

PREFACE

Various phenomena and structures observed in the biological world, materials, and space, can be considered as one of the aspects that self-organization systems exhibit as a result of the interplay between various elements (multi-components). Physics of the 20th century focused on simple systems composed of a single or a few types of components, but in this 21st Century COE (Center of Excellence) program conducted since 2003, we challenged the new objectives of physics, i.e., “Self-organizing systems composed of multi-components”, in order to create a new field and establish universal comprehension in physics. The typical example of such a system is a biological system. Even though it is a living organism, it is also a “product” created by nature. It may be said therefore that a living being is a enthralling research object for the physics of the 21st century. It is a fascinating goal for physicists to reveal the mechanism, structure, and organization of biological systems from the viewpoint of physics, and to solve the puzzle of a biological system as being a physical one, just the same as the physics of space and materials. Even more so, as their components are created in the same environment, there must exist a common law that governs living organisms and materials, and materials and space.

Therefore, not only did we study these three apparently separate fields, but also postulated that living organisms, materials, and space have strong mutual links and it is worth studying them unitedly, as a single whole, or “matter”. It is the long-standing tradition of Waseda University to emphasize the practical approach to science. However, in this COE program, we seek to come up with a new dimension of physics as a basic science. While taking advantage of the Waseda tradition to prioritize the applied science, we aimed to establish a research group that will be able to contribute to the development of basic science.

In particular, we committed ourselves to the education of young talented researchers. In order to venture into unknown realms of physics and explore frontier fields, the enthusiasm of young researchers is indispensable. The Major in Pure and Applied Physics at Waseda University fully has the potential to produce the next-generation scientists.

As the valuable activity of our 21st Century COE program, every year we organized an International Symposium. This book is the Proceedings of the last Symposium (the *Fifth International Symposium of our 21st Century COE program entitled "Physics toward the next generations"*) held at the Waseda International Conference Center on September 13-14, 2007. The Proceedings consist of three parts entitled Biophysics, Nonequilibrium Statistical Physics and Related Topics, and Astrophysics as Interdisciplinary Science. In each part, there are several articles written by young researchers, including not only post-doctoral fellows, but doctoral course students as well, from which, we hope, readers can recognize the high level of research activities done by members and students of our 21st Century COE Program, and by researchers collaborating with us.

How our program was successful should be evaluated not only from the research results presented in these Proceedings, but also from the education and research activities performed through this 21st Century COE Program. We sincerely hope that our endeavor, spanning the last several years to create the foundation for the high-level activities of the Major in Pure and Applied Physics at Waseda University, will be rewarded in future.

And finally but not the least, on behalf of the Local Organizing and Program Committees, we would like to express our sincere thanks to all the contributors and the participants of this Symposium.



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