The Second Okazaki Biology Conference on

"Terra Microbiology"

Date: September 26th –September 30th, 2004

Preface

In this Second Okazaki Biological Conference of "Terra Microbiology", we will discuss a various aspects of the strategy of organisms through the interaction with microbiology in terrestrial environment. The purpose of this prestigious conference is to stimulate thinking and interactions among relevant disciplines in the field of emerging importance and ripe for intriguing, cutting-edge science, such as Terra Microbiology, and to explore the possibility of forming a new research field of basic biology. Since our targeting novel discipline may not be expressed in any existent term, we dared to create a novel term, 'Terra Microbiology' to express what we intend to do in this conference.

Not only scientists who have strong backgrounds in microbiology and molecular biology but also those who work more on environmental sciences and geology will present various aspects and foresights to cover vast area in Terra Microbiology. The conference consists of four sessions; 1) Environmental Constraints and Evolutional Diversity, 2) Biogeochemical Cycling and Terra Formation, 3) Symbiosis and Interactions, and 4) Novel Approaches for Microbial Systems. In these sessions, we will review how we understand microbial life in terrestrial environment, and what we will be more focusing on to explore a new research field. We consider that the application of molecular biology techniques, genomics and system biology concepts towards the understanding of complex ecosystems, such as terrestrial environments, is one such grand challenge. This is one such thing that we will discuss in the conference.

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OBC 2 Organizing Committee

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Kenji Kato (Shizuoka Univ., Japan)	*Convener of Session 1*
Joseph L. Kirschvink (California Inst. Technol., USA)	*Co- convener of Session 1*
Hiroyuki Ohta (Ibaraki Univ., Japan)	*Convener of Session 2*
Vigdis Torsvik (Univ. of Bergen, Norway)	*Co- convener of Session 2*
Masanori Saito (Natl. Inst. Agr-Env. Sci., Japan)	*Convener of Session 3*
Bengt Söderström (Lund Univ., Sweden)	*Co- convener of Session 3*
Kiwamu Minamisawa (Tohoku Univ.)	*Convener of Session 4*
Eugene L. Madsen (Cornell Univ. USA)	*Co- convener of Session 4*
Yuichi Suwa (AIST, Tsukuba, Japan)	*Secretary*

Sessions

Session 1. Environmental Constraints and Evolutionary Diversity

Convener: Kenji Kato, Japan
Co-convener: Joseph L. Kirschvink, USA

Life evolved most of the basic biochemical machinery for energy metabolism during the first two billion years since it appeared on Earth. These anaerobic and aerobic microbes developed chemilithotrophic and photolithotrophic processes that profoundly modified Earth' environment. Microbes also expanded their environmental tolerance to include almost all conceivable niches, from temperatures below freezing to above boiling, and with wild variations of pH, salinity, and redox state. In parallel with this, they radiated into habitats from the deep sub-surface in rock, to hydrothermal vent systems, and even to the atmosphere. In this session we will gaze at the interaction of microbes with their environment at the molecular level, and discuss their geological role in time and space, including the future. The 'Ecological Theater of Life Itself' is the subject for discussion in this session.

Session 2. Biogeochemical Cycling and Terra Formation

Convener: Hiroyuki Ohta, Japan
Co-convener: Vigdis Torsvik, Norway

In this session we discuss "terra formation" and "soil ecosystem evolution" from the aspect of microbial biogeochemical cycling. The process of terra formation is possibly classified into at least two phases: the first phase of wholly new, plant-free ecosystems and the second phase of plant-growing ecosystems. A central model for the first phase is represented by the ecosystem on new substrates laid down by volcanic eruptions or maybe those appeared by glacial recessions. Here we start the session with topics of microbial ecology on volcanic deposits and freshly cut rock. Then we focus on the metabolism and ecology of chemoautotrophic microbes in relation to biogeochemical cycling and finally deal with relationships between microbial diversity and terra formation. In order to gain a better understanding of terra formation, the proposed session includes not only topics with cellular levels of bacteria and fungi but also those with molecular approaches.

