



# International Newsletter

Research Institute for Sustainable Humanosphere Kyoto University, Japan

= Foreword =

## Perspective on the International Academic Collaborations of RISH

Prof. Shuichi Kawai, Director



The Research Institute for Sustainable Humanosphere (RISH) was established as an inter-university cooperative research institute. Its activities include not only domestic but international collaborative research programs such as the “International Collaborative Research Core” focusing on humanospheric science budgeted by MEXT since 2005.

At present, RISH provides eight collaborative research facilities as well as equipment and a variety of databases regarding humanospheric science (refer to International Newsletter No.19, September 2006). We organize research conferences/symposia as well promote novel, interdisciplinary, and exploratory research programs. These inter-university cooperative research programs are gradually being opened to overseas researchers, and the use of our research facilities and equipment and intellectual property is being expanded to the world-wide research communities.

For example, in AY 2005 we accepted international collaborative research programs on a trial basis. Two

programs involving Middle and Upper atmosphere (MU) radar were proposed by overseas researchers. Equatorial Atmosphere Radar (EAR), which is installed in west Sumatra, Indonesia, is operated in close cooperation with the National Institute for Aeronautics and Space (LAPAN) of Indonesia in accordance with a Memorandum of Understanding (MOU), and four research programs have been carried out. Similar international use of other facilities is being prepared. Six international symposia were held in 2005. These included the Radio Science Symposium for Sustainable Humanosphere, the 17th Symposium on Sustainable Humanosphere -Understanding basic plant function and their application-, *etc.* RISH invited 7 researchers from overseas (5 countries) to serve as members of 6 committees for collaborative research and to solicit their opinions from an international standpoint.

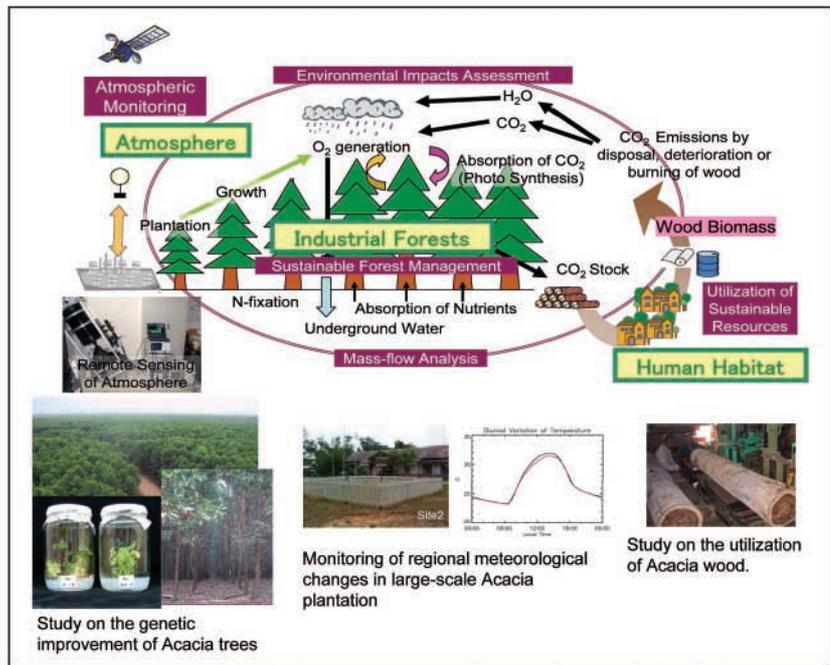
RISH is actively carrying out various international collaborative research projects. A typical example is the inter-

sphere and interdisciplinary mission project regarding “Sustainable Forest Management and Regional Environment (the Acacia Project)”, as shown in the figure, in which a large-scale industrial acacia plantation in southern Sumatra has been established as a research field in collaboration among RISH, the Indonesian Institute of Sciences (LIPI), and the Musi Hutan Persada Corp. (MHP). The project integrates the research fields of bioscience, forest science, radio science, atmospheric science, and materials science, and aims to evaluate the forest biomass as sustainable material/energy and environmental resources, thus contributing to both the health of the global environment and the economy of the local community. Other examples are “Coupling processes in the equatorial atmosphere” being carried out in cooperation with primarily Indonesia, and scientific satellite projects including

“Plasma Wave Observation via the GEOTAIL Satellite” in which RISH is participating jointly with institutions from Europe and the U.S. In AY 2007, RISH will introduce the “Development and Assessment for Sustainable Humansphere (DASH) System” for collaborative research studies in the fields of bioscience and biotechnology.

