Preface