- Adelwohrer C., Yoneda Y., Nakatsubo F. and Rosenau T.: Synthesis of the perdeuterated cellulose solvents n-methylmorpholine N-oxide (nmmo-d(11)) and N,N-dimethylacetamide (DMAc-d(9)). Journal of Labelled Compounds & Radiopharmaceuticals 51(1-2): 28-32, 2008.

Patent

Patent pending/applied for

- Patent no. JP 2007126976, patentee: Nakatsubo, F., Sakakibara, K., Ogawa, Y., registration date: May.11, 1007
- Patent no. JP 2007153897, patentee: Nakatsubo, F. Yano, H., Abe, K. registration date: June 11, 2007.

Review

Nakatsubo, F., Sakakibara, K. "Anodic photocurrent generation from cellulose thin film -Role-sharing functionalization of cellulose-", Cellulose Communications, 14(4), 149-153 (2008).

Reports

Takano T.: European-Japanese Workshop on Cellulose and Functional Polysaccharides 2007, Cellulose Communication 15(1) 40-41 TakanoT.: The 13th Cellulose micro-symposium report, Cellulose Communications 15(1) 42-44

- b) Conference and seminar papers presented
- The 14th Annual Meeting of the Cellulose Society of Japan (Shizuoka, 2007.7.19-7.20), 2 papers
- The 57th Annual Meeting of the Japan Wood Research Society (Hiroshima, 2007.8.8-8.10) 4 papers
- The 21th Chitin and Chitosan symposium (Kobe, 2007.7.26-27) 1paper
- The 5th Sekisui Chemical Co. Forum (Kyoto, 2007.10.17) 1paper
- The 2nd International Cellulose Conference (Tokyo, 2007.10.22-10.25) 5 papers
- European-Japanese Workshop on Cellulose and Functional Polysaccharides 2007 (Kyoto, 2007.10-29-10-31) 1 paper
- The 2nd Symposium on Future of Polysaccharides (Nagoya, 2007.11.2) 1 paper
- The 52th Lignin Symposium (Utsunomiya, 2007.11.14-11.14) 2 papers

The 58th Annual Meeting of the Japan Wood Research Society (Tsukuba, 2008.3.17-3.19) 3 papers

A-3. Off-campus activities

Membership in academic societies (roles)

Nakatsubo, F.: The Japan Wood Research Society (A member of Education-promotion committee);
The Cellulose Society of Japan (President); The Society of Fiber Science and Technology,
Japan (Kansai Regional Board), Wood Technical Association of Japan (Councilor),
International Academy of Wood Science (Fellow), Cellulose (Editorial committee), J.
Wood Chem. Technol. (Editorial committee)

Takano, T.; The Cellulose Society of Japan (Kansai regional committee)

Research grants

Monkasho Research Grant:

- Nakatsubo, F.: Basic Research (B) General "Molecular design of the photo-induced electron transfer super material from cellulose and its development for utilization" (Nakatsubo: head, Takano, Kamitakahara: coworker)
- Takano, T.: Basic Research (C) General "Preparations of new functional DHPs from γ -substituted monolignol derivatives." (Takano: head, Nakatsubo, Kamitakahara: coworker)
- Kamitakahara, H.: Young Scientists (A) "Preparation of nano-particles from cello-oligosaccharaides and their dynamic functionalities."

NEDO grant:

Nakatsubo, F.: Funding for the practical application of the university outcomes, Development of the technology for the production of modified bio-nanofibers and their utilization, (Co-researcher)

Nakatsubo, F.: Grant for the production of organic electronics devices (Investigator)

- Nakatsubo, F.: Preliminary Investigation for the International Co-operative Research, the investigation on the availability of biomass resources as raw materials for bio-nanofibers, (Co-researcher)
- Takano, T.: Preliminary Investigation for the International Co-operative Research, the investigation on the availability of biomass resources as raw materials for bio-nanofibers, (Co-researcher)

JSPS grant:

Kamitakahara, H.: JSPS Bilateral Joint Projest between Japan and Germany "Development of

novel pathway for cellulose derivatives with both regiospecific and blockwise substitutions and their structure-property relationships"

A-4. International cooperations and overseas activities

International meetings

- Nakatsubo F.: The 2nd International Cellulose Conference (Tokyo, 2007.10.22-10.25) (Executive Committee)
- Nakatsubo F.: International Academy of Wood Science 2007 Annual Meeting (IAWS2007), (Kyoto, 2007.10.25-27) (Organizing committee: Chairman)
- Nakatsubo F.: European-Japanese Workshop on Cellulose and Functional Polysaccharides 2007 (Kyoto, 2007.10-29-10-31) (Organizing committee; invited lecturer)
- Takano T.: European-Japanese Workshop on Cellulose and Functional Polysaccharides 2007 (Kyoto, 2007.10-29-10-31) (Organizing committee: Secretary General)
- Takano T.: International Academy of Wood Science 2007 Annual Meeting (IAWS2007), (Kyoto, 2007.10.25-27) (Local organizing committee)
- Kamitakahara H.: International Academy of Wood Science 2007 Annual Meeting (IAWS2007), (Kyoto, 2007.10.25-27) (Local organizing committee)

Memberships in international academic societies

International Academy of Wood Science (Fellow), Cellulose (Editorial committee), J. Wood Chem. Technol. (Editorial committee)

International joint research, overseas research surveys

- Nakatsubo F.: the investigation on the availability of biomass resources as raw materials for bio-nanofibers (Thailand), NEDO (2008.2.16-22)
- Takano T.: the investigation on the availability of biomass resources as raw materials for bio-nanofibers (Thailand), NEDO (2008.2.16-22)
- Kamitakahara, H.: JSPS Bilateral Joint Projest between Japan and Germany "Development of novel pathway for cellulose derivatives with both regiospecific and blockwise substitutions and their structure-property relationships"
- Kamitakahara, H.: JSPS Bilateral Joint Projest between Japan and Germany (Jena) (2008.3.3-3.14)

Scholars from abroad

Research fellow of JSPS (short term) (2006.5.31-2007.4.30) Dr. Christian Adelwöhrer (from Austria)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

- Undergraduate level: Basic Forest and Biomaterials Sciences II (Nakatsubo), Cellulose Chemistry (Nakatsubo), Biomass Chemistry (Takano), Laboratory Course in Forest and Biomaterials Science II (Takano, Kamitakahara), Laboratory Course in the Basic Forest and Biomaterial Chemistry (Takano, Kamitakahara), Laboratory Course in Biomaterials Chemistry I (Takano, Kamitakahara)
- Graduate level: Biomaterials Chemistry II (Takano), Scientific writing and presentation in English (Takano), Seminar in Biomaterials Chemistry (Nakatsubo, Takano,

Kamitakahara), Laboratory Course in Biomaterials Chemistry (Nakatsubo, Takano, Kamitakahara)

C. Other remarks

Takano T: Sanitary supervisor

Chair of Forest Resources (Field Science Education and Research Center: FSERC)

2.2.14 Laboratory of Forest Information

Staff	Professor	: Takahito,Yoshioka Dr. Sci.	
	Associate Professor: Shiba, Masami, Dr. Agric. Sci.		
	Lecturer	: Nakashima, Tadashi, Dr. Agric. Sci.	
	Lecturer	: Nishimura, Kazuo, Dr. Agric. Sci.	
	Assistant Professor : Sakanoue, Nao, Dr. Agric. Sci.		

Students and research fellows

Master's program : (3) Undergraduate : (2) Research student : (1)

A. Research Activities (2007.4-2008.3) A-1. Main subjects

a) Material cycles in forested watersheds

Surveys on effects of changes in forest environments on watershed environments have been conducted from the viewpoint of the dynamics of material cyclings in the forest, soil and aquatic ecosystems. In order to elucidate characteristics on water discharge and soil/sand erosion from a naturally regenerated forest, temporal and yearly variations in inorganic and organic particles flowing down in streams were observed with a weir and particle traps. Relationship between organic matter and nutrient salts concentrations were used for analyzing the material cyclings in the forest-soil-stream systems.

b) Management of forest resources and timber trade strategies

Taking the sustainable management of forest resources into consideration, the importance of the precise evaluation and monitoring for forest resources is increasing. We conducted integrative and practical surveys on the quantitative evaluation of multi-functions of forest and on the development of forest resource management strategies and timber production technologies. Strategic surveys on the forest certification and those on the timber production, processing and trades, and the forest resource monitoring system based on GIS/image processing have been investigated.

c) Interactions between humans and natures

Relationships between multifunction of an environment and people's value judgment have

been investigating in order to clarify interactions between humans and natures. Biogeochemical simulation models have been developed to predict environmental changes in a forested watershed environment to tree cutting impacts. People's preferences on tree cutting scenarios were estimated by a choice experiment using predicted environmental changes. This study is a collaborative project supported by the Research Institute for Humanity and Nature.

A-2. Publications and presentations

a) Publications

Books

- Shiba, M.: Investigation of the possibility of LCA. Kamigoromo Vol.35, p.148, Nishigaki Forestry Company, Nara, 2007 (in Japanese)
- Nakashima, T.: Brief Note 2 Sediment and circulation. Connected Rings of Forest-Human Habitation-Marine (edited by Yamashita, Y.), p.135-149, Kyoto University Press, Kyoto, 2007 (in Japanese)
- Yoshioka, T.: Forest and Water, Humans and Nature. Connected Rings of Forest-Human Habitation-Marine (edited by Yamashita, Y.), p.211-222, Kyoto University Press, Kyoto, 2007 (in Japanese)
- Kohyama, T., J. Urabe, K. Hikosaka, H. Shibata, T. Yoshioka, E. Konohira, J. Murase and E. Wada : Terrestrial ecosystems in Monsoon Asia: Scaling up from shoot module to watershed. Terrestrial Ecosystems in a Changing World (edited by Canadell, J. G. et al.), p.285-296, Springer-Verlag, Berlin Heidelberg, 2007

Original papers

- Sakamoto, T., M. Shiba and M. Kawamura: New role of forest owners association on forest management practice in local area. Transaction of 118th Annual Meeting of the Japanese Forest Society, 185, 2007 (in Japanese)
- Shiba, M.: Contradistinction of forest certification scheme and forest practice code as a monitoring tool for SFM. Transaction of 118th Annual Meeting of the Japanese Forest Society, 134, 2007 (in Japanese)
- Itaya, A. and M. Shiba: The detection of the long-term forest information from aerial photographs by the object-based image analysis. Transaction of 118th Annual Meeting of the Japanese Forest Society, 433, 2007 (in Japanese)
- Shiba, M. and A. Itaya: Object-oriented image segmentation approach for timber harvest cruising strategies in mountainous areas. Proc. of Austro2007/FORMEC'07, Vienna, Austria, 1-7, 2007
- Sakamoto, T. and M. Shiba: Some Issues on Japanese forest management practice based on the overall analysis of assessment reports on forest certification procedures by FSC. Applied Forest Science 16, 59-67, 2007 (in Japanese)
- Shiba, M. and N. Ogawa: Confronting sustainable forestry in a period of uncertainty and change: forest certification's role as a market-based catalyst. Proc. of 2007 IUFRO All Division 5 Conference, Taipei, Taiwan, 174, 2007
- Yoshioka, T., K. M. G. Mostofa, E. Konohira, E. Tanoue, K. Hayakawa, M. Takahashi, S. Ueda, M. Katsuyama, T. Khodzher, N. Bashenkhaeva, I. Korovyakova, L. Sorokovikova and L. Gorbunova. Distribution and characteristics of molecular size fractions of freshwater dissolved organic matter in watershed environments: Its implication to degradation.