We hope to achieve our goal of creating an international research network for the further development of humanospheric science through collaboration among world-wide research communities.

*Intersphere and interdisciplinary mission project regarding “Sustainable Forest Management and Regional Environment (Acacia Project)”*



= RISH International Symposium =

## The 2<sup>nd</sup> Wood Science School (Wood Science School 2007) –“Recent Trends on Wood Science and Technology”– and the 69<sup>th</sup> RISH Symposium –“Tropical Tree Biotechnology Initiative”– Assoc. Prof. Tsuyoshi Yoshimura

Following the successful “Wood Science School 2006” held March 5-7, 2006, the 2<sup>nd</sup> Wood Science School (Wood Science School 2007) was held February 26-27, 2007 in the RISH Satellite Office in the Research and Development Unit for Biomaterials (RDUB)-LIPI, Cibinong, Indonesia, with the special support of Kyoto University. The school was co-organized by RISH and RDUB with the title “Recent Trends on Wood Science and Technology”. Approximately 50 young scientists from all over Indonesia participated in the 2-days course that included 10 lectures addressing “state-of-art” research topics in the field of wood science. At the end of the school, all participants delivered a self-introduction to strengthen their research relationships with each other.

On the day after the school ended,

February 28, the 69<sup>th</sup> RISH Symposium entitled “Tropical Tree Biotechnology Initiative” was held at the Research and Development Center for Biotechnology-LIPI, Cibinong, Indonesia. The symposium was also co-organized by RISH and RDUB, and approximately 80 participants from many institutions exchanged their past and present research results and discussed future prospects in tree biotechnology.

As Prof. Bambang Subiyanto, Head of RDUB, indicated in his lecture, Indonesia is now beginning to rely on plantation trees for its natural bio-resources. In this context, the development of tropical tree biotechnology, which can only be achieved by strong national and international collaborations, is indispensable

for establishing a future sustainable humansphere as described by Prof. Endang Sukara, Deputy Chairman of Life Science Division, LIPI, in his opening remarks. The Jakarta Residence, Center for Southeast Asian Studies, Kyoto University (CSEAS), which was introduced by Dr. Makoto Yoshida, CSEAS, at the school, is also a great help in combination with the RISH Satellite Office in RDUB, as we develop deeper collaboration between Japanese and Indonesian scientists.

The programs of the school and the symposium are as follows:

### Wood Science School 2007

**February 26, 2007 (Monday)**

# Welcome Address: Prof. Shuichi Kawai, Director of RISH

# Future Prospects in Tropical Fast Grow-



*Opening remarks by Prof. Shuichi Kawai at the Wood Science School 2007*

- ing Tree Studies: Prof. Bambang Subiyanto, Head of RDUB
- # Wood in Four Dimensions -structure, growth and function- : Prof. Junji Sugiya-ma, RISH
- # Future Trends of Pulping and Bleaching Technology: Dr. Nyoman J. Wistara, Bogor Agricultural University
- # Genetically Modified Trees: grow faster: Dr. Takahisa Hayashi, RISH

#### February 27, 2007 (Tuesday)

- # Development of Wood-Based Materials for Establishing the Resource-Sustainable Society: Prof. Shuichi Kawai, RISH



Presentation of Dr. Shiro Suzuki at the 69<sup>th</sup> RISH Symposium

- # Wooden Construction: Dr. Takuro Mori, RISH
- # Wood-Deteriorating Organisms -biology and control strategies-: Dr. Tsuyoshi Yoshimura, RISH
- # Recent Research on Physical Properties of Indonesian Wood Species: Dr. Wahyu Dwianto, RDUB)
- # Academic and Social Activities of the Japan Wood Research Society: Prof. Yuji Imamura, RISH, President of the Japan Wood Research Society
- # Outline of Jakarta Residence, Center for Southeast Asian Studies, Kyoto University (CSEAS): Dr. Makoto Yoshida, CSEAS
- # Closing Remark: Prof. Yuji Imamura, RISH