Session 3. Symbiosis and Interactions

Convener: Masanori Saito, Japan
Co-convener: Bengt Söderström, Sweden

The word “symbiosis” introduced by the botanist de Bary in 1879 meant simply the living together of different kinds of organisms. Vast studies on various symbioses during more than a century stresses that interaction that occurs when different organisms or cells closely co-exist is one of the driving forces of evolution. Emergent properties come from combining different organisms into a single functioning whole. The emergent properties appear at cellular, genetic and population level. In this session, by looking at various microbial symbioses and interactions, we will discuss how the emergent properties appear, what are the mechanisms governing them, and why they have been evolving.

Session 4. Novel Approaches for Microbial Systems

Convener: Kiwamu Minamizawa, Japan
Co-convener: Eugene L. Madsen, USA

A number of types of molecular, genomic and isotopic techniques are now developing to find, identify and study in situ various functional groups of environmental microbiology. Modern microbial techniques show a great promise in linking to the ecological concepts and theoretical framework into ecosystem level function and evolution of microbes. In particular, it is important how recent progresses of microbial genomics are linked to these studies. The theme is not to talk about techniques per se but their application, more importantly what new concept / evidence we gained in microbial ecology from using the modern tools of genomics and molecular biology.

Conference Program

September 26 (Sunday)

-Breakfast	7:00 – 9:00
-Registration / Chair Meeting	9:00 – 11:40
-Lunch	11:40 – 12:40
-Meeting logistics, Dr. Yuichi Suwa (OBC Secretary, AIST, Tsukuba)	12:45 – 13:00
-Opening Speech, Dr. Yoshitaka Nagahama (National Institute for Basic Biology)	13:00 – 13:20
-Key Note Lecture by Dr. Jim Tiedje (Center for Microb. Ecol., Michigan State Univ., USA)	13:20 – 14:00
-Coffee Break	14:00 – 14:20
-Group Meeting by each session	14:20 – 14:50
-Remarks of Session 4, Dr. Kiwamu Minamisawa (Tohoku Univ.)	14:50 – 15:00
4-1: Using field-based DNA stable isotope probing (SIP) to explore the identity and activity of biodegrading microbial populations in soil and sediment Dr. Eugene L. Madsen (Cornell Univ. USA)	15:00 – 15:40
4-2: RNA Stable Isotope Probing Dr. Andrew S. Whiteley (CEH Oxford, UK)	15:40 – 16:20
-Coffee Break	16:20 – 16:40
4-3: Theory and application of DNA microchip in microbial community analysis Dr. Wen-Tso Liu (National Univ. of Singapore, Singapore)	16:40 – 17:20
4-4: Dynamics of rhizobial expression and microevolution: what can we know by array analysis? Dr. Kiwamu Minamisawa (Tohoku Univ., Japan)	17:20 – 18:00
4-5: Microbial genome evolution - comparative genome analysis of pathogenic and non-pathogenic bacteria - Dr. Ken Kurokawa (Nara Inst. Sci. Technol., Japan)	18:00 – 18:40
- Introduce with each other/Mixer	18:40 – 21:00

September 27 (Monday)

-Breakfast	7:00 – 8:40
4-6: Community structure and evolution in an acid mine drainage ecosystem Dr. Eric E. Allen (Univ. of California, Berkeley, USA)	8:40 – 9:20
4-7: Eco-genomic explorations into antarctic bacterioplankton communities Dr. Alison Murray (Desert Res. Inst., USA)	9:20 – 10:00
4-8: The uncultivated *Crenarchaeota* from soil: what do we learn from metagenomics? Dr. Alexander H. Treusch (Darmstadt Univ. of Technol., Germany)	10:00 – 10:40
-Coffee Break	10:40 – 11:10
-Remarks of Session 3, Dr. Masanori Saito (Natl. Inst. Agr-Env. Sci.)	11:10 – 11:20
3-1: Evolution of cooperation and conflict Dr. Paul Rainey (The Univ. of Auckland, New Zealand)	11:20 – 12:00
-Lunch/Group photo	12:00 – 13:30
3-2: Biofilm systems – microbes, polymers and microhabitats – Dr. Thomas R. Neu (UFZ Center for Env. Res., Germany)	13:30 – 14:10
3-3: Endosymbiotic bacteria of insects: biological significance of hidden players Dr. Takema Fukatsu (AIST, Tsukuba, Japan)	14:10 – 14:50
-Coffee Break	14:50 – 15:10
3-4: Cellular symbioses within the symbiotic microbial community in the gut of termites Dr. Moriya Ohkuma (RIKEN, Wako, Japan)	15:10 – 15:50
3-5: The ectomycorrhizal interaction studied by global expression analyses Dr. Bengt Söderström (Lund Univ., Sweden)	15:50 – 16:30
-Coffee Break	16:30 – 16:50
3-6: Creation, organization and maintenance of genetic variability in arbuscular mycorrhizal fungi Dr. Alexander M. Koch (Univ. of Lausanne, Switerland)	16:50 – 17:30