Limnology, 8:29-44, 2007

- Mostofa, K. M. G., T. Yoshioka, E. Konohira, and E. Tanoue. Photodegradation of fluorescent dissolved organic matter in river waters. Geochemical Journal, 41:323-331, 2007
- Kawano, T., H. Takahara, T. Nomura, H. Shibata, S. Uemura, N. Sasaki, N. and T. Yoshioka. Holocene phytolith record at Picea glehnii stands on the Dorokawa Mire in northern Hokkaido, Japan. The Quaternary Research, 46(5):413-426, 2007
- Mostofa, K. M. G., T. Yoshioka, E. Konohira and E. Tanoue. Dynamics and characteristics of fluorescent dissolved organic matter in the groundwater, river and lake water. Water Air and Soil Pollution, 184:157-176, 2007

Reports

- Shiba, M.: Introduction of remote location facilities: FSERC Asiu Research Forest. Newsletter Kyoto University No. 627, p.2481-2482, 2007 (in Japanese)
- Shiba, M.: Impression of memorial symposium of German Prime Minister Menkeru visit to Japan- 10 years from Kyoto Protocol Adapt. Forest Technology No. 787, p.24-25, 2007 (in Japanese)
- Shiba, M.: Tidings from Asiu:1-5, 2006-2007. Information for university workers union, No.67-71, (in Japanese)
- Yoshioka, T.: Natural scientific and humanity-social scientific research on forested watershed environment. Report on the 3rd meeting of the research promotion program on the construction of the cross-disciplinary network for the regional and environmental information in Asia, The Research Promotion Center of the RIHN ed., p.15 and p.62-67, 2008 (in Japanese)
- Environmental valuation project of the Research Institute for Humanity and Nature: Survey on Interest in Watershed Environment. pp.120, ISBN 978-4-902325-27-0, 2008 (in Japanese)
- Environmental valuation project of the Research Institute for Humanity and Nature: Survey on Forest Management for the Next Generation, pp.84, ISBN 978-4-902325-26-3, 2008
- Environmental valuation project of the Research Institute for Humanity and Nature: Survey on Impact Scenario Valuation of Watershed Environment, pp.220, ISBN 978-4-902325-25-6, 2008
- Takahashi, E. and Sakanoue, N.: Wood production and wood processing industry at Yoshino district in Nara Prefecture: The possibility of supply repairing materials for wooden cultural buildings. Transaction of Grant-in-Aid for Scientific Research (A) 2005-2007 Study on Repairing Materials for Wooden Cultural Buildings, 198-207, 2008 (in Japanese)
- b) Conference and seminar papers presented

The 119th Annual Meeting of Japan Forest Society: 8

Annual Meeting of The Japan Forest Engineering Society 2008: 2

The 54th Annual Meeting of The Japanese Society of Group Dynamics: 1

Annual Meeting of Society of Environmental Science, Japan 2008: 3

The 55th Annual Meeting of Ecological Society of Japan: 1

Symposium of the Eco Material Forum: 1

Symposium on the recent status and subjects on the long-term ecosystem monitoring: 1

Annual Branch Meeting of Japan Forest Society: 1

Annual Meeting of The Japanese Forest Economic Society: 1 International society meeting/world conference: 7

A-3. Off-campus activities

Membership in academic societies

Shiba, M.: Kyoto University Branch of JFTA (Chief), The Japan Forest Engineering Society (Director), Branch of Japanese Forest Society (Editorial board member)

Yoshioka, T.: The Japanese Society of Limnology (Councilor)

Research grants

JSPS Research Grant: Grant-in-Aid for Scientific Research (C) (2); Dynamics and environmental preservation role of natural old stands. (Nakashima, T., head), Grant-in-Aid for Scientific Research (C) (2); Development of adaptive forest management system (AFMS) oriented towards the sustainable forest management for Japanese plantation forests. (Shiba, M., head), Grant-in-Aid for Scientific Research (A) (1); Study on the procurement of vegetable materials for repair of wooden constructions as cultural property. (Sakanoue, N., Co-researcher)

A-4. International cooperations and overseas activities

International meetings(roles)

Shiba, M.: International Precision Forestry Symposium, Stellenbosch University, South Africa (Chairperson/presenter), International Conference on Ecological Restoration in East Asia, Osaka, Japan (Presenters), Council on Forest Engineering 29th Annual Meeting, Fortuna CA, USA (Presenter), Austro2007/FORMEC'07, Vienna, Austria (Presenter), 2007 IUFRO All Division 5 Conference, Taipei, Taiwan (Presenter)

International academic society and/or organizational officers

Shiba, M.: IUFRO S3.06 Coordinator, IUFRO S3.06.02 Duty coordinator, International Editorial Board for International Journal of Forest Engineering, USA, International Member of Council on Forest Engineering COFE, USA, FSC International (Japanese member), ISTVS (Japanese member), FSC forest certifiers (Japanese adjudicator)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

- a) Courses given
- Undergraduate level: Forest Management System & Applied Technology (Shiba, M.), Practice Course in Forest Science IV (Shiba, M.), Integrated Practice and its Method on Forest Science (Shiba, M., Nakashima, T. and Sakanoue, N.), Practice in Research Forest III (Sakanoue, N. and others), Fundamental of Glaciology (Yoshioka, T. and Nakashima, T.), Basic Forest Science IV (Yoshioka, T. and others), Forest Science (Shiba, M. and Nakashima, T.), Connected Rings of Forest-Human Habitation-Marine (Shiba, M., Nakashima, T. and Yoshioka, T.), Pocket Seminars (Siba, M., Nakashima, T., Nishimura, K.), Practice on Connected Rings of Forest-Human Habitation-Marine (A: Shiba, M. and others, C: Yoshioka, T. and others), Practice on Environment of Winter Season in Warmtemperate Snowfall Region (Nakashima, T.)

Graduate level: Special lecture on Forest Information Science II (Shiba, M.), Seminar on Forest

Information Science (Yoshioka, T., Shiba, M., Nishimura, K., Nakashima, T. and Sakanoue, N.), Laboratory course in forest information (Yoshioka, T., Shiba, M., Nishimura, K., Nakashima, T. and Sakanoue, N.)

B-2. Off-campus teaching, etc.

Part-time lecturer

Nakashima, T.: Kyoto University of Education (Practice of Cultivation and Breeding)

- Sakanoue, N.: Shimizu branch of Arida-cho High School, "Woods Science" (Lecture)
- Shiba, M.: Faculty of Agriculture, Kyoto Prefecture University (Biosphere resource management), Faculty of Agriculture, Ehime University (Forest operational environment), Japan Green Resources Agency, Kansai and Hokuriku Management Regions (Timber harvesting and transport systems)
- Yoshioka, T.: University of Human Environments (Basic biology A and B), Nara University of Education (Special lecture on Ecological Science)

Open seminar

- Nakashima, T.: The 4th Clock Tower Open Seminar (Planning and Conductor), Summer Open Seminar of Kamigamo E.F.S. (Planning and Conductor), ANA "Aozora-juku: Watashi no Aozora" (Lecture), Spring Open Seminar of Kamigamo E.F.S (Lecture)
- Shiba, M.: Kyoto Univ. For., Open Seminar, Structure and function of Forests (Lecturer), Nature experience class of elementary schools in Miyama (Lecture), University local open special project (Lecture), Forest experience practice program of Kitakuwada high school (Lecture), Senior campus (Lecture), Kyoto University technical training program for staff (Lecture), Field training practice of Japan Green Resources Agency, Kansai and Hokuriku Management Regions (Lecture), Nature observation in Asiu forests (Lecture)

Sakanoue, N.: ANA "Aozora-juku: Watashi no Aozora, Asahi Forest" (Lecture)

Yoshioka. T.: Open Seminar in the Ashiu Experimental Forest "Structure and function of Forests" (Chief organizer, Lecturer), KBS Kyoto TV program "Kyoto Cha-cha-cha" 'Values of Environments' (Lecturer), Open Seminar of ANA "Aozora-juku: Watashi no Aozora, Yaotsu Forest" (Lecturer), The 4th Clock Tower Open Seminar (Main host)

C. Other remarks

Shiba, M.: Mie Prefecture Environmental Conservation Agency (Technical advisor), World Wide Fund For Nature, Japan (Council member of forest management system), TOMIMURA Environment Research Institute (Technical advisor), NPO Forsta (Director), FSC National Initiative

Sakanoue, N.: Forest Committee of Shiga Prefecture (Member)

Yoshioka, T.: Cooperative Researcher in the Research Institute for Humanity and Nature, Japan Wildlife Research Center (Working group member for the Monitoring Site 1000 for freshwater ecosystem)

2.2.15 Laboratory of Silviculture

Staff Professor : Shibata, Shozo, Dr. Agric. Sci. Associate Professor: Ando, Makoto, Dr. Agric. Sci. Associate Professor: Tokuchi, Naoko, Dr. Agric. Sci. Assistant Professor : Sakimoto, Michinori, Dr. Agric. Sci. Students and research fellows

> Doctor's program : (3) Master's program : (6) Undergraduate : (1)

A. Research Activities (2007.4-2008.3) A-1. Main subjects

a) Satoyama management

At present *Satoyama* woodlands especially in urban fringe area are noticed as the target to restore their management, ecosystem and biodiversity. To consider these theses researches of forest vegetation and biodiversity, monitoring of environmental characteristics of managed woodlands, discussion of restoration methods, ecological research of bamboo forest and so on are practiced.

b) Regeneration and dynamics of forest

The establishment of forests and the distribution of tree species are influenced by climate, soil and topography, or natural disaster, artificial disturbance, animal, insect, disease, and the like. Main theme of this study is to clarify the relationship between various environmental factors and dynamics of forest by long-term research of stand structure, diversity, growth and regeneration for natural forest, secondary forest, man-made forest and urban forest of warm-temperate zone, cool-temperate zone and subarctic zone in Japan.

c) Nitrogen cycling

Nitrogen is the limiting factor for plant growth. N dynamics is important for forest, especially in plant-soil system. Nitrogen dynamics is described the typical Japanese vegetation which belongs to Field Science and Education Center, Kyoto University.

d) Studies on dynamics, maintenance mechanisms of biological diversity, and life historical strategies of plant species in forests.

Natural forests are heterogeneous in time and space, and are composed of various many plant species. Those plant species have their own specific life history strategies. To develop the methods for ecological management and conservation of forests, we are engaged in analyzing spatial structure, dynamics mechanisms of diversity, and reproductive ecology and demography of plant species in natural forests.

A-2. Publications and presentations

a) Publications

Books

Shibata S.: Revegetation technology. In "Environmental design – Conservation and creation of landscape - " (Ed. Morimoto Y. & Shirahata Y.), 123-135, Asakura Shoten, Tokyo, 2007 (in

Japanese)

Kobayashi T. & Shibata S.: Satoyama. In "Environmental and revegetation technology" (Ed. Morimoto Y.& Kobayashi T.), 178-186, Asakura Shoten, Tokyo, 2007 (in Japanese)

Original papers

- Shibata S.: Secondary vegetation with shifting mosaics in the world *-Satoyama* and slash-and-burning agriculture farmland-. Proc. 4th International Symposium of Preservation and Restoration of Environmental Ecology, 48-54, 2007
- Abe Y. & Shibata S.: Observation on sporadic flowering of a dwarf bamboo, *Sasa veitchi* Rehder var. *hirsuta* -Flower and seed production habit-. Bamboo Journal, 24, 12-16, 2007 (in Japanese)
- Kimura E., Fukamachi K., Furuta Y., Oku K. & Shibata S.: A study on the actual condition of bamboo forest landscape and the laws of landscape conservation in Saga-Arashiyama. Landscape Research, 70(5), 605-610, 2007) (in Japanese)
- Yoshida H., Imanishi J., Shibata S. & Morimoto Y.: A method for predicting the required seedling density in seeding work, J. Japanese Revegetation technology, 33(2), 369-379, 2007) (in Japanese)
- Ogishi M., Fukamachi K., Oku K., Miyoshi I & Shibata S.: Cooperation of parties involved in the conservation of rice terraces in Kamiseya, Miyazu City. J. Japanese Agricultural Planning, 26 (special issue), 263-268, 2007) (in Japanese)
- Tokuchi, N., Hirobe, M., Nakanishi, A., Wachirinrat, C. and Takeda, H. (2007) Comparison of soil N dynamics between dry dipterocarp forest and dry evergreen forest in Northeastern Thailand. Tropics 16: 323-336
- Fujimaki, R., Tateno, R. and Tokuchi, N. (2007) Root distribution and morphology in Japanese cedar (*Cryptomeria japonica* **D. Don**) plantation chronosequence. Journal of Forest Research 12: 96-102
- Kajimoto, T., Osawa A., Matsuura, Y., Abaimov, A. P., Zyryanova, O. A., Kondo, K., Tokuchi, N. Hirobe, M. (2007) Individual-based measurement and analysis of root system development: case studies for Larix gmelinii trees growing on the permafrost region in Siberia. Journal of Forest Research 12:103-112
- Tateno, R., Tokuchi, N., Yamanaka, N., Du, S., Otsuki, K., Shimamura, T., Xue, Z., Wang, S. and Hou, Q. (2007) Comparison of litterfall production and leaf litter decomposition between an exotic black locust plantation and an indigenous oak forest near Yan'an on the Loess Plateau, China. Forest Ecology and Management 241:84-90
- Arai, H., Tokuchi, N. and Koba, K. (2007) Possible mechanisms leading to a delay in carbon stock recovery after land use change. Soil Science Society of American Journal 71:1636-1638

Reports

- Shiabta S.: Eat the bamboo –Story of human beings and animals eating bamboo-, Text for Open Classes of Department of Forestry, Kyoto University in 2007 "Eat the Forest – Forest, Trees and Health", 9-24, 2007
- Shibata S.: Effort to the degradation of bamboo forest in Japan and provision against it, Text for the forum "New utilization of bamboo resources", 2-5, 2007
- Shibata S. & Ikeda K.: Flowering of bamboo *Melocanna baccifera* in Mizoram, India 1. Flowering records and the tribe kept in Japan, Proc. 118th Mtgs Japan Forest Society, 2007
- Saito T., Suyama Y., Nishiwaki A., Makita A., Mongpuia C.H., Ikeda K., & Shibata S.: Flowering

of bamboo *Melocanna baccifera* in Mizoram, India 2. Condition of bamboo forest before gregarious flowering, Proc. 118th Mtgs Japan Forest Society, 2007