#### 69th RISH Symposium

#### February 28, 2007 (Wednesday)

- # Opening Remarks: Prof. Endang Sukara, Deputy Chairman of Life Science Division, LIPI
- # Roadmap for Tropical Tree Biotechnolo-



Wood Science School 2007 participants

- gy: Prof. Toshiaki Umezawa, RISH
- # *Acacia mangium* Tree Improvement Program: Prof. Eko B. Hardiyanto, Gadjah Mada University
- # *Acacia* Wood for Construction Material: Dr. Anita Firmanti, Research Institute of Human Settlement Technology
- # Tree Biotechnology of *Acacia mangium* - current status and future prospects -: Dr. Shiro Suzuki, RISH
- # Plant Biotechnology Studies in LIPI: Dr. Satja Nugroho, Research and Development Center for Biotechnology-LIPI
- # Closing Remarks: Prof. Toshiaki Umezawa, RISH

= Visiting Professor =

## Research Activities in RISH

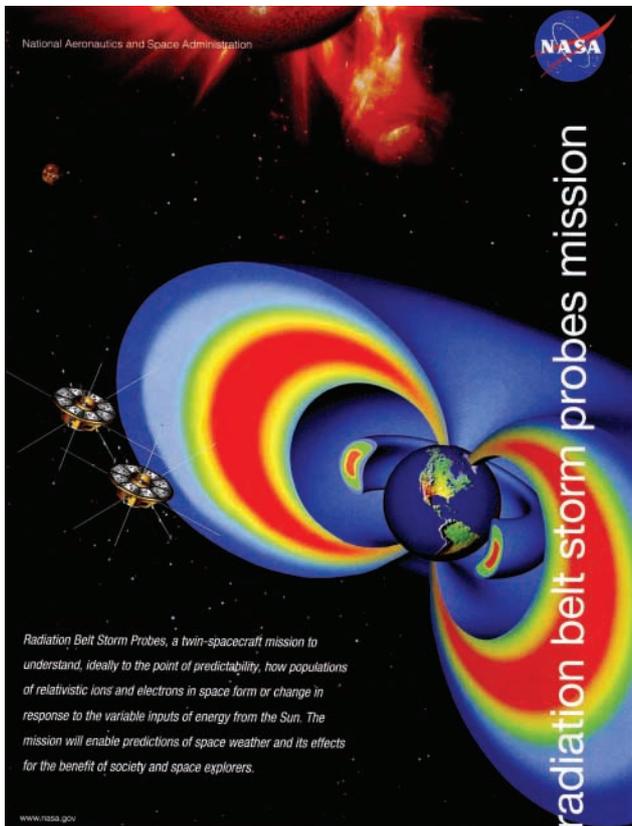
Prof. Danny Summers  
Visiting Professor from Canada

I am currently visiting RISH during the period November 1, 2006 to April 30, 2007. I am on leave from Memorial University of Newfoundland, St. John's, Canada, where I lecture in the Department of Mathematics and Statistics. I am working here at RISH with Prof. Yoshiharu Omura and other scientists and students in the area of space physics, including, in particular, the physics of the Van Allen radiation belts and space weather science. These belts, discovered by James Van Allen of the University of Iowa in 1958, are doughnut-shaped rings of energetic charged particles encircling the Earth. Intense activity on the Sun, including solar flares and coronal mass ejections, can lead to magnetic storms at the Earth, and consequently extremely energetic

(relativistic) electrons can be generated in the Van Allen belts. These electrons have been called "killer electrons" because they can temporarily disrupt or even permanently damage instruments in orbiting spacecraft. This can lead to communication problems on Earth. My research interests include trying to understand the physical processes by which the killer electrons are produced, and also trying to predict exactly when and where they will be generated. More generally, I am interested in "space weather" science, which is the study of conditions on the Sun, in the Earth's magnetosphere, ionosphere, and thermosphere that influence the performance of space and ground-based technological systems and endanger human activity in space. During November 14-