September 27 (Monday) - continued

Short talks 17:30 – 18:40
Poster/Video Presentations 20:00 – 21:00

P1-1: Microbes in million years aged groundwater of deep geothermal aquifer in the Great Artesian Basin, Australia
Dr. Hiroyuki Kimura (Shizuoka Univ., Japan)

P2-1: Influence of global volcanisms on C, N and P elemental cycles on the early earth and its constraints on the evolution of early life
Dr. Takeshi Kakegawa (Tohoku Univ., Japan)

P2-2: Sequence-specific cleavage of 16S rRNA with oligonucleotides and ribonuclease H: a rapid and simple approach to the rRNA-based quantitative detection of microorganisms in complex ecosystems
Dr. Yuji Sekiguchi (AIST, Tsukuba, Japan)

P2-3: Production of novel genes discovered by environmental genomics from hydrothermal environments
Dr. Mayumi Sasaki (AIST, Tsukuba, Japan)

P3-1: Long distance transport of phosphate in arbuscular mycorrhizal fungi: linking structure and function
Dr. Yukari Kuga-Uetake (Shinshu Univ., Japan)

P3-2: Horizontal transfer of symbiotic bacteria to host offspring in the light organ symbiosis between *Photobacterium leiognathi* and leiognathid fish
Dr. Minoru Wada (Ocean Res. Inst., Univ. of Tokyo, Japan)

P3-3: A cell-to-cell signaling molecule produced by environmental indigenous bacteria enhances tolerance to an antimicrobial of *Pseudomonas aeruginosa*
Dr. Nobuhiko Nomura (Univ. of Tsukuba, Japan)

P4-1: Genomic and phenotypic comparison of mesorhizobial isolates from *Lotus* species in Japan and other places
Dr. Kazuhiko Saeki (Osaka Univ., Tokyo)

P4-2: Isolation of novel acidophilic or acido-tolerant heterotrophic bacteria from Japanese acidic environments and their phylogenetic diversity
Dr. Tsuyoshi Yasuta (Natl. Inst. Technol. Eval., Japan)

S-1: Autoecological study of a γ-hexachlorocyclohexane (γ-HCH) decomposing bacterium in the soil of long-term experimental upland field
Dr. Keishi Senoo (Univ. of Tokyo, Japan)

S-2: Attempts on potential rate measurements of anaerobic ammonia oxidation in freshwater sediments and sewage sludges
Dr. Yuichi Suwa (AIST, Tsukuba, Japan)

S-3: Fluorescence lifetime imaging (FLIM) of in situ microbial activity
Dr. Thomas R. Neu (UFZ Center for Env. Res., Germany)

-Dinner 18:40 – 20:00

September 28 (Tuesday)