- Ikeda K., Kanzaki M. & Shibata S.: Flowering of bamboo Melocanna baccifera in Mizoram, India 3. Flowering of Melocanna baccifera in slush-and-burning area, 118th Mtgs Japan Forest Society, 2007
- Saito S., Shibata S. & Imanishi A.: Regeneration condition of tree species on the 6th year after the creation of artificial gap in the secondary urban fringe forest. Proc. 118th Mtgs Japan Forest Society, 2007
- Udo T., Yoshida K. & Shibata S.: Sea water sprinkling test aiming at the weeding in revegetation area using coastal plant species – Trial of the Kansai International Airport on the second island –". J. Japanese Revegetation Technology, 33(1), 288-291, 2007
- Muranaga Y., Shibata S. & Hoang H.D.: Basic research of forest resource uses of mountainous minortribes of central Vietnam. Proc. Japan Assoc. Agri. System, 2007
- Shibata S., Ikeda K., Suyama Y., Saito T., Hasegawa H., Miguchi H. Nishiwaki A. & Makita A.: Gregarious flowering and regeneration of *Melocanna baccifera* in Mizoram, India. Proc. 55th Mtg. Ecological Soc. Japan, 142, 2008
- Saito T., Ikeda K., Muanpuia C.H., Suyama Y., Nishiwaki A. Makita A. & Shibata S.: Population structure of bamboo forest just before flowering – *Melocanna baccifera* in Mizoram, India. Proc. 55th Mtg. Ecological Soc. Japan, 142, 2008
- Nakanishi A., Inagaki Z., Shibata S. & Osawa N.: Nitrogen investment to the propagation organ of *Chamaecyparis obtusa* according to the slope location. Proc. 119th Mtgs Japan Forest Society, 2008
- Matsuo A., Suyama Y., Sumiyoshi C., Isagi Y., Hasegawa H., Saito S., Shibata S., Abe Y., Saito T., Nishiwaki A., Suzuki J. & Makita A.: Clone structure and propagation effort of gregariously flowering Sasa veitchii var. hulda vegetation. Proc. 119th Mtgs Japan Forest Society, 2008
- Ando, M.: Report of Vegetation Research of Forest around Hacchou-daira swamp in 2007. Kyoto City, 1-46, 2008
- Ando, M.: Influence of Climate Change on the Decrescence of Fagus species at a Large Scale and Long Term Plot. 94th RISH Symposium, Research Institute for Sustainable Humanosphere, 24-28, 2008
- Ando, M.: Can beech forest survive in Ashiu? : Long term dynamic research of natural forest. Abstract of Open-seminar of Center for Exploratory Research on Humanosphere in 2007, Research Institute for Sustainable Humanosphere, 26, 2008
- Morishita, K., Sakimoto, M. (2007) Spatial distribution patterns of co-dominant three shrubs in a natural conifer-hardwood forest, snowy region of Japan. Trans. 118th Annual Meeting of Forest Society of Japan 118: 458.
- Sakimoto, M., Arai, R., Nakane, I., Nakagawa, T., Kuroda, M., Shibata, Y., Yamauchi, T., Yanagimoto, J., and Nakashima, T. (2007) Dynamics of seeds and seedlings of hinoki-cypress in a natural hinoki-cypress forest, northern suburb of Kyoto City. Trans. 118th Annual Meeting of Forest Society of Japan 118:717.
- Matsuyama, S., Oosawa, N., and Sakimoto, M. (2008) The reproductive ecology of *Rhus trichocarpa*: roles of inflorescence morphology and generalist pollinators on reproductive success. The 55th Annual Meeting of Ecological Society of Japan. P3-078

b) Conference and seminar papers presented

- Shibata: Annual meeting of 118th Japan Forest Society (4), Annual meeting of Japanese Society of Revegetation Technology (1), Annual meeting of Japan Association of Agricultural System (1), Annual meeting of Japan Institute of Landscape Architecture (1), Annual meeting of Society of Agricultural Planning (1), Annual meeting of Ecological Society of Japan (2), Annual meeting of 118th Japan Forest Society (2)
- Sakimoto: The 55-th Annual Meeting of Ecological Society of Japan (1), The 119-th Annual Meeting of Japanese Forest Society (2)

A-3. Off-campus activities

Membership in academic societies

Shibata, S.: Jpn. Inst. Landscape Architecture (Directors, Associate chairman of special journal, Review committee member), Jpn. Soc. Revegetation Technol. (Directors, Chairman of environmental forest section, Member for the selection of award, International community committee member), Ecological Society of Japan (Editorial member of Japanese Journal of Conservation Ecology)

Membership in Science Council of Japan, etc.

Shibata, S.: Jpn. Bamboo Soc. (Councilor, Editorial member), Soc. Study of Bamboo (Rep.), Center for Support of Forest regeneration (Councilor), Foundation for the promotion of bamboo culture (Councilor), Consortium for Bamboo Resources Effective Uses (Advisor), Consortium for green purchase (Advisor), CDM Network in Osaka (Advisor), Research institute of development of environmental resources (Vice-chairman)

Research grants

- Shibata, S.: Grant-in Aid for Scientific Research: Basic Research (A) (1); Ecological study of gregarious flowering of bamboo, *Melocanna baccifera* in North-east India (Shibata rep.), Grant-in Aid for Scientific Research: Basic Research (B) (1); Solution and application of regional recovery mechanism in the middle Vietnam (Shibata part.), Grant-in Aid for Scientific Research: Basic Research (A) (2); Academic research of scientific estimation , restoration methods and abstraction of important ecosystems (Shibata part)
- Ando, M.: Grant-in Aid for Scientific Research: Basic Research (C); Recovery of the forest landscape behind world's cultural heritage in Kyoto (Ando rep.), Kyoto City Grant; Vegetation Research of Forest around Hacchou-daira swamp, 2007 (Ando rep.), Japan Wildlife Research Center Grant; Study for the Long-term Change of the Forest Ecosystem (Ando rep.)
- Tokuchi, N : Grant-in Aid for Scientific Research: Basic Research (B); Mechanism of nitrogen saturation with forest development and its evaluation by PnET-CN (Tokuchi rep) , Grant-in Aid for Scientific Research: Basic Research (B) (2); Evaluation method of environmental influences in forested ecosystem Using model of stream water chemistry (Tokuchi part.)

A-4. International cooperations and overseas activities

International meetings (roles)

Shibata, S.: 4th International Symposium of Preservation and Restoration of Environmental Ecology (presentation), Ceremony for the finish of JICA cooperation project of CENEED

(presentation)

Membership in international academic societies

Shibata S.: World Bamboo Organization (Board member)

International joint researches, overseas research surveys

Shibata, S.: Survey of flowering *Melocanna baccifera* forests (India), Arrangement of the site in natural history museum, Tribhuvan Univ. (Nepal), Survey for research of traditional techniques against the disaster (Vietnam), Ecological research of Miombo forest (Zambia), Bamboo resource research in southern Africa (Malawi), Bamboo resource research in Luzon Island (Philippine), Vegetation research in North-eastern China (China), Support of tree planting activity in central Thailand (Thailand)

Ando, M.: Study for the Vegetation of Semi-arid region (China)

B. Educational activities

B-1. On-campus teaching

a) Courses given

Undergraduate level: Planting design for landscaping (Shibata & Morimoto), Silvology (Sakimoto), Silviculture (Shibata, Sakimoto, Tokuchi), Forest Botany (Ando), Laboratory Course in applied Forest and Biomaterials Science (Ando), Practice of University Forest III (People and Nature of East Hokkaido) (Ando), Practice of University Forest IV (Natural Environment of Cold Winter Period of East Hokkaido) (Ando), Basic Science for Forest and Biomaterials II (Ando and Sakimoto), Practice of Biological and Environmental Science I (Sakimoto and Ando), Science of Biosphere - Life, Food and Environment (Ando and Tokuchi), Regeneration and Dynamics of Forests (Ando), Exercises in Ecological Interactions between Forest and Coastal Area C (Ando), Exercises in Ecological Interactions between Forest and Coastal Area B (Tokuchi), Forest Science (Ando) Training of Research Method I (Kawamura, Ando), Practice of Biological and Environmental Science I (Sakimoto), Practice of Biological and Environmental Science I (Sakimoto), Practice of Biological and Environmental Science I (Sakimoto), Practice of Biological and Environment I (Sakimoto), Practice of Biological Area B (Tokuchi), Forest Science (Ando) Training of Research Method I (Kawamura, Ando), Practice of Biological and Environmental Science I (Sakimoto),

Graduate level: Seminar in Silviculture (Ando, Shibata, Tokuchi, and Sakimoto), Practice Course in Silviculture (Ando, Shibata, Tokuchi, and Sakimoto), Landscape ecology and planning (Morimoto & Shibata), Regeneration of woodland in countryside (Shibata), Practice of field works in forests (Shibata), Insistence of global environmental studies (Shibata et al.)

B-2. Off-campus teaching, etc.

Part-time lecturer

Shibata, S.: Kyoto College of Art (Correspondence course, Landscape Design and Nature conservation)

Open seminar, etc

Shibata, S.: Spring and Autumn Open Lecture of Kyoto Univ.(lecture), 4th Neo Nishiyama Cultural Forum (lecture), Lecture course of Association of Natural Environment conservation of Osaka Pref. (lecturer), ANA Blue Sky Lecture in Thailand (lecture), Open Seminar of Faculty of Agriculture, Kyoto Univ. (lecture), Forum for utilization of bamboo resources in Forestry and Agriculture Center in Shimane Pref. (keynote speech), Bamboo Linkage project of Kyoto Univ. (lecture), Regular meeting of Kyoto Univ. Club, Osaka (lecture), 48th annual meeting of Japan Bamboo Association in Nagano (keynote speech), Open seminar of Kamigamo Experimental Station (lecture), Lecture course of Awaji Landscape Planning and Horticulture Academy (lecturer),, 7th Junior School of Eco; Field study (lecture), Eco-products 2007 (lecture), Regular meeting of Kochi Biomass Study (lecture), Senior Nature College 2007 (lecture), Restoration Project of Ide Town, Kyoto((comment), Workshop for woody biomass energy in Kochi (lecture), Workshop for research of Niyodo river in Ikenoura fishermen's cooperate (report), Cultural School of Kochi Newsletter (lecture), 4th open dialog meeting in Kyoto University Clock Tower (report), Forum for effective use of bamboo resources in Kumamoto Pref. (lecture), Forum of forest and green (lecture)

Sakimoto: Open Seminar in Ashiu Forest Research Station (Lecture), Open Campus for Students of Senior High School

C. Other remarks

- Shibata, S.: Member of committee for the preservation of cultural landscape of Residential woodland in Tonami (Agency of Cultural Affairs), Member of committee for evaluation of research project (Forestry and Forest Products Research Institute, Kansai Branch), President of CENEED (Centre for Nepal of Environmental and Educational Development) Supporting Group, Member of committee for promotion provision of non-timber products (Agency of Forestry), Member of committee for promotion of flood control and disaster control project (Disaster Control Research Corporation), TV interview: Asahi TV (2007.7.27), Newsletter interview: Kyoto Newsletter (2007.6.27)
- Ando, M.: Special Committee of the Meeting for the Promotion of the Forest of Traditional Culture in Kyoto, Director of Sakamoto Shougakkai, Representative of Exploratory Research on Humanosphere in 2007, Research Institute for Sustainable Humanosphere in Kyoto University, Committee of Forest Promotion in Shibecha-cho, Committee of Revegetation in Shibecha-cho

Chair of Wood Biomass Science

2.2.16 Laboratory of Biomass Morphogenesis and Information (Research Institute for Sustainable Humanosphere)

Staff Professor : Sugiyama, Junji, Dr. Agric. Sci. Assistant Professor : Baba, Kei' ichi, Dr. Agric. Sci. Students and research fellows Doctor's program : (2) Master's program : (1) Postdoctoral Fellow : (4) Research Staff : (2)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

a) Structure 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 in vitro biosynthesis technique.

b) In vitro synthesis of cellulose and cell wall-polysaccharides

Biosynthesis of cellulose is hardly clarified. In order to elucidate it, isolating and reconstituting the cellulose-synthesizing activity *in vitro* are put into action with plants or cellulose-producing organisms. Related polysaccharides like ($\beta 1 \rightarrow 3$)-D-glucan is studied as well. Special attention is paid to the fiber formation.

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) Tree Species of Excavated Wood and Relevant Environment

Japan is characterized by wooden culture and many wooden articles have been used for living from ancient time. Man-Wood relation can thus be studied by identifying species used in old wooden building and wood statues. Especially, projects that stem from our unique collection of aged wood from national cultural heritages are of increasing interest.