17, 2006 I attended the CAWSES (Climate and Weather of the Sun-Earth System) International Workshop on Space Weather Modeling at The Earth Simulator Center, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), in Yokohama. The workshop also included a visit to the Earth Simulator, itself, which is a very powerful supercomputer designed to model the entire Earth system. On December 4, 2006 I visited the Kwasan Observatory, Kyoto University, and gave a seminar entitled "Connections between solar physics and magnetospheric physics". During December 11-15, 2006, I attended the Fall Meeting of the



Schematic picture of the Earth's Van Allen radiation belts illustrating the planned NASA Radiation Belt Storm Probes Mission

American Geophysical Union, in San Francisco, U.S.A., and presented the paper "Precipitation loss of radiation belt electrons due to resonant wave-particle interactions". On December 19, 2006, I gave a seminar to the Gaku-jyutsu-Sosei group at RISH, entitled "Why are the radiation belts important in space weather science?" During March 18-20, 2007 I will attend the CAWSES Meeting on Comparative Study of Solar Flares and Magnetospheric Substorms

as a Basis of Space Weather Research, at Fairbanks, Alaska, U.S.A., and give the invited presentation "Wave-particle interactions in the Van Allen radiation belts with implications for space weather science".

With respect to cultural activities during my stay, the high-light has been a visit on January 23, 2007, to the Kyoto State Guest House located in the grounds of the Kyoto Imperial Palace. The recently-constructed and beautiful Kyoto State Guest House was created in a sophisticated traditional Japanese style, and built to accommodate eminent visitors from abroad.

I am enjoying my current visit to Japan tremendously, both scientifically and socially. I would like to thank my friends and colleagues at RISH for making my stay so enjoyable. In particular, I thank Mrs. Michiko Okazaki for helping me in many ways. I very much hope to visit RISH again in the future.

= Visiting Professor =

## Research Activities in RISH

Prof. Blagovest Shishkov  
Visiting Professor from Bulgaria



Currently I am Head of Telecommunications Department of the Institute of Mathematics and Informatics (IMI) at the Bulgarian Academy of Sciences (BAS). You can see more at <http://www.math.bas.bg/~bshishkov/>

My first visit to Japan dates a long ago in August 1993 when I was visiting professor at Tokai University Educational System. Then I had presented an invited talk at 24th General Assembly of URSI 1993, Kyoto-Japan. Then and there I have acquainted Prof. Hiroshi Matsumoto and was impressed from his advance in radio and space sciences (now one of greatest scientists). One follows:

- Contribution to the Spatial and Temporal Processing of Cyclostationary Signals in Array Antennas-National Institute of Communications Tech-

nology (NICT), Tokyo, Japan, 1997.

- Contribution to the Research Program and Projects of the Advanced Telecommunications Research Institute International (ATR), Adaptive Communications Research Laboratories, Kyoto, Japan, 2000-2002.
- Contribution to the Research Program and Projects of the Radio Science Center for Space and Atmosphere (RASC) and Research Institute of Sustainable Humanosphere (RISH), Kyoto University, Japan, 2003 and 2006.

In 2006 I was invited from Prof. Shuichi Kawai to perform collaborative research in RISH on "Minimization of Side Lobe Level in Large Antenna Arrays for Microwave Power Transmission" with Dr. Naoki Shinohara, Prof. Kozo Hashimoto and Prof.

Hiroshi Matsumoto.

Recent advances in space exploration have shown a great need for antennas with high resolution, high gain and low side lobe level (SLL). The last characteristic is of paramount importance especially for the Microwave Power Transmission (MPT) in order to achieve higher transmitting efficiency (TE) and higher beam collection efficiency (BCE). In this concern statistical methods play an important role. Various interesting properties of a large antenna array with randomly, uniformly and combined spacing of elements were studied and especially the relationship between the required number of elements and their appropri-

ate spacing from one part and the desired SLL, the aperture dimension, the beamwidth and TE from the other. See for example our publication: Shinohara, N., B. Shishkov, H. Matsumoto, K. Hashimoto, A.K.M. Baki "New Stochastic Algorithm for Optimization of Both Side-lobes and Grating lobes in Large Antenna Arrays for Microwave Power Transmission", IEICE Transactions on Communications, (to appear).

