FOREWORD

Special Section on Cutting-Edge Technologies of Superconducting Electronics

Superconductive electronics opened in the middle of 1950's. A switch named "cryotron" was invested and applied to digital circuits. The operating principle was based on the transition between a superconducting state and a normal state controlled by heat injections. The cryotron was eliminated after the discovery of the Josephson Effects, because the Josephson junctions worked faster and consumed less power. The Josephson junctions had been believed to be a unique device for constructing superconducting electronics.

We had also believed that ferromagnetic materials were considered as the natural enemy in superconducting devices including the Josephson junctions, because these materials often lead to degradation of superconductivity, increase in noise, etc. Superconductor researchers kept ferromagnetic materials out of superconducting electronics.

However, a lot of innovations have been developed in a last decade. For example, superconducting nanotechnology including utilization of ultra-thin superconducting films and ultra-fine patterning of the films creates very sensitive sensors or voltage amplifiers based on heat injections. Superconducting spintronics creates a new type of Josephson junctions which have different current-phase relationship from that of a conventional Josephson junction. We are obliged to change the above-mentioned long-held belief, and superconducting electronics enters a new era. Of course, it goes without saying that consistent improvements are found in the historical research fields.

In this Special Section, latest achievements of superconductive electronics are featured. Although all the fields cannot be covered because of the limit of the pages, readers will be able to feel a touch of cutting-edge technologies of superconductive electronics. On behalf of the editorial committee, I would like to express our great thanks to all the authors of invited and contributed papers submitted to this Special Section and to all reviewers. I expect this Special Section to contribute to further progress in all fields of superconductive electronics.

Finally, I would like to thank all the editorial committee members listed below for their efforts to this editorial work.

Akira Fujimaki (Nagoya University), Guest Editor-in-Chief

Akira Fujimaki *(Member)* received his B. E, M. E., and Dr. Eng. degrees from Tohoku University in 1982, 1984, and 1987, respectively. He was a Visiting Assistant Research Engineer at the University of California, Berkeley, in 1987. Since 1988, he has been working on superconductor devices and circuits at the School of Engineering, Nagoya University, Nagoya, Japan, where he is currently a professor. His current research interests include single-flux-quantum circuits and their applications including systems based on low- and high-temperature superconductors.