A-2. Publications and presentations

a) Publications

Original papers

Okahisa Y, Yoshimura T, Sugiyama J, Erwin, Horikawa Y and Imamura Y, Longitudinal rand radial distribution of free glucose and starch in moso bamboo (Phyllostachys pubescens Mazel), J. Bamboo and Rattan, 6, 21-31, (2007)

Kato N, Sato T, Kato C, Yajima M, Sugiyama J, Kanda T, Mizuno M, Nozaki K, Yamanaka S,

Amano Y, Viability and cellulose synthesizing ability of Gluconacetobacter xylinus cells under high-hydrostatic pressure, Extremophiles, 11, 693-698, (2007)

- Hori R, Sugiyama J, Wada M, The thermal expansion of mannan I obtained from ivory nuts, Carbohydr Polym, 70, 298-303, (2007)
- Yokota S, Kitaoka T, Sugiyama J, Wariishi H, Cellulose I nanolayers designed by self-assembly of its thiosemicarbazone on a gold substrate, Adv Mater, 19, 3368-3370, (2007)
- Kvien I, Sugiyama J, Votrubec M, Oksman K, Characterization of starch based nanocomposites, J Mater Sci, 42, 8163-8171, (2007)
- Uraki Y, Nemoto J, Otsuka H, Tamai Y, Sugiyama J, Kishimoto T, Ubukata M, Yabu H, Tanaka M, Shimomura M: Honeycomb-like architecture produced by living bacteria, Gluconacetobacter xylinus. Carbohydr Polym, 69, 1-6, (2007)
- Fujimura F, Horikawa Y, Morita T, Sugiyama J and Kimura S: Double assembly composed of lectin association with columnar molecular assembly of cyclic tri-6-peptide having sugar units.Biomacromolecules, 8, 611-616, (2007)
- Yui T, Taki N, Sugiyama J, Hayashi S: An exhaustive structure search and crystal modeling of β-chitin. Int J Biol Macromol, 40, 336-344, (2007)
- b) Conference and seminar papers presented
- 49th Annual meeting of Japan Society of Plant Physiologist (2)

14th Annual meeting of the Cellulose Society of Japan (4)

58th Annual meeting of the Japan Wood Research Society (13)

A-3. Off-campus activities

Membership in academic societies

Sugiyama Junji: Cellulose society of Japan (Executive board, branch head, Editor), The Japanese Society of Microsocpy (Council, Regional manager, Regional Council), Japan Wood Research Society (member of future planning committee, public information committee)

Research grants

- Sugiyama Junji: Grant-in-Aid for Scientific Research (A) "*In vitro* synthesis of cell wall polysaccharides and their characterization" (coordinator)
- Sugiyama Junji: Funding for the practical application of the university outcomes, Development of the technology for the production of modified bio-nanofibers and their utilization, NEDO(Co-researcher)
- Sugiyama Junji: Grant for the production of organic electronics devices, Industrial-University Comprehensive Alliance (Investigator)
- Baba Kei'ichi: Grant-in-Aid for Scientific Research (C) "Cell wall ultrastructure of transgenic poplar for some glycosyl hydrolases" (coordinator)
- Baba Kei'ichi: Program of Basic Research Activities for Innovative Biosciences (PROBRAIN), "Functions and control of polysaccharides in plant cell wall" (share)

A-4. International cooperations and overseas activities

Membership in international academic societies

Sugiyama, J.: American Chemical Society, cellulose and renewable materials division(program committee), Cellulose (editorial board)

International joint researches, overseas research surveys

Sugiyama J.: *In vitro* synthesis of cell wall polysaccharides (Sweden)

Scholars from abroad

1 Postdoctoral fellow

2 Foreign cooperative researchers (KTH (Sweden), NTNU(Norway))

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given Graduate level: Graduate school of Agriculture (Sugiyama)

B-3. Overseas teaching

Sugiyama, J: Summer school in Sustainable Humanosphere Science (Chibinon, Indonesia)

C. Other remarks

Sugiyama, J.: Committee member for public information Sugiyama, J.: Committee member for the home page administration

2.2.17 Laboratory of Active Bio-based Materials (Research Institute for Sustainable Humanosphere)

Staff	Professor	: Yano, Hiroyuki		
	Associate Profe	essor: Morooka, Toshiro		

Associate Professor: Tanaka, Fumio

Students and research fellow

Post doctoral research fellow :(3)Doctor's program: (1)Master's program: (4)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

- a) Extraction of cellulose nanofibers from wood and agricultural wastes
- b) Development of cellulose nanocomposites
- c) Production of high performance materials based on bacterial cellulose
- d) Utilization of cellulose nanofiber for organic electronic devices
- e) Investigation of the moisture adsorption properties of wood and related materials
- f) Studies on house climate

Regulation mechanism of temperature and humidity in wooden house is investigated.

g) Molecular design of high-performance polysaccharides

New high-performance materials based on polysaccharide derivatives are designed using molecular simulation technique.

A-2. Publications and presentations

a) Publications

Books

- Yano H.:Cellulose Nanofiber Composites, Advance in Cellulose Utilization, p258-266, CMC publishing, Tokyo, 2007
- Yano H.: Wood and House Environment, Sound and Vibration, Wood Physics, p.254-256, Bun-eido publishing, Tokyo, 2007
- Morooka T.: Wood Bending, Encyclopaedia for wood processing, p.290-291, Kodnasha publishing, Tokyo, 2008

Original papers

- Iwamoto, S., A.N. Nakagaito and H. Yano: Nano-fibrillation of pulp fibers for the processing of transparent nanocomposites. Applied Physics A, 89, 461-466, 2007
- Shimazaki, Y., Y. Miyazaki, Y. Takezawa, M. Nogi, K. Abe, S. Ifuku and H. Yano: Excellent Thermal Conductivity of Transparent Cellulose Nanofiber / Epoxy Resin Nanocomposites. Biomacromolecules, 8(9), 2976-2978, 2007
- Abe, K., S. Iwamoto and H. Yano: Obtaining Cellulose Nanofibers with a Uniform Width of 15 nm from Wood. Biomacromolecules, 8(10), 3276-3278, 2007
- Nakagaito, A. N., and H. Yano: Toughness enhancement of cellulose nanocomposites by alkali treatment of the reinforcing cellulose nanofibers. Cellulose, 15(2), 323-331, 2008
- Nogi, M. and H. Yano: Transparent nanocomposites based on cellulose produced by bacteria offer potential innovation in electronics device industry, Advanced materials, 20(10), 1849-1852, 2008
- Iwamoto, S., K.Abe and H. Yano: The effect of hemicelluloses on wood pulp nano-fibrillation and nanofiber network characteristics. Biomacromolecules, 9, 1022-1026, 2008
- Hsieh, Y.-C., H. Yano, M. Nogi and S.J. Eichhorn: An estimation of the Young's Modulus of bacterial cellulose filaments. Cellulose, 15(4), 507-513, 2008
- Nakagaito, A. N., and H. Yano: The effect of fiber content on the mechanical and thermal properties of biocomposites based on microfibrillated cellulose. Cellulose, 15(4), 555-559, 2008
- Morooka, T, Y. Homma and M. Norimoto: Criterion for estimating humidity control capacity of materials in a room. Journal of Wood Science, **53**(3),192-198, 2007
- Morooka, T, Y. Homma and M. Norimoto: Predicting the humidity control capacity of material based on linear excitation-response relationship. Journal of Wood Science, **53**(3),199-203, 2007

Reviews

- Yano H.:Plan resouce-based Materials Innovation for Sustainable Society, Green-Pla Journal, No.25; 17-21, 2007
- Yano H.: Wood for Musical Instruments, KOBUNSHI, 56(8); 614-618, 2007
- Yano H.:Cellulocic Nanocomposites, Jpn. Journal of Materials Science, 57(3); 310-315, 2008

Yano H.:Bionanofiber as Future Oriented Materials, Chemical Engineering, **53**(1); 46-51, 2008

Reports

- Yano H.: Report on the investigation on the availability of biomass resources as raw materials for bio-nanofibers, NEDO, March 2008
- Yano H.: Report on the Inter-University Collaborative Programs (Wood Composite Hall),

"Cellulose nanofiber from Plant Sources", March 2008

Tanaka F.: Molecular simulation of biopolymers — Elastic modulus of cellulose crystallite along the each principal axis —, 2007 Super Computer Laboratory Report, Institute for Chemical Research, Kyoto University, p.95, 2008

Patents

- Yano H. et al.: No.2007-142560, 2007
- Yano H. et al.: No.2007-153897, 2007
- Yano H. et al.: No.2007-234080, 2007

Articles, News paper and TV program

- Yano H.: [Development of bionanofiber reinforced composites] 2007 May 21st, The Chemical Daily
- Yano H.: [Development of bionanofiber materials] 2007 March 10th, Nikkei Shimbun
- Yano H.: [Bionanofiber materials as strong as steel] 2007 March 11th, 12th, Nikkei Buisiness Daily
- Yano H.: 「Automobile using light and high strength plant resources-based materials」 2008 February 15th, Yomiuri Shimbun
- b) Conference and seminar papers presented

The 57th Annual Meetings of the JWRS (8 presentations, Yano, H.)

The 58th Annual Meetings of the JWRS (8 presentations, Yano, H.)

14th Annual meeting of cellulose society of Japan (4 presentations, Yano, H.)

2nd International Cellulose Conference (6 presentations, Yano, H.)

Gordon Research Conference Composites (1 presentation, Yano, H.)

Annual meeting of the Society of Fiber Science and Technology, Japan (2 presentations, Yano)

The 56th Annual meeting of the Society of Materials Science, Japan (2 presentations, Yano)

The 56th Annual meeting of the Society of Polymer Science, Japan(1 presentation, Yano)

Seminar of Wood-based Materials Division, the Society of Materials Science, Japan (1 presentation, Yano)

A-3. Off-campus activities

Membership in academic societies

- Yano H.: Member of The Japan Wood Research Society, Member of The Wood Technological Association of Japan, Member of The Society of Materials Science, Member of the Cellulose Society of Japan
- Morooka T.: Member of The Japan Wood Research Society, Member of The Society of Materials Science, Japan, Member of the Society of Rheology, Japan
- Tanaka F.: Member of The Society of Polymer Science, Japan, Member of The Society of Fiber Science and Technology, Japan, Member of he Crystallographic Society of Japan, Member of Society of Computer Chemistry, Japan, Member of The Japanese Society of Carbohydrate Research, Member of The Cellulose Society of Japan, Member of The Society of Cyclodextrins, Japan

Research grants

Yano H.: Grant for the production of organic electronics devices (Investigator)

Funding for the practical application of the university outcomes, Development of the technology for the production of modified bio-nanofibers and their utilization, NEDO(Head Investigator)

Preliminary Investigation for the International Co-operative Research, the investigation on the availability of biomass resources as raw materials for bio-nanofibers, NEDO (Head Investigator)

Morooka T.: Grant-in-Aid for Scientific Research (C) (2), Moisture adsorption of wood above 100C (Head Investigator)

A-4. International cooperations and overseas activities

International joint researches, overseas research surveys

- Yano H.: the investigation on the availability of biomass resources as raw materials for bio-nanofibers, NEDO
- Yano, H.: 9th International Conference on Wood & Biofiber Plastic Composites (Invited speaker) (2007.5.21-23)
- Yano, H.: International Nanofiber Symposium 2007 (Invited speaker) (2007.6.18-19)
- Yano, H.: International Cellulose Conference 2007 (Invited speaker) (2007.10.22-25)
- Yano, H. International Academy of Wood Science 2007 Annual Meeting (Invited speaker) (2007.10.25-27)
- Yano, H.:European-Japanese Workshop on Cellulose and Functional Polysaccharides 2007(Invited speaker) (2007.10.29-31)

Yano, H.: The 10th Pacific Polymer Conference (Invited speaker) (2007.12.4-7)

Scholars from abroad

 $1\ \mathrm{JSPS}$ postdoctoral fellow

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Wood Composite Products (Yano)

Graduate level: Bio-based Materials Physics II (Yano, Morooka, Tanaka), Seminar in Bio-based Materials Physics (Yano, Morooka, Tanaka), Laboratory course in Bio-based Materials Science (Yano, Morooka, Tanaka), Science for Creative Research and Development of Humanosphere (Yano et al)

B-2. Off-campus teaching, etc.