We have created an original combined stochastic algorithm, which outperforms both conventional uniform spacing algorithm and pure stochastic algorithm. In this concern our scientific contributions and achievements seem to be an important step toward the realization of future SPS/MPT systems.



In parallel, I have presented the following academic lectures before research staff and students of RISH:

1. Asymptotic Optimal Algorithms in Statistical Communication Theory, Sept. 6, 2006
2. Optimization of Reactively Controlled Adaptive Antenna Array Based on Stochastic Approximation Theory, Sept. 27, 2006
3. On the Use of Higher-Order Statistical Tests in Signal Processing, Oct. 11, 2006

At this my stay in RISH was generated and realized the idea of performing International Symposium on Radio Systems and Space Plasma to be held at Borovets, near Sofia, Bulgaria, on September 2-5, 2007.

The symposium provides a scientific forum covering the topics of traditionally established URSI Commissions C and



H (toward space plasmas) and Solar Power Satellites (SPS)-  
<http://www.math.bas.bg/isrssp>

We have created a strong collaboration between RISH, Kyoto University and IMI (BAS) and hope it will continue in the years ahead. The joint research between the two Institutes could be "Study on Beamforming and Control of Beam in Large Antenna Arrays for MPT".

I have been 6 times visiting professor in Japan for the past thirteen years. In Kyoto University I have met such a unique research environment with an inspiring and enjoyable atmosphere which remains unforgettable for me.

= RISH Staff =

## Scientific Collaborations with Developing Countries

Prof. Shoichiro Fukao

The origin of global-scale atmospheric motions is the strong convective motion caused by the absorption of the strong solar radiation present in the equatorial region, specifically, in the western Pacific region called the Indonesian Archipelago. Atmospheric dynamics over the Indonesian equator is one of the most significant sources of global atmospheric change. The mechanism of this atmospheric change, however, has not yet been made clear due to the sparseness of observations in that region.

Equatorial atmospheric dynamics has long been one of our major scientific

interests at RISH. In 1984 we started the project that exploits atmospheric radar techniques, which we have cultivated with the MU radar in Japan, for clarification of the mechanisms. Since then, we have closely cooperated and collaborated with many people in Indonesia, especially, at the National Institute of Aeronautics and Space (LAPAN), Agency for the Assessment and Application of Technology (BPPT) and Bureau of Meteorology and Geophysics (BMG). We have been quite productive in the last two decades, obtaining much new knowledge regarding convective motions, atmospheric



waves, and ionospheric irregularities. Through intensive efforts in both countries, we eventually established one of the world's premier equatorial observatories with the Equatorial Atmosphere Radar (EAR) as its core instrument in Kototabang, West Sumatra, Indonesia (Figure). We appreciate continuing and extensive support for the project by LAPAN and other Indonesian institutes, and the on-site operation of EAR is being successfully conducted by Indonesian technicians.



The Equatorial Atmosphere Radar (EAR) of RISH Kyoto University located at Kototabang in West Sumatra, Indonesia (top), and its antenna elements (bottom)

For successful promotion of any international scientific collaboration, seeds of the research should not be proposed by governments or institutions but initiated by individual scientists who know and mutually respect each other at the grassroots level, and promoted under their strong leadership in both countries. We have learned from these experiences in Indonesia that more than this will be required for collaborations with counterparts in developing countries. For instance, to cultivate the abilities of scientists and technicians in the counterpart country, it may be important

to understand their circumstances and conditions for conducting science, and to provide infrastructure for research to them. In some research areas, Japanese scientists are requested more to provide training than to do research itself, and/or to accept graduate students for Ph.D. studies at Japanese universities. This may seem time-consuming to some Japanese scientists and make them reluctant to continue the collaboration, while some scientists in developing countries may claim that Japanese scientists exploit important data from their countries without considering host-country benefit.