-Breakfast	7:00 – 8:20
3-7: Fine tuning of nodulation by complementary rhizobial signals Dr. William Broughton (Univ. of Geneve, Switzerland)	8:20 – 9:00
3-8: Challenged by micro-oxia: How rhizobia adapt to the symbiotic life style Dr. Hauke Hennecke (Inst. Microbiol., ETH, Switzerland)	9:00 – 9:40
-Coffee Break	9:40 – 10:00
-Remarks of Session 2, Dr. Hiroyuki Ohta (Ibaraki Univ.)	10:00 – 10:10
2-1: Development of bacterial community on fresh volcanic deposits Dr. Hiroyuki Ohta (Ibaraki Univ., Japan)	10:10 – 10:40
2-2: Microbial colonization of and succession on recent volcanic deposits Dr. Gary M. King (Univ. of Maine, USA)	10:40 – 11:20
2-8: Microbial diversity and community structure in pristine and disturbed soils at different climatic zones Dr. Vigdis Torsvik (Univ. of Bergen, Norway)	11:20 – 12:00
-Lunch/then free	12:00 – 18:20
-Dinner	18:20 – 19:20
-Remarks of Session 1, Dr. Kenji Kato (Shizuoka Univ.)	19:30 – 19:40
1-1: A paleoproterozoic planetary suicide attempt: did the evolution of oxygenic photosynthesis trigger the first snowball earth? Dr. Joseph L. Kirschvink (California Inst. Technol., USA)	19:40 – 20:20
1-2: Horizontal gene transfer accelerates genome innovation and evolution Dr. James A. Lake (UCLA, Los Angeles, USA)	20:20 – 21:00

September 29 (Wednesday)

-Breakfast	7:00 – 8:20
1-3: Sharing genes and sharing environments: two versions of cooperation Dr. Gary J. Olsen (Univ. of Illinois, USA)	8:20 – 9:00
1-4: Water activity as a factor affecting the development of microbial communities in solid-phase environments Dr. Akira Hiraishi (Toyohashi Univ. of Technol., Japan)	9:00 – 9:40
-Coffee Break	9:40 – 10:00
1-5: Analysis of structure, function, and eco-physiological interactions among community members in complex multispecies biofilms Dr. Satoshi Okabe (Hokkaido Univ., Japan)	10:00 – 10:40
1-6: Microbial alteration of geochemistry beneath the soil Dr. Kenji Nanba (Univ. of Tokyo, Japan)	10:40 – 11:20
1-7: Distribution of novel "*Epsilonproteobacteria*" in microbial mats from terrestrial caves and springs with sulfidic water Dr. Annette Summers Engel (Louisiana State Univ., USA)	11:20 – 12:00
-Lunch	12:00 – 13:30
1-8: Unseen prokaryotic communities in the earth's interior Dr. Fumio Inagaki (JAMSTEC, Japan)	13:30 – 14:10
-Coffee Break	14:10 – 14:30
2-3: Fungal component in sub-aerial rock-inhabiting communities: role in land colonization and contribution to biogeochemistry of rock surfaces Dr. Anna A. Gorbushina (Carl v. Ossietzky Univ., Germany)	14:30 – 15:10
2-4: Emission and consumption of carbonyl sulfide by a chemolitho-autotroph *Thiobacillus thioparus* THI115 and distribution of micro-organisms carrying the relevant activities in natural environments Dr. Yoko Katayama (Tokyo Univ. of Agr. Technol., Japan)	15:10 – 15:50
-Coffee Break	15:50 – 16:10
2-5: Chemoautotrophic bacteria in biogeochemical cycling Dr. Daniel J. Arp (Oregon State Univ., USA)	16:10 – 16:50
2-6: Autotrophic nitrification in acidic tea field soil Dr. Masahito Hayatsu (Shizuoka Univ., Japan)	16:50 – 17:30
2-7: Mobile xenobiotic-degrading genes and their mobility in soil bacteria Dr. Masataka Tsuda (Tohoku Univ., Japan)	17:30 – 18:10
-Farewell Mixer	18:10 – 21:00

September 30 (Thursday)

-Breakfast/Check out	7:00 – 9:40
-Talk, Prof. Masayuki Ohmori (Saitama Univ., Tokyo)	9:40 – 10:20
-Coffee Break	10:20 – 10:40
-Comprehensive and Concluding Discussions, MO, JMT and NIBB	10:40 – 11:20
-Free talk for Future	11:20 – 12:00