Open seminar, etc

Yano H.:Seminar for Industrial Technology Center of Kyoto Municipal Industrial Research Institute (Lecturer), The 75th RISH Humanosphere Symposium (Lecturer, Coordinator), SocialNetwork for Biomas Industry Kyoto Biomas School (Lecturer), Kyoto University Open Seminar "Forest, Wood and Life" (Lecture), Seminar of the Adhesion Society of Japan in Osaka (Lecturer), The 34th Symposium for Physical Properties of Food (Lecturer), Seminar for New Materials and New Technology Study Group (Lecturer), Seminar of Carbonized Materials Study Group (Lecturer), Seminar of the Adhesion Society of Japan in Tokyo (Lecturer), Seminar for Advanced Functional Materials Study Group. KinkiChemicalSociety (Lecturer), Seminar for Water and Membrane Study Group, The Society of Polmer Science (Lecturer), Activated Charcoal Study Group Seminar (Lecturer)

Part-time Lecturer

Yano H.: Special Lecture for Bio-Science Cource, Kinki University (Lecturer)

B-3. Overseas teaching

Lectures and seminars

Yano H.: "Cellulose nanocomposites", Indonesian Institute of Science (Indonesia, Lecturer) Yano H.: "Cellulose nanocomposites", Australian Pulp and Paper Institute (Australia, Lecturer) Yano H.: "Cellulose nanocomposites", Queensland University of Technology (Australia, Lecturer) Morooka T. "Humidity control effect of wood", Beijing Forestry University (China, Lecturer) *Student and research fellows from abroad*

Master's program: 1 (Indonesia)

2.2.18 Laboratory of Sustainable Materials (Research Institute for Sustainable Humanosphere)

Staff	Professor	: Kawai, Shuichi , Dr. Agric. Sci.			
	Assistant Professor : Umemura, Kenji, Dr. Agric. Sci.				
Student	s and research fello	WS			
	Doctor's program	: (1)	Research fellow	: (3)	
	Master's program	: (3)	Resercher	: (2)	

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

The laboratory aims to establish the sustainable cycle of forest and forest products by developing the production, utilization and recyling/desposal system of wood biomass. New wood based materials harmonized with both global and regional environment are being developed by making use of the functions of wood as a cellular solid, and integrated projects in the interdisciplinary fields are being carried out to confirm the sustainability of production/utilization system of wood biomass.

The research projects are as follows:

- 1. Development of New Wood Based Materials
 - a) Continuous production process of cylindrical LVL by using spiral winding method.
 - b) Numerical analysis of mechanical properties of cylindrical LVL and paper pipe.
 - c) Development of plant fiber reinforced composites by using plant fibers
 - d) Development of bamboo carbon composites
 - e) Rapid curing technology of cement bonded particleboard
 - f) Development of ultra-low density fiberboard
- 2. Adhesive Resins/ Durability of Adhesion
 - a) Durability of isocyanate resin adhesives
 - b) Application of polysaccharides as adhesives
 - c) Development of chitosan-based adheisves

- d) Characterization of bonding mechanism of binderless board and its application to wood adhesives
- e) Development and utilization of lignin binder
- f) Production of high durable wood adhesives from bark of fast growing trees

3. Integrated Projects

- a) Analysis of material cycle in large-scale industrial plantation
- b) Total processing and utilization system of domestic small-diameter low-grade logs
- c) Preservation of wooden cultural properties –thermal treatment of wood for the color and property control–
- d) Aging of wood and prediction of service life of wood

A-2. Publications and presentations

a) Publications

Original Papers

- Walter T, Kartal S.N, Hang W.J, Umemura S, Kawai S: Strength, decay and termite resistance of orieted kenaf fiberboard. J Wood Sci., 53; 481-486, 2007
- Munawar SS, Umemura K, Kawai S: Characterization of the morphological, physical and mechanical properties of seven nonwood plant fiber bundles. J Wood Sci., 53; 108–113, 2007
- Munawar SS, Umemura K, Kawai S: Effects of alkali, mild steam, and chitosan treatments on the properties of pineapple, ramie, and sansevieria fiber bundles. J Wood Sci., 54; 23-28, 2008

Patents

Patent no.4097249 'Wood adhesive and adhesion method', inventor: Umemura K., Kawai S., resistration date: May 21, 2008

Reviews

- Kawai S.: Development of environmenttaly adaptable materials from biomass resources. WEB Journal, No89, 34-36 (2007)
- Uemura K.: Application for chitosan as wood adhesive. Research Journal of Food and Agriculture, 30(4); 36-40, (2007)

Reports

- Kawai, S.: NPO Sai-no-ki –Process of estabiliment and target of the activities-, Shin-rin Gijutsu, 2-7, No, 783 (2007)
- Kawai, S.: Report of the panel discussion, Wood utilization and forest fostering from viewpoints of citizens, indusries, and rigions -Collabolation and communication-, Wood Industry (Mokuzai Kogyo), 63(1); 2-7 (2008)

Yano, H., Mori, T., Umemura, K.: Utilization of Acasia wood. Seizonken Kenkyu, 3; 49-53, 2007

b) Conference and seminar papers presented

 $58^{\rm th}$ Annual Meetings of the Japan Wood Reserch Society: 8 presentations

G-COE International Workshop: 1 presentaion

The 16th Indonesian Scientific Conference in Japan: 1 presentaion

48th Annual Meeting of Atmospheric Environment: 1 presentaion

The 2007 IUFRO All Division 5 (Forest Products) Conference: 1 presentaion

A-3. Off-campus activities

Membership in academic societies (roles)

- Kawai, S.: The Japan Wood Research Society (Member of directors board) The Society of Materials Science, Japan (General clerk, Members of the Committees of Wood Composite materials and Referee), The Japanese Forest Society, The Forest, Wood, and Environment Academy ((Member of directors board, Member of Steering Committee), The Wood Technological Association of Japan (Member of directors board), The Japan Wood Preserving Association (Head of LCA Committee), The Adhesion Society of Japan,
- Umemura, K.: The Wood Technological Association of Japan (Planning Committee and Officer of the Kansai Branch, Officer of the Plywood Section), The Japan Wood Research Society (Member of Editorial Board).

Membership in Science Council of Japan, etc.

Kawai, S. : Associate Member of the Science Council of Japan

Research grants

- Kawai, S.: Grants-in-Aid for Scientific Research (B): Service life of wood members: Investigation with the samples from histrical wooden buildings and cultural properties.
- Umemura, K.: Grants-in-Aid for Scientific Research (C): Development of high-performance adhesive without using fossil resources., The Agriculture, Forestry and Fisheries Research Council Project: Development of manufacture technology of biomass materials.

A-4. International cooperation and overseas activities

International meetings (roles)

Umemura, K.: AMEU Project Seminar, Indonesia (Invited participant)

Membership in international academic societies

Kawai, S.: International Academy of Wood Science (Fellow)

Umemura, K.: The Japan Wood Research Society (Member of Editorial Board).

International joint researches, overseas research surveys

Kawai, S.: Evaluation of wood biomass in large-scale platation forest and effective utilization of tropical fast growing trees (Indonesia and Mallaysia)

Research and Development for Non-wood Lignocellulosic Materials (China)

Umemrua, K.: Research survey of wood industry using fast-growing tree (China)

Scholars from abroad

Dr. Zhang Ming: Prof. of Nanjing Forestry University

Dr. Ragil Widyorini: Gadjah Mada University

Dr. Ma Lim Fei: Prof. of Zheng Jian Forestry College

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Wood Composites (Kawai, Yano), Science for Sustainable Humanosphere (Kawai)

Graduate Level: Seminar in Wood Composites (Kawai, Umemura).

Laboratory Course of Wood Composites (Kawai, Umemura). Wood Composite Products I (Kawai)

B-2. Off-campus teaching, etc.

Part-time lecturer

Kawai S: Tokyo University f Agriculture and Technology (Faculty of Environment and Resource Science)

Open seminar, etc

Kawai, S.: 1st,2nd, and 3rd NPO Sai-no-ki Symposia Symposium (Coordinator), Kaishonomori daigaku (Lecturer), Nagoya International Forum (Coordinator), Kyoto Biomass School (Lecturer), The Symposium for Promoting Domestic Forest Products Utilization (Lecturer), Forest Seminar in Okayama (Lecturer), Life Style Forum (Lecturer), Housing and Domestic Timber (Lecturer), Seminar of Kenaf Association (Lecturer), Hiyoshi Forest owners Association Seminar on the Award of Emperor (2008) (Coordinator), Semianr of Nantan Forest Association (Lecturer), Seminar of Japan Project Indurial Corp. (Lecturer),

Umemura, K.: Wood Science Seminar (Lecturer), School of wood adhesion (Lecturer),

B-3. Overseas teaching

Lectures and seminars

Kawai, S.: Science for Sustainable Humanosphere 2007 (Indonesia), Indonesia Grobal COE Program (Indonesia), USM-RISH Joint Symposium (Malaysia), The Humanosphere Science School 2008 (Indonesia)

Students and research fellows from abroad

Doctor course student: 1 person (Indonesia)

C. Other remarks

Kawai, S.: President of the association of the research institutes for Inter-university collabolations, Director of the Research Inst. for Sustainable Humanosphere, Member of education and research council, Kyoto Univ., Sub-committee member of JSPS Grant-in-Aid Committee, Councilor of Forst and Forest Products Lab. Japan, Councilor of Forest Management of Kyoto Prefecture, Adviser of Okayama Pref. Wood Technology Center, Sub-committee member of University Establishment (MEXT)

2.2.19 Laboratory of Innovative Humano-habitability (Research Institute for Sustainable Humanosphere)

Staff	Professor	: Imamura,	Yuji, Dr. Ag	rric. Sci.			
	Associate Professor	Associate Professor: Tsunoda, Kunio, Dr. Agric. Sci.					
	Associate Professor	Associate Professor: Yoshimura, Tsuyoshi, Dr. Kyoto Univ. (Agric. Sci.)					
	Lecturer	Lecturer : Hata, Toshimitsu, Dr. Kyoto Univ. (Agric. Sci.)					
	Postdoctoral fellow	Postdoctoral fellow : Kawasaki, Tamami					
	Postdoctral fellow	Postdoctral fellow : Nakayama, Tomoe					
	Postdoctral fellow	Postdoctral fellow : Fujita, Motoko					
Student	ts and research fellows						
	Doctor's program		: (4)	Research fellow	: (3)		
	Master's programn		: (2)	Foreign visiting scient	ist : (2)		
	Foreign collaborative researcher : (3)						

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

The laboratory aim is to establish the society with proper resource recycle system in the future humanosphere. Fundamental and innovative investigations are being conducted with emphasis on the symbiotic relations with forest and wood resources.

a) Comprehensive study on the improvement of durability of wood, wood-based materials and wooden constructions

The improvement of durability of wood and wood-based materials, and the long life-span of wooden constructions with the horizon to the environmental conservation and the prevention of the global warming.

b) Integrated termite control on the basis of fundamental research

Role of symbiotic micro-organisms in the cellulose metabolism of termite; Synthetic route of termite trail-following pheromone; Biological control of termites by entomogenous fungi; Estimation of colony size of termites and fopraging territories and application of bait system to termites.

c) Application of low-toxicity wood preservatives and novel treatment methods to the wood preservation

Development of low-toxicity wood preservatives based on laboratory screening tests of various chemicals and field evaluation; Mode of actions of wood preservatives; Detoxificating pathways of chemicals under various conditions; Application of supercritical fluid to the preservative treatment of wood and wood-based composites.

d) Durability assessment of wooden houses and development of the reliable maintenance system

Assessment of the durability of wooden houses by means of various integrated techniques including the non-destructive detection of deterioration, and development of the reliable maintenance system.

e) Improvement of properties of timbers and wood-based composites by various treatments

Development of high performance wood products by chemical modification, impregnation of polymerizing materials and complex of wood and inorganic chemicals, as well as introduction with natural components.

f) Conservation of wooden cultural properties

Conservation technology wooden cultural properties and waterlogged wood.

g) Bioremediation by wood-relating microorganisms

Bioremediation of environment with decay fungi and termite-symbionts; biological treatments of stable waste materials and insulation materials, and development of new energy options by wood deteriorating organisms.

h) Faunal and floral assessment of tropical plantation forests on wood-deteriorating agents

Biodiversity assessment of wood-deteriorating organisms, such as termites and decay fungi, in tropical plantation forests to maintain sustainability.

i) Wood deterioration and development of electrical conductive wood in the space environment

Wood deterioration in the space environment consisting of radiations, heat cycles etc and electrical conductive wood used as a body of monitoring environment in the space.

j) Development of advanced high functional biomass carbon materials by thermal conversion.

Based on the fundamental study on the structure of carbonized biomass, high functional carbonized materials such as SiC nanorods, nanotubes and graphite are developed with or without catalyst of SiO_2 or Al_2O_3 by thermal conversion such as pulse current sintering method or flush pyrolysis.

k) Micro-structural anlysis of wood carbons and their application to electro-chemical devices

Application of wood carbons to electro-chemical devices, such as litium-batteries and fuel cells, by detailed micro-structual analyses

1) Development of purification or recycling technology from preservative treated wood waste

Development of novel technology for purification and recycling preserved wood wastes with pyrolysis or chemical extraction. Electron microscopic study is conducted for clarifying the mechanism of pyrolysis of CCA (chromium, copper and arsenic oxide)-treated wood. Selective separation of components of CCA, purification and recycling technique of preserved wood wastes.

m) Development for improving fire-resistant performance of wood composites.

Reduced scale fire resistance tests on traditional timber-frame soil walls are studied.