In the Earth sciences, observational data from South and South-East Asia

are yet insufficient, hindering our thorough understanding of the atmospheric dynamics over the equator. However, any collaboration that is conducted for the sole purpose of getting data from developing countries will never evolve into true scientific collaboration. Admitting the imbalance in current research abilities between Japan and counterpart countries, we should make sustained efforts to promote collaborations on an equal footing. We should insist that the collaboration with the developing countries be mutually beneficial, and for that we need to mutually understand our counterparts. No international collaboration should be a target for its own sake; it should be an effort to reach the scientific goal that they can aim for together.

In conclusion, the importance of cooperation and collaboration with Asian countries has been emphasized in the third Science and Technology Basic Plan drawn up by the government. Under these auspices our collaborations with Indonesia will promote and enhance links widely to research groups in South and South-East Asian countries.

= Students from Abroad =

## Research Activities as a Student at RISH

Yuliati Indrayani  
Ph.D. student from Indonesia

I came to Japan first in 2000 as a participant in the Third International Wood Science Symposium (IWSS) which was held at the former Wood Research Institute (WRI). I was quite fortunate to visit this institute since at that time I was able to meet Prof. Yuji Imamura, Professor of the former Laboratory of Deterioration Control, and his Associate Professor, Dr. Tsuyoshi Yoshimura. Two years later, in 2002, I came again to Japan for two months to do research at the same laboratory. In October 10, 2003, I was quite excited to return Japan for a doctorate course with scholarship from the Monbuka-

gakusho under the supervision of Dr. Tsuyoshi Yoshimura.

My research has focused on the drywood termite, *Incisitermes minor* (Hagen), an invasive pest termite from the western region of the United States. This exotic species has been reported in a number of locations in Japan. My work focuses on the infestation, feeding ecology, and control strategy for this pest insect.

We first surveyed the infestation of *I. minor* in Wakayama Prefecture. Based on the present survey, we found that the chemical soil and timber treatments under floors against subterranean

termites generally employed for the majority of Japanese houses do not always afford protection against *I. minor* attacks which commonly start in roofing materials. We thus evaluated the relationship between *I. minor* colonies distributed in Japan and an *I. minor* colony from the USA (California) by analysis of the individual DNA structure. The present results provide evidence of multiple invasions of *I. minor* occurring in Japan.

In the present study, a new test





Field survey in the snowy field test site in Okayama Prefecture

method was developed for the evaluation of wood preference by dry-wood termites. We also have investigated the pattern of feeding behavior and the optimal temperature and relative humidity preference of *I. minor*. It was revealed that *I. minor* is much more tolerant of high temperatures and arid conditions than other termite species. In the last part of the study, we developed a possible a gel bait system against *I.*

*minor*. The recent development of a termite control strategy using a bait system has been encouraged since this strategy does not pose environmental hazards. I hope that these studies will be beneficial to other countries with “termite problems” as well as to my home country of Indonesia.

During our three years of research, we published 5 papers in international scientific journals, 2 papers in local scientific journals, and 2 papers currently under submission to international scientific journals. In addition, I have attended three international and two national conferences, namely The 2<sup>nd</sup> Conference of Pacific Rim Termite Research Group (February, 2005, Bangkok, Thailand), The XV International Union for the Study of Social Insects (July, 2006, Washington D.C., USA), The 4<sup>th</sup>

Conference of Pacific Rim Termite Research Group (February, 2007, Kaohsiung, Taiwan), The 54<sup>th</sup> Annual Meeting of the Japan Wood Research Society (August, 2004, Sapporo, Hokaido), and The 56<sup>th</sup> Annual Meeting of the Japan Wood Research Society (August, 2006, Akita) and presented papers at these meetings.



Fumigation experiment in Wakayama Prefecture

= Students from Abroad =

## My Research Life at the Research Institute for Sustainable Humanosphere

Fengliang Tang  
Master course student from China

First, I would like to express my sincere appreciation to my research supervisor Prof. Yoshiharu Omura. Without his help, it would have been impossible for me to contribute to this International Newsletter. He has provided encouragement and suggestions ever since I came to RISH. Studying in Japan has been an important opportuni-

ty for me, and I have the warmest regard for the Space Group at RISH.

