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Preface

The 21st Century Center of Excellence (COE) Program for Neo-Science of Natural History (Program Leader: H. Okada) at Hokkaido University, in association with the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Japan Drilling Earth Science Consortium (J-DESC), Botanical Society of Japan, Hokkaido University Museum, Palaeontological Society of Japan, Union of Japanese Societies for Systematic Biology, and Zoological Society of Japan, hosted a 5-day international symposium, “The Origin and Evolution of Natural Diversity,” at the Conference Hall of Hokkaido University, Sapporo, Japan. This COE Program, launched in September 2003 with the aim of creating a world-class research and educational (R&E) center in the natural-history sciences under a 5-year grant from the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT), is a collaborative endeavor of 21 participating scientists actively engaged in teaching and research in fields of the natural-history sciences (mainly geosciences and biodiversity), an equal number of full-term postdoctoral researchers, and a dozen graduate students, partly involved as research assistants, at Hokkaido University.

During the five symposium days (1–5 October 2007), attended by over 200 participants (including 24 guest researchers from Canada, Belgium, China, Germany, Iceland, Indonesia, Japan, Russia, Singapore, UK, and USA), there were about a dozen sessions with 67 oral presentations, including an *opening session* devoted to keynote lectures focused on the evolutionary history of Earth and life; two *plenary sessions* emphasizing earth-life interactions at relatively “long” and “short” time scales; eight *parallel sessions* devoted to recent research findings, often based on a multidisciplinary approach, on specific topics among the natural sciences; and one *workshop* with two half-day sessions dealing with the micro- and macro-evolution of fishes. Additional programs included a *poster session* with 44 presentations mainly by young researchers; a *demonstration booth* explaining the construction of an electronic database, or e-museum; a *public-oriented lecture* popularly known as the *Science Café* at a local bookstore; and a 2-day bus excursion to observe fossiliferous sites in southwestern Hokkaido (e.g., so-called *Bryozoan Paradise* near the town of Kuromatsunai).

The international symposium served as a venue for dissemination of the achievements of the COE program. COE activities and accomplishments in research and education were briefly addressed by three talks, each 10–15 min. long, given at the very beginning of the opening session: (i) a general introduction (H. Okada), (ii) R&E activities with an emphasis on the Earth sciences (N. Suzuki); and (iii) R&E activities with an emphasis on biodiversity studies (S.F. Mawatari). The presentation and discussion of research findings were addressed mainly during the parallel sessions, which focused on topics/themes and educational programs introduced and advanced by the COE program. Important themes covered during these sessions were: (i) Earth and life interactions operating at various time scales; (ii) integration of geoscience and biodiversity research, under topics such as the “Kokemushi (= Bryozoa) Paradise” and Daikokujima Island projects on geological and biological diversity; and (iii) parataxonomist training courses at the national and international levels.

The keynote lectures during the opening sessions provided participants with a unique overview of the latest developments in the natural history sciences. There were four lectures, each 60 min. long, by M.A. Fedonkin (early eukaryotization of life), P.B. Wignall (end-Permian mass extinction), R.D. Norris (extinction of pelagic taxa), and P. Schäfer (Late Quaternary environment and climate in the North Atlantic and their relationship to marine biodiversity). An additional eight keynote lectures, each 40 min. long, though slightly specialized, given during two plenary sessions addressing the complex interactions between life

and earth, dealt with diverse global phenomena. Long-term interactions were addressed by S. Maruyama (history of Earth & life: importance of Gondwana and the V/C boundary), L.K. Medlin (molecular clocks and biogeography of microalgae), P. Taylor (seawater chemistry, biomineralization, and the fossil record of calcareous organisms), and H. Kawahata (mid-Cretaceous paleo-environment and the carbon cycle). Lectures in the category of short-term interactions, which spanned several disciplines in natural history, were by S. Emslie (impact of climate change on birds in Plio-Pleistocene North America), J. Pecon-Slattery (genomic diversity and natural history of the cat family, Felidae), Lixin Wu (impact of decadal climatic variability on marine ecosystems), and H. Watanabe (species divergence times based on vicariant speciation).

To provide a better appreciation of the symposium, a list of all sessions is as follows:

- The Origin and Evolution of Natural Diversity
- Long-Term Earth-Life Interactions
- Origin and Evolution of Life and the Earth
- The Evolution of Primary Producers and the Earth System
- “Kokemushi Paradise” – Its Potential Significance for Paleoclimatic and Evolutionary Studies
- Short-Term Earth-Life Interactions
- Atmosphere-Ocean-Life Interactions
- Activities and Future Directions of the Para-Taxonomist Training Course
- The Natural Diversity of Daikokujima Island, Hokkaido – A Case Study
- Short-term Changes in the Diversity of the Fauna of Sagami Bay—A Case Study
- Diversification of Life in the Recent Geological Past
- Micro and Macroevolution in Fishes

This book is a compilation of 34 articles, both reviews and original research contributions, which reflect a range of topics presented during the oral and poster sessions of the Sapporo symposium. Taking into account scientific discipline and study region, these contributions are arranged into eight categories as follows: 1. Origin, Evolution, and Diversity of Life; 2. Bryozoan Diversity: Sedimentological, Isotopic, and Magnetic Approaches Towards Paleoenvironment/climate Reconstruction; 3. Faunal Diversity in Sagami Bay; 4. Floral and Faunal Diversity on Daikokujima Island, Hokkaido; 5. Paleoecology and Mineralization, 6. Land-Atmosphere-Ocean Interactions and Climate; 7. Biomarkers as Paleoenvironmental Proxies; and 8. Taxonomy Training in Natural History. Contributions related to Micro and Macroevolution in Fishes, theme of a workshop jointly organized with the Tokyo University COE for Biodiversity and Ecosystem Restoration and the Ichthyological Society of Japan, will be published as a special issue of the international journal *Environmental Biology of Fishes*, probably in 2008.

We express our utmost thanks to all authors contributing to this volume for their timely submission of articles. We acknowledge the active role of the members of the Symposium Organizing Committee (K. Fujino, T. Horiguchi, H. Katakura, K. Maekawa, S. Minobe, S. Tochinai, and U. Tsunogai) and the cooperation of other COE core members and young researchers during the various stages of the symposium. We believe that this symposium served as an active forum for productive interactions and the mutual exchange of knowledge in the multidisciplinary field of the natural-history sciences. We hope that this book will be a source of useful information for many researchers around the world working in the natural history sciences.

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