A-2. Publications and presentations

a) Publications

Books

Imamura, Y.: Dictionary of charcoal and wood&bamboo vinegars(edited by Yatagai, M.), Sojyu-Sha, Tokyo, 2007(in Japanese)

Original papers

- Tsunoda, K. and R. Yamaoka: Determination of lethal dose of fipronil for workers of *Coptotermes* formosanus (Isoptera: Rhinotermitidae) in contact with treated sandy loam. Sociobiology 50; 201-204, 2007
- Kubota, S., Y. Shono, T. Matsunaga and K. Tsunoda: Termiticidal efficacy of bistrifluron as a bait toxicant against the Japanese subterranean termites *Coptotermes formosanus* and Reticulitermes speratus (Isoptera: Rhinotermitidae). Sociobiology 50; 623-631, 2007
- Kubota, S., Y. Shono, T. Matsunaga T. and K. Tsunoda: Response of the subterranean termite Coptotermes formosanus (Isoptera: Rhinotermitidae) to soil treated with microcapsulated fenobucarb. Pest Manag Sci 63; 1224-1229, 2007

- Indrayani, Y., T. Yoshimura, Y. Yanase and Y. Imamura: Feeding responses of the western dry-wood termite *Incisitermes minor* (Hagen) (Isoptera: Rhinotermitidae) against ten commercial timbers. J Wood Sci 53; 239-248, 2007
- Katsumata, N., T. Yoshimura, K. Tsunoda and Y. Imamura: Resistance of gamma-irradiated sapwood of *Cryptomeria japonica* to biological attacks. J Wood Sci 53; 320-323, 2007
- Katsumata N., T. Yoshimura, K. Tsunoda and Y. Imamura: Termite feeding preference to four wood species after gamma irradiation. J Wood Sci 53; 361-364, 2007
- Okahisa, Y., T. Yoshimura, K. Tsunoda and Y. Imamura: Changes of free glucose and starch contents Moso bamboo (Phyllostachys pubescens) during the transpiration drying method ("hagarashi"). BAMBOO JOURNAL, No.24, 27-32, 2007
- Hayashi A., H. Aoyagi, T. Yoshimura and H. Tanaka: Development of a novel method for screening microorganisms by using symbiotic association between insect (*Coptotermes formosanus* Shiraki) and intestinal microorganisms J Biosci Bioeng 103; 358-367, 2007
- Hayashi A., H. Aoyagi, K. Kinjo, T. Yoshimura and H. Tanaka: Development of an efficient method for screening microorganisms by using symbiotic association between insect (*Nasutitermes takasagoensis* Shiraki) and intestinal microorganisms. Appl Microbiol Biotechnol 75; 1437-1446, 2007
- Fujii Y., Y. Fujiwara, Y. Yanase, S. Okumura, K. Narahara, T. Nagatsuma, T. Yoshimura and Y. Imamura: Nondestructive detection of termites using a millimeter-wave imaging technique, For Prod J, 57(10), 75-79 (2007)
- Ohmura W., Y. Suzuki, H. Imaseki, T. Ishikawa, H. Iso, T. Yoshimura and Y. Takematsu: PIXE analysis on predominant elemental accumulation on the mandibles of various termites. Int J PIXE 17(3); 113-118, 2007
- Ohmura W., H. Matsunaga, T. Yoshimura, Y. Suzuki and H. Imaseki: Zinc distribution on the mandible cutting edges of two drywood termites, *Incisitermes minor* and *Cryptotermes domesticus* (Isoptera: Kalotermitidae). Sociobiology 50; 1035-1040, 2007
- Kartal S. N., W. J. Hwang and Y. Imamura: Water absorption of boron-treated and heat-modified wood. J Wood Sci 53; 454-457, 2007
- Kartal S. N., W. J. Hwang, T. Yoshimura and Y. Imamura: Evaluation of leaching medium effect on the release of copper, chromium, and arsenic from treated wood. Building and Environment 42, 1188-1193, 2007
- Kartal, S. N., W. J. Hwang, Y. Imamura and Y. Sekine: Effect of essential oil compounds and plant extracts on decay and termite resistance of wood. Holz als Roh und Werkstoff 64; 455-461, 2006
- Nakai, T., S. N. Kartal, T. Hata and Y. Imamura: Chemical characterization of pyrolysis liquids of wood-based composites and evaluation of their bio-efficiency. Building and Environment, 42; 1236-1241, 2007
- Kakitani T, T. Hata, N. Katsumata, T. Kajimoto, H. Koyanaka and Y. Imamura: Chelating extraction for removal of chromium, copper, and arsenic from treated wood with bioxalate. Environmental Engineering Sci 24; 1026-1037, 2007
- Kurosaki F., H. Koyanaka, T. Hata and Y. Imamura: Macroporous carbon prepared by flash heating of sawdust. Carbon 45(3); 671-673, 2007
- Ishimaru K., T. Hata, P. Bronsveld, T. Nishizawa and Y. Imamura: Characterization of sp2- and sp3-bonded carbon in wood charcoal. J Wood Sci 53; 442-448, 2007

- Ishimaru K., T. Hata, P. Bronsveld amd Y. Imamura: Microstructural study of carbonized wood after cell wall sectioning. J Mater Sci 42; 2662-2668, 2007
- Ishimaru K., T. Hata, P. Bronsveld and Y. Imamura: Spectroscopic analysis of carbonization behavior of wood, cellulose, and lignin. J Mater Sci 42; 122-129, 2007
- Fujisawa M., T. Hata, H. Kitagawa, P. Bronsveld, Y. Suzuki, K. Y. Noda, and Y. Imamura: Thermoelectric properties of porous SiC/C composites. Renewable Energy 33, 309-313, 2008
- Tsujimoto, Y. and Y. Imamura: Development of an evaluation method of photo-stability for house interior materials II. Application of the new photo-atability test method to wood-based house interior materials. Mokuzai Gakkaishi 53; 141-148, 2007(in Japanese)
- Tsujimoto, Y., N. Ikeda and Y. Imamura: A study on the durability evaluation method of coated steels for exterior by the new cyclic test apparatus, Materiaru Raifu Gakkaishi 19, 179-184(2007)
- Nanbu, Y., Y. Indrayani, K. Matsumura, T. Yoshimura, Y. Imamura, A. Enoki and S. Itakura: Analysis of the colony structure of *Incisitermes mior* (Hagen) using microsatellite. Jpn. J. Environ. Entomol. Zool. 53; 137-141, 2007(in Japanese)
- Yamamoto, A. and Y. Imamura: Improvement of weather-proofing of water repellent for wood by silicone rubber emulsion. Mokuzai Hozon(Wood Preservation) 33; 226-230, 2007(in Japanese)

Reviews

Yoshimura, T.: Termite infestation and its control. Mokuzai Kogyo(Wood Technology) 62; 234-237, 2007(in Japanese)

Reports

- Imamura, Y.: Exploration and promotion of new interdisciplinary research projects on a sustainable humanosphere. RISH International Newsletter No.21; 1-2, 2007
- Imamura. Y.: Research projects on high-performance utilization of wood for outdoor uses. Sustainable Humanosphere No.3; 11, 2007
- Imamura, Y.: Trends in anti-fungi and anti-termite technologies. Housing Tribune Vol.326; 17-21, 2007(in Japanese)
- Imamura, Y.: Message from the president. Mokuzai Hozon(Wood Preservation) 33; 301-302, 2007(in Japanese)
- Imamura, Y.: Wood identification. Ringyo Gijyutsu(Forestry Technology) Nno.788; 7, 2007(in Japanese)
- Imamura, Y.: Sound and smell. Ringyo Gijyutsu(Forestry Technology) Nno.782; 26, 2007(in Japanese)
- Yoshimura, T.: Reinforcement of wooden parts in houses regarding termite infestation. Proceedings of the 1st Research Meeting of Kougakuin University EEC Program; 11-14, 2007(in Japanese)
- Yoshimura, T., T. Hattori and Y. Takematsu: Conservation of biodiversity in the tropical plantation forest. Seizonken Kenkyu. No.3; 35-38, 2007(in Japanese)
- Yoshimura, T.: Termites for new energy options. RISH-SBS Seminar (The 83rd RISH Symposium); p.13, 2007
- Yoshimura, T. and M. Fujita: Biodiversity in tropical plantation forests. Humanosphere Science School 2008; pp.5, 2008

- Toyoumi, A., S. Horisawa, T. Yoshimura, Y. Imamura and S. Doi: Floral changes of wood-relating fungi in the crawl space of a new wooden Japanese house. Proceedings of the IUFRO, All Division 5 Conference; 2007
- Hata, T., M. Fujisawa, J. Sulistyo, K. Hashimoto and Y. Imamura: Wood-based thermal conductive materials for SPS. Proceedings of the 3rd Symposium on Energy Recycling System for the Sustainable Humanosphere; 19-20, 2007(in Japanese)
- Hata, T. and J. Sulistyo: Utilization of tropical wood biomasses as carbon materials. The 70th RISH Symposim "The Roadmap to the Sustainable Production and Utilization of Tropical Wood Biomasses"; 39-40, 2007 (in Japanese)

b) Conference and seminar papers presented

The 23nd Annual Meeting of Japan Wood Preservation Association: 3 presentation

The 2007 Annual Meeting of Architectural Institute of Japan: 1 presentations

The 57th Annula Meeting of the Japan Wood Research Society: 13 presentations

The 58th Annula Meeting of the Japan Wood Research Society: 10 presentations

The 18th MRS Symposium: 1 presentation

The 34th Annual Meeting of Carbon Materials: 1 presentations

The 5th Annual Meeting of the Wood Carbonization Research Society: 2 presentation

The 5th Conference of Pacific Rim Termite Research Group: 3 presentations

- The 37th Annual Conference of the International Research Group on Wood preservation: 4 presentations
- The Joint Symposium of the 9th Eco-carbon and the 43rd Charcoal Utilization Research Groups: 1 presentation
- The 55th Spring Meeting of the United Societies of Applied Physics: 1 presentation
- The 56th Annual Meeting of the JapanSociety for Material Scieces: 1 presentation
- The Spring Meeting of E-MRS IUMRS ICEM 2007: 1 presentation
- The 55th Annual Meeting of the Ecological Society of Japan: 1 presentation
- The 2nd International Conference (CESEP'07), Carbon for Energy Storage and Environmental Protection: 1件

The International Carbon Conference 2007, CARBON 2007:1件

The 2nd International Symposium on Sustainable Humanosphere 2007:1件

IUFRO, All Division 5 Conference : 2件

The Ecological Society of America 92nd Annual Meeting 2007: 1件

The International Research Group on Wood Protection: 1件

A-3. Off-campus activities

Membership in academic societies (roles)

- Imamura, Y.: Japan Wood Research Society (President), Japanese Association of Wood Technology (Trustee and member of project committee in Kansai branch), Japan Wood Preserving Association (President), Japanese Society of Environmental Entomology and Zoology (Vice president), Wood Carbonization Research Society (Vice president)
- Tsunoda, K.: Japan Wood Preserving Association (Chairman of the Committee for the Promotion of Nishinihon Project)
- Yoshimura, T.: Japanese Society of Environmental Entomology and Zoology (Trustee), Material Research Society, Japan (Editorial board and secretary of research party on wood-based
materials), Japan Termite Control Association (Council, Editor-in chief, Vice president of Kansai Branch), Japan Wood Preserving Association (Editorial board)

Hata, T.: Wood Carbonization Research Society (Member of the steering committee and technical and editorial committee), Japan Wood Preserving Association (Member of the Committee for the Promotion of Nishinihon Project)

Research grants

- Imamura, Y: Grant-in-aid for Scientific Research (B), Wood deterioration under the extreme enviroment (Head investigator), Grant-in-aid for Scientific Research (Exploratory), Development of the termite detector with a smell sensor (Head investigator), Grant-in-aid for Scientific Research (B), Development of new type of lithium battery from carbonized wood with multiwall carbon (Fellows), Grant-in-aid for Scientific Research (Exploratory), Development of carbonized-wood substrate for diffusing heat in solar power satellite (Fellows), Grant-in-aid for Scientific Research (B), Development of thermal conversion technology of wood biomass to carbon nano-tubes (Fellows), Grant-in-aid for Scientific Research (C), The development of wood-nano-capsule containing metals by fast heating system (Head investigator), Grant-in-Aid for Scientific Research (B) Non-destructive survey of wooden cultural products with AE and radar technologies and inspection of treatments (Fellows), Grant-in-aid for Scientific Research (Exploratory), Development of wood-based space materials(Fellows)
- Tsunoda, K.: Grant-in-aid for Scientific Research (B) Recoverable soil treatment units against termites based on grooming behavior (Head investigator), Grant-in-aid for Scientific Research (B), Wood deterioration under the extreme environment (Fellows)
- Yoshimura, T: Grant-in-aid for Scientific Research (A) Bio-processing of preservative treated wood and wood-based materials with deteriorating organisms and the production of new energy resources (Head investigator), Grant-in-aid for Scientific Research (B) Non-destructive survey of wooden cultural products with AE and radar technologies and inspection of treatments (Fellows), Grant-in-aid for Scientific Research (B) Wood deterioration under the extreme environment (Fellows), Grant-in-aid for Scientific Research (Exploratory), Mechanical and material characteristics of termite mandibles (Fellows), Grant-in-aid for Scientific Research (Exploratory), Interaction between termites and white rot fungi and its applicability to termite control (Fellows), Grant-in-aid for Scientific Research (Exploratory), Development of the termite detector with a smell sensor (Fellows)
- Hata, T.: Grant-in-aid for Scientific Research (B), Development of new type of lithium battery from carbonized wood with multiwall carbon nanotubes (Head investigator), Grant-in-aid for Scientific Research: (Exploratory) Development of carbonized-wood substrate for diffusing heat in solar power satellite (Head investigator), Grant-in-aid for Scientific Research: (C) Utilization and Application of meso-porous carbons with crystal characteristic for electrodes (Fellows), Grant-in-aid for Scientific Research (B) Wood deterioration under the extreme environment (Fellows), Grant-in-aid for Scientific Research (Exploratory), Development of wood-based space materials(Fellows)