My research focuses on the dynamics of high energy particles in the magnetosphere of the Earth by means of computer simulation. As technological development spreads throughout the world, more and more countries have become interested in space exploration.

Thus it is important to face the serious problem created by the abundance of energy particles presented in the Radiation Belt. My research requires thorough basic knowledge of space plasma physics and the techniques of computer simulation. Whenever I encountered problems in

these areas I was able to rely on members of Space Group for help. The discussions of the Simulation Group were especially helpful and allowed me to continue my research in the right direction. I would like to give my sincere thanks to all the people who provided help.

I have found life in Japan to be enjoyable and interesting, and I have especially good memories of playing basketball with friends from Japan, the United States, Korea, and many other countries. I feel very fortunate to have had the chance to study at a world famous university, Kyoto University, and will always remember this period very fondly.



= News Topics =

## Courtesy Visit by a Delegation of Universiti Sains Malaysia

Ayako Honda  
International Affairs, Adm. Office

A delegation of two deans and researchers from Universiti Sains Malaysia (USM), which is one of the partner universities of the Research Institute for Sustainable Humanosphere (RISH), visited the RISH in November 24, 2006. The group was headed by Professor Mashhor Mansor, Dean of the School of Biological Sciences of USM.

First, they presented an overview of the USM at the RISH. Thereafter, they discussed mutual and specific interests

with Director Shuichi Kawai and other concerned researchers at the RISH for the purpose of implementing academic exchange. First concluded in 2001, the two institutes have renewed their MOU on July 21, 2006, and came to activate exchange programs.

The USM, which is a research oriented uni-

versity mainly consisting of science departments, is a leading Malaysia university according to Malaysian government standards. The USM also worked on a core university program under the auspices of the Japan Society of Promotion of Science (JSPS) with the RISH.



After the discussion of academic exchanges at RISH held in 24<sup>th</sup> November, 2006. The second left in the rear: Prof. Dr. Wan Ahmad Kamil Mahmood, Dean of School of Chemical Sciences, the third left in the rear: Prof. Dr. Mashhor Mansor, Dean of School of Biological Sciences, and the middle in the rear: Prof. Dr. Shuichi Kawai, Director of RISH

= News Topics =

## Building a Wooden Eco-House “Rishu-sha”

Assist. Prof. Takuro Mori

Six years ago, we began the development of a wooden house composed of recyclable and low-environmental-load materials. Since the re-organization of RISH, this project has been conducted as a major research project of Mission 4, which is responsible for the “Development of Technology and Materials for Cyclical Utilization of Bio-based Resources.” The eco-house project explored the following subjects

among others:

- # Development of a shear wall composed of small pre-fabricated mud shear walls
- # Development of Sugi compressed wood and compressed bamboo for use in joints
- # Development of eco-control of termites
- # Application of ubiquitous power supply technology

Through yearly meeting with regard to this project, we concluded that we could obtain good experimental results by constructing a real wooden eco-house. Thus, we decided to build the wooden eco-house known as “Rishu-sha”. “Rishu-sha” was completed next to the Wood Composite Hall in November, 2006. In “Rishu-sha”, a great deal

of Sugi is used for the posts, beams, walls, floor, roof sheathings, and so on. “Rishu-sha” is a good full-scale specimen through which the durability of various building materials and joints can be investigated as well as methods for protecting wooden houses from termites. We hope you will pay a visit.

### The Committee of International Academic Exchange

Toshiaki Umezawa (Chair),  
Shuichi Kawai,  
Toshitaka Tsuda,  
Kazufumi Yazaki,  
Mamoru Yamamoto,  
Tsuyoshi Yoshimura,  
Naoki Shinohara and  
Ayako Honda (adm. office)

Published by S. Kawai  
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Title Back:  
Illustrated by Chikako Noshi



The opening ceremony of “Rishu-sha”