Preface

To all participants, in particular professors who spent a great deal of time flying from overseas: I would sincerely like to show my deep gratitude to all of you for attending and giving lectures on behalf of the organization and advisory committees. I am very pleased to note that this International Workshop "Frontiers of Quantum Physics" is fully supported by a kind of special grant called a "Grant in Aid from Scientific Research on Priority Areas No. 763" from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan. The title of the grant is "Dynamics of String and Field Theories", which is the same as that of the workshop. However, in this workshop, we have extended the scope to include anything fitting the title. In fact, the program includes not only superstring theory and field theory themselves, but also information theories, and biophysics topics, such as DNA, since we believe such new subjects may well be those in field theories in the 21st Century.

The subject of our priority area corresponds to research of a wide range of dynamical properties of quantum field theory and superstring theory, which are truly the basis of present elementary particle physics. The contents of the studies are 1) dynamics of quantum gravity and construction of unified theory through superstring theory, 2) foundations of quantum field theory and its application to broad areas from pure mathematics to material science, 3) weak-electromagnetic unified theory and phenomenological research and basic research of the standard model, weak-electromagnetic-strong interactions. Furthermore, applications to cosmology, the theory of the standard model, superstring theory and various models of elementary particle physics are included.

These research subjects may appear to be a collection of various different ones. However, these are indeed unified and universal investigations that clarify the dynamics of quantum field theory and superstring theory. In the 20th Century, physics developed in such a manner that one discovery in a research area stimulated quantum field theory and superstring theory. In this manner, new discoveries were induced among various fields that superficially appear to be very different. We may well say that the process of scientific development of the 20th Century occurred repeatedly. Science developments in this manner will be further accelerated in the 21st Century, and this development will focus to create and construct a new science.

In general, grants are very difficult to receive, and we were fortunate to receive ours. In our case, quite a few prominent physicists, such as Professor Hirotaka Sugawara, former President of the High Energy Accelerator Organization (KEK), Professor Toshihide Maskawa, former Director of the Yukawa Institute for Theoretical Physics, Kyoto University, and Professor Makoto Kobayashi, former Director of the Institute for High Energy and Nuclear Physics, substantially support our proposal of for a grant.

This workshop was organized to a great extent by young particle physicists who made great efforts to organize it in such a short time. Finally, I would like to acknowledge, with deep gratitude, to Professor Taichiro Kugo, Director of the Yukawa Institute for Theoretical Physics, Kyoto University, for his very kind arrangement to allow us to use the facilities of YITP and the hospitality extended to all participants.

Thank you all for your dedication again.

July 2006

Masao Ninomiya
Yukawa Institute for Theoretical Physics, Kyoto University
and
The Leader of a Grant-in-Aid for Scientific Research on Priority Areas
(No. 763, September 2003 – March 2008).

Organizing Committee:

Toshiki Ide

Nobuyuki Ishibashi

Satoshi Iso

Hiroshi Kunitomo

Yukinori Nagatani

Jun Nishimura

Satoru Odake

Fumihiko Sugino (Chairperson)

Hiroshi Suzuki

Tsukasa Tada

Hiroshi Umetsu

Advisory Committee:

Kazuo Fujikawa

Kiyoshi Higashijima

Yutaka Hosotani

Hiroshi Itoyama

Hikaru Kawai (Chairperson)

Yoshihisa Kitazawa

Makoto Kobayashi

Masao Ninomiya

Hirotaka Sugawara

Tamiaki Yoneya