A-4. International cooperation and overseas activities

International meetings (roles)

- Imamura, Y.: The Annual Meeting of the Chinese Society of Wood Science and Technology (Invited speaker)
- Tsunoda, K.: The 5th Conference of Pacific-Rim Termite Research Group, Bali, Indonesia (President)
- Yoshimura, T.: The 5th Conference of Pacific-Rim Termite Research Group, Bali, Indonesia (Secretary general)

Membership in international academic societies

- Tsunoda, K.: Pacific Rim Termite Research Group (President), IUFRO Working Party 5.03.05 (Moderator)
- Yoshimura, T.: Pacific Rim Termite Research Group (Secretary general)

International joint researches, overseas research surveys

- Imamura, Y.: Joint research on deterioration of wood by outdoor exposure (Indonesia, Malaysia), Properties enhancement of wood by chemical modification (France), Joint research on wood preservation and recycling system of waste treated wood (Turkey)
- Tsunoda, K.: Durability of sill plates under service conditions (USA, Canada), Filed evaluation of preservative-treated wood (New Zealand)
- Yoshimura, T.: Joint research on the colony structure of *Coptotermes formosanus* (Australia), Joint research on the novel natural wood preservatives (Finland), Joint research on termite resistance of tropical timbers (Malaysia), Joint research on biodiversity of wood-deteriorating organisms in tropical plantation forests (Indonesia, Malaysia)
- Hata, T.: Microstructural investigation of wood based carbon materials (The Netherlands), Development of SiC nanorods and MWNT from wood waste and its new utilization (France)

Scholars from abroad

Collaborative researchers: 5 (Istanbul University Turkey (2), Universiti Sains Malaysia Malaysia, University of Georgia, USA, CSIRO Entomology • Australia)

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

- Undergraduate level: Wood Preservation (Imamura and Yoshimura), Science for Humanosphere-[Development of science and technology through biomass and solar power satellite research toward a solar energy society] (Imamura, Yoshimura and Hata), Science for Humanosphere-[Development of technology and materials for cyclic utilization of bio-based resources] (Hata)
- Graduate level: Lecture on Wood Deterioration Control II (Tsunoda), Seminar on Wood Deterioration Control (Imamura, Tsunoda, Yoshimura and Hata), Laboratory Course of Wood Deterioration Control (Imamura, Tsunoda, Yoshimura and Hata), Lecture in Kyoto University Sustainable Innitiative (Imamura)

B-2. Off-campus teaching, etc.

Part-time lecturer

Imamura, Y.: Nara Edicational University (undergraduate level), Kyusyu University (graduate level), Nagoya University (graduate level), Tokyo University of Agriculture and Technology (graduate level)

Yoshimura, T: The University of Tokyo (graduate level)

B-3. Overseas teaching

Students and research fellows from abroad

Foreign students: Doctor's Program: 2 (Indonesia) Postdoctoral fellow: 1 (Turkey)

C. Other remarks

- Imamura, Y.: Kyoto University (Council member of Kyoto University Rakuyukai, Council member of Resrach Center for Ecology), ISO/TC Wood Preservation Committee (Member), Japanese Agency for the Evaluation of Wood Preservatives (Chairman of technical committee),, Japan Housing and Wood Technology Center (Council member), Nara Prefecture (Member of Forestry Research Council), Kumiyama Town (Member of Town Planning Council), Architecture Research Association(Council member)
- Yoshimura, T.: Japanese Agency for the Evaluation of Wood Preservatives (Member of technical committee), Toyama Prefecture (Invited researcher, Member of Research Promotion Council, Forestry Technology Center), Miyazaki Prefecture (Invited researcher, Wood Technology Center)
- Hata, T.: Society for the Study of Functional Wood-based New Materials (Member of Professional Technical Committee), Burea of Kinki Economy and Industry, Ministry of Economy, Trade and Industry, 2007 Grant-in-aid Demonstration for Unused Biomass Energy, "Feasibility Study of Power Generation and Thermal availability system by Pyrolysis Gasification of CCA-treated Waste Wood for that uses waste of CCA treated wood" (Member of Technical Committee)

2.2.20 Laboratory of Structural Function

Staff	Professor	: Komatsu, Koh	ei,	Dr. Agric. Sci.
	Assistant Professor	: Takino, Shinjir	r0,	Dr. Agric.Sci.
	Assistant Professor	: Mori, Takuro,		Dr. Engr
Students and research fellows				
	Overseas special research fellows : (1)			
	Doctor's program		: (3,)
	Master's program		: (2,)

A. Research Activities (2007.4-2008.3)

A-1. Main subjects

In order to develop reliable wooden structures, it is important to select the optimum joint methods having high joint efficiency for both stiffness and strength. We are developing various engineered timber joints or/and structural units and analyzing their behaviors through full-scale experiments as well as theoretical modeling on the basis of timber engineering, wood science and technologies, and structural engineering.

1. Development of Engineered Timber Joint for Medium or/and Large Scale Timber Construction.

a) Research and development of large finger jointed glulam frame corners.

There is a jointing method called as "Large Finger Joint (LFJ)" to make glulam beams and columns glued joint on-site directly. As this joint method is completed by gluing literally large fingers joint on-site, it requires less steel connectors, is low-cost and has high initial stiffness. But the failure mode is quite brittle. Especially in the case where two members are jointed having finite angle, the joint part tends to fail in brittle manner, especially by the mode of tension perpendicular to the grain subjected to open mode moment. In this research subject, we are investigating strength expression mechanism and developing improvement methods for preventing brittle failures.

b) Evaluation of pull-out capacity of Lagscrewbolt and its application to glulam frame structures.

We developed screw-in type connector called as 'Lagscrewbolt (LSB)' as an innovating fastener using minimum steel and high aesthetic concealed joint, and are investigating its strength expression mechanism. At the same time, we are developing structural design method as well as recognizing safety of LSB by full-scale experiments in order to applying LSB to the actual glulam portal frame structures, thus we expect LSB would be used more widely in general wooden constructions.

c) Development of High Ductility and High Strength Wooden Portal Frames Using Mixed Species Glulam.

Mixed species glulam is constituted by domestic Sugi inner laminae whose mechanical properties are relatively inferior to others and imported Douglas fir outer laminae whose mechanical properties are relatively superior. We are developing glulam portal frames which are composed of mixed species glulam for all members and their beam-column joints and leg joints are assembled by using steel gusset plates with flange parts though where embedment stresses can be transmitted to the glulam members so as to utilize stronger properties of outer laminae.

- 2. Development of Wooden Post & Beam Dwelling House by Utilizing Natural Building Materials. In order to propose a long duration and low environmental load wooden post & beam dwelling house to be built using Kyoto prefecture grown Sugi timber which are pre-dried by Hagarashi treatment then dried under about 40°C low temperature with moisture removing system so as to keep hart wood extractives having high anti-fungy or/and anti-termite function,we are developing hevy timber housing system which shall be comosed of 15cm square timber with pith for continuous column, 12cm square timber with pith for short post and 12cmx 24cm rectangular timebr for beams, roof girder, and horizontal girders.
- 3. Estimation and Analyses of Mechanical Properties of Various Wooden Structural Components

a) Estimation of various wooden shear walls, floor system and semi-rigid frames.

We are estimating strength ratio (multiplier) of various shear walls and floor systems composed of such materials as plywood, oriented strand boards or mud shear wall, and braces made of sawn timbers cooperating with commercial based companies. In addition to this, we are also developing optimum evaluation system for timber semi-rigid frame systems by cooperating with independent estimation organization.

b) Investigation on the mechanism of stiffness and strength in ductile moment-resisting joints focused on the role of traditional Nuki or Kusabi joints.

Nuki or Kusabi is important structural component in traditional wooden structures. Its initial stiffness, however, is relatively low so that its application to modern wooden constructions seems to be difficult if traditional style is rigorously applied. In this research subject, we intend to develop a new ductile, stiff and strong moment-resisting joint based on traditional timber joint mechanism by mixing latest technology while keeping advantage points of traditional joint, which is essentially ductile.

c) Structural utilization of Sugi compressed dowels.

Compressing relatively low density Sugi timber up to 30 to 50 % of the original volume can easily produce high-density joint supplemental material. In this research subject, we are developing innovating timber joint method with less stress relaxation function by making use of both characteristics of 'high strength properties' and volume recovering with water absorption. Actually, we are investigating applicability of Sugi compression timber to Kusabi (wedge) or Syachi (shear connector).

d) Development of wooden blocks shear wall system

We are developing a new type of shear wall by using wooden block, which has grooves around each side face to interlock with other wooden blocks. Diamond shape Sugi compression wood keys were inserted into spaces, which were born by cutting off triangular area on each corner of the wooden blocks, to make in-plane stiffness of shear wall higher.

A-2. Publications and presentations

a) Publications

Books

Kohei Komatsu : Wooden Semi-Rigid Frame and It's Joints. [Build residential houses by wooden semi-rigid frame system] Kenchiku-Gijutsu, 115-120、May, 2007. (in Japanese)

Original papers

Z.W. Guan, A. Kitamori and K. Komatsu : Experimental study and finite element modelling of

Japanese "Nuki" joints — Part one: Initial stress states subjected to different wedge configurations, Engineering Structures 30, 2032–2040, (2008).

- Z.W. Guan, A. Kitamori and K. Komatsu : Experimental study and finite element modelling of Japanese "Nuki" joints — Part two: Racking resistance subjected to different wedge configurations, Engineering Structures 30, 2041–2049, (2008).
- Kohei Komatsu, Shinjiro Takino, Takuro Mori, Youji Itho, Ryouji Kataoka : Lateral Shear Performance of Nailed Plywood Sheathed Shear Wall with Opening and Portal Frame with Nailed Plywood Sheathed Hanging Wall, Journal of Structural Engineering, Vol.54B, 119-128, 2008. (in Japanese)
- Takeshi Shiratori, Kohei Komatsu, Adrian Leijten :Modified traditional Japanese timber joint system with retrofitting abilities, Structural Control and Health Monitoring, Published Online: Feb 8 2008 1:18PM,DOI: 10.1002/stc.240
- Yasuo Kataoka, Akihisa Kitamori, Hiroyuki Echi, Yoichi Toyoda, Kohei Komatsu : Traditional Wooden Buildings of Chinese Dong Race: Part 1 "NUKI" construction system of dram tower, Journal of Structural and Construction Engineering, Transactions of AIJ, No.622, 137-144, 2007. (in Japanese)
- Kinsaku Nakata, Kohei Komatsu : Development of Timber Portal Frames Composed of Compressed LVL Plates and Pins I, Mokuzaigakkaishi, 53(6) , $313 \sim 319$, 2007.(in Japanese)
- Kiho Jung, Akihisa Kitamori, Kohei Komatsu : Improvement of Creep Resisting Performance of Kanawa-tsugi (Japanese Traditional Beam to Beam Joint) by Using the Recovery-property of Compressed Sugi Komisen, Mokuzai Gakkaishi, 53(6), 306-312, 2007. (in Japanese)
- Masaya Fujii, Shinya Matsumoto, Masahide Murakami, Toshikazu Sugimoto, Ryuji Inoue, Toshiyuki Kanyama, Kohei Komatsu : Influence on long-term axial column force upon shear force-displacement curve of sheathed Shear Walls under in-plane shear test, Journal of Structural and Construction Engineering, Transactions of AIJ, No.619, 105-110, 2007. (in Japanese)
- Wen-Shao Chang, Kohei Komatsu, Min-Fu Hsu and Wei-Jye Chen : On mechanical behavior of traditional timber shear wall in Taiwan II: simplified calculation and experimental verification, Journal of Wood Science, 53(1), 24-30, 2007.
- Wen-Shao Chang, Kohei Komatsu, Min-Fu Hsu and Wei-Jye Chen : On mechanical behavior of traditional timber shear wall in Taiwan I: background and theory derivation ,Journal of Wood Science, 53(1), 17-23, 2007.
- Hiroshi Watanabe, Kohei Komatsu, Takuro Mori : Discussion of ultimate strength and diagnosis on used members for Kintaikyo, Proceedings of 6th Symposium on Timber Bridge Technologies, JSCE, Vol.6, 105-112, 2007. (in Japanese)

Reports

- Kohei Komatsu : "Research and Developments for Enhancing Seismic Performance of Wooden Dwelling Houses in Recent Japan", 73rd Symposium on Sustainable Humanosphere -RISH-LAPAN-LIPI International Symposium, Science for Sustainable Humanosphere, International Collaborative Programs in Indonesia, LAPAN, Bandung, Indonesia, July 25, 2007
- Kohei Komatsu, Shinjiro Takino, Hajime Tateishi: "Lag Screwed Timber Joints with Timber Side

Members", Proceedings of the 40th Meeting of CIB-W18, Paper No.40-7–8, Bled, Slovenia, August 2007.

- Kohei Komatsu : Why Timber Portal Frame is Attractive, Sustainable Humanosphere Research, Vol.3, 11-17, 2007. (in Japanese)
- Kohei Komatsu [:] On Stiffness and Strength of Wooden Semi-Rigid Portal Frames, Proceedings of the 72nd Symposium on Sustainable Humanosphere, 15-26, Kyoto, 2007. (in Japanese)
- Kohei Komatsu, Mitsushi Akagi, Chiori Kawai, Takuro Mori, Kiyoshi Hosokawa, Shingo Hattori: Comparisons of Performances of Beam-Column Joints in the case of that composed of Through-Bolts and that composed of LSB for Column-side Joint, Proceedings of the 98th Symposium on Sustainable Humanosphere, 1-10, Kyoto, 2007. (in Japanese)
- Atsushi Tabuchi, Yoshihiro Murata, Takuro Mori, Kohei Komatsu : Research on Utilization of Timbers Grown in Kyoto Prefecture, Proceedings of the 98th Symposium on Sustainable Humanosphere, 1-10, Kyoto, 2007. (in Japanese)
- Shigeto Fukudome, Akihisa Kitamori, Kohei Komatsu : Improvement of Reliability on Tiber Joint by Using Compressed Wood, Proceedings of the 98th Symposium on Sustainable Humanosphere, 1-10, Kyoto, 2007. (in Japanese)
- Hidemaru Shimizu, Takuro Mori, Kazuki Tachibana, Shingo Murase, Hiroshi Isoda, Kohei Komatsu : Static Loading Tests on Shear Walls for Estimating Earthquake Resistance Performance by Shaking Table Test of Two Story Wooden Residential House, Proceedings of the 98th Symposium on Sustainable Humanosphere, 1-10, Kyoto, 2007. (in Japanese)
- Naoaki Shibata, Kohei Komatsu, Ken Saitho, Kiyoshi Saitho, Hitoshi Tazawa, Hideo Getto, Isamu Ide, Naonobu Higuchi, Takafumi Itoho, Takeo Hasizume, Shigehisa Ishihara: Development of Earthquake Resistance and Reliable Joints in Domestic Timber Houses, Proceedings of the 98th Symposium on Sustainable Humanosphere, 32-36, Kyoto, 2007. (in Japanese)
- Ysunobu Noda, Takuro Mori, Kohei Komatsu, Shigeaki Kawahara: Strength Properties of Finger Jointed Timber Subjected to Severe Environment, Proceedings of the 98th Symposium on Sustainable Humanosphere, 37-42, Kyoto, 2007. (in Japanese)
- Makoto Nakatani, Takuro Mori, Kohei Komatsu, Takeshi Shimizu, Shigeaki Kawahara, Mitsushi Akagi: Effect of The Arrangement of LSB on the Strength Properties, Proceedings of the 98th Symposium on Sustainable Humanosphere, 43-49, Kyoto, 2007. (in Japanese)
- Masafumi Inoue, Kei Tanaka, Jun Ishitani, Tsuyoshi Sato, Yuutaro Nakajyo, Kohei Komatsu, Takuro Mori, Design of Wooden Joint using Connector Inserting from End Grain, Proceedings of the 98th Symposium on Sustainable Humanosphere, 53-60, Kyoto, 2007. (in Japanese)
- Koji Adachi, Takuro Mori, Kenji Umemura, Hidefumi Yamauchi, Makoto Nakatani, Hiroyuki Yano: Development of Simple Improvement Method for Glulam using Wooden Tape, Proceedings of the 98th Symposium on Sustainable Humanosphere, 73-76, Kyoto, 2007. (in Japanese)
- Masahiro Noguchi, Takuro Mori, Naoki Midorikawa, Kenji Miyazawa: Attempt of Quantitative Estimation of Energy Dissipation Mechanism in Wooden Earthquake Resistance Elements, Proceedings of the 98th Symposium on Sustainable Humanosphere, 85-86, Kyoto, 2007. (in Japanese)
- Hiroshi Watanabe, Sakuma, Kohei Komatsu, Takuro Mori: Cyclic Loading Test of Sugi Glulam

Bolted Joints with Side Steel Members, Proceedings of the 98th Symposium on Sustainable Humanosphere, 89-93, Kyoto, 2007. (in Japanese)

- Munekazu Minami, Akihisa Kitamori, Kiho Jung, Kohei Komatsu: Development of Exposed Floor System using Sugi Thick Boards, Proceedings of the 11th Technical Meeting of Japan Timber Engineering Society, 12-15, Tokyo, 2007. (in Japanese)
- Akihisa Kitamori, Kiho Jung, Munekazu Minami, Kohei Komatsu: Improvement of Wall Shear Resistance Factor of Latticed Shear Wall- Proposal of anti-gapfilling technique at each nodal point, Proceedings of the 11th Technical Meeting of Japan Timber Engineering Society, 16-19, Tokyo, 2007. (in Japanese)
- Kiho Jung, Akihisa Kitamori, Kohei Komatsu: Development of Joints Utilizing Compressed Wood, Proceedings of the 11th Technical Meeting of Japan Timber Engineering Society, 62-65, Tokyo, 2007. (in Japanese)
- Kohei Komatsu, Mitsushi Akagi, Chiori Kawai, Takuro Mori, Kiyoshi Hosokawa, Shingo Hattori: Comparisons of Performances of Beam-Column Joints of H-edge Semi-rigid Portal Frame in the case of that composed of Through-Bolts and that composed of LSB for Column-side Joint, Proceedings of the 11th Technical Meeting of Japan Timber Engineering Society, 66-69, Tokyo, 2007. (in Japanese)
- Takuro Mori, Akihiro Kosoku, Yoshiyuki Yanase, Kohei Komatsu: Fundamental Study on Presumption for Residual Strength of Wood Attacked by Termites, Proceedings of the 11th Technical Meeting of Japan Timber Engineering Society, 62-65, Tokyo, 2007. (in Japanese)
- Takuro Mori, Kenji Umemura, and Misato Norimoto: Manufacture of Drift Pins and Boards Made from Bamboo Fiber for Timber Structures, Proceedings of the ICBS 2007, Changsha, China, 2007. (in Japanese)
- Takuro Mori: Earthquake and Biological Damages of Wooden Dwelling Houses subjected to Noto-hanto Peninsular Earthquake, Shiroari(Termite), Vol.148, 18-22, July, 2007. (in Japanese)
- Takuro Mori: State-of-the-Art report on Engineered Timber Joints, Mokuzai Kogyo (Wood Industry), Vo;.63, December , 2007. (in Japanese)
- Takuro Mori, Yoshiyuki Yanase, Satoru Murakami, Akihiro Kosoku: Earthquake and Biological Damages of Wooden Dwelling Houses subjected to Cyuetsu-Oki Earthquake, Shiroari(Termite), Vol.149, 11-19, January, 2008. (in Japanese)
- b) Conference and seminar papers presented
- The 2007 Annual Meeting of the Japan Wood Research Society (8-10, August, 2007): 10 papers
- The 2007 Annual Meeting of the Japan Society of Material Science (19-20, May, 2007): 1 papers
- The 2007 Annual Meeting of Arch. Inst. of Jap. (29-31, August, 2007): 8 papers
- The 2007 Annual Meeting of Wood Technological Association of Japan (26-28, September, 2007) 1 paper
- The 2007 Annual Technical Meeting of the Japan Timber Engineering Society (29-30, November, 2007): 5 papers
- The 2008 Annual Meeting of the Japan Wood Research Society (17-18, March, 2008): 7 papers

A-3. Off-campus activities

Membership in academic societies (roles)

Kohei Komatsu: Architectural Institute of Japan (Committee Member of Timber Structure, Chief of Sub-Committee for Design of Timber Joints), The Society of Materials Science (Reviewer), The Japan Wood Research Society (Award Winner Selection Committee Member), Japan Timber Engineering Society(Board member)

Shinjiro Takino.: The Japan Wood Research Society, Architectural Institute of Japan

Takuro Mori: Architectural Institute of Japan (Secretary in Kansai branch), The Society of Materials Science Japan(Committee Member in Wood Based Materials), The Japan Wood Research Society, Wood Technological Association of Japan, Japan Timber Engineering Society

Research grants

- Kohei Komatsu(Chief), Shinjiro Takino & Takuro Mori(Sub): Research Grant of Japan Society for the Promotion of Science (B2), Development New Innovative Wooden Post & Beam Structures Taken Material's Characteristics As Much As Possible and Analysis of It's Strength Expression Mechanism
- Kohei Komatsu(Chief), Shinjiro Takino & Takuro Mori(Sub):Development of Low Environment Load and Resource Sustainable Wooden Dwelling Houses Made of Natural Materials Typical to Kyoto, Research Grant for Developing Construction Technique, Ministry of Land, Infrastructure, Transport and Tourism
- Kohei Komatsu and Takuro Mori(Sub): Research Grant of Japan Society for the Promotion of Science (S), Research on Development of Seismic Design Method of Traditional Wooden Structures Based on their Structural Details.
- Takuro Mori(Chief): TOSTEM Foundation for Construction Materials Industry Promotion, Research Grant, Investigate the damage of the beam material for termite.

Takuro Mori: Saneyoshi Foundation, Research Grant for Oversea Travel, Board Shear Wall

A-4. International cooperation and overseas activities

International meetings (roles)

Takuro Mori: ICBS, 28-30th October 2007, Changsha, China, (Presenter and session chairman) *International joint researches, overseas research surveys*

- Kohei Komatsu, Shinjiro Takino and Takuro Mori : (1st April to 30th June 2007)Cooperative research with Professor Y.H. Chui, Director of Wood Science and Technology Research Center of New Brunswick University, Canada, on "Improvement of I-beam performance" while he was an invited professor of RISH(10th Jan. to 30th June 2007)
- Kohei Komatsu: (25th to 29th November 2007, RIHS, Bandung, Indonesia) Cooperative research on Development of Anti-Earthquake Wooden Dwelling Houses Composed of Engineered Wood Products Made of Tropical Fast Grown Timber.

B. Educational Activities (2007.4-2008.3)

B-1. On-campus teaching

a) Courses given

Undergraduate level: Science for Sustainable Humanosphere - Development of Technology and Materials for Cyclical Utilization of Bio-based Resources (Komatsu) Graduate Level: Wooden Structural Function II (Komatsu), Lecture for Kyoto Sustainable Initiative Course(Komatsu)

Seminar in Structural Functions (Komatsu, Takino, Mori).

Laboratory Course of Structural Functions (Komatsu, Takino, Mori)

B-2. Off-campus teaching, etc.

Part-time lecturer

Undergraduate level : Architecture and Society (Cyuubu University, Komatsu)

Graduate level : Glulam Structures (Cyuubu University, Komatsu)

Lecturer: Timber structures (Kagoshima Industrial Research Center, Komatsu)

Open Lectures

Kohei Komatsu: Kyoto University Open Campus (Lecture), RISH 98th Symposium (Lecture), RISH 72nd Symposium (Lecture)

Takuro Mori: RISH 98th Symposium (Lecture)

B-3. Overseas teaching

Overseas Lectures and Open Lectures

Kohei Komatsu: 73rd Symposium on Sustainable Humanosphere - RISH-LAPAN-LIPI International Symposium, Science for Sustainable Humanosphere, International Collaborative Programs in Indonesia, 25th July 2007 (LAPAN, Bundung, Indonesia)

Kohei Komatsu [:] Special lecture at timber structure course in Nanjing Forestry University, 11th to 14th November 2007(Nanjing Forestry University, Nanjing, China)

Kohei Komatsu [:] Keynote Speaker[:] Indonesian National Seminar on System of Preparing Quality Timber for Construction, 26th November 2007 (RIHS, Bandung, Indonesia)

Students and research fellows from abroad

RISH Invited Professor: 1 (Canada)

Foreign cooperative researcher 0

C. Other remarks

- Kohei Komatsu: Technical Committee Member of General Building Research Cooperation of Japan, Estimator for FFPRI Project, Committee Member of Japan Housing and Wood Technology Center for ISO-TC-165, Committee Member for JSPS, 10th WCTE Advisory Committee Member, Visiting Research Fellow in Kagoshima Industrial Research Center
- Takuro Mori: WG member of Kansai-branch on Architectural Institute of Japan, Higashi-Honganji-Temple Project Member, Secretary of Wood and Wood-Based Materials Committee on the Society of Materials Science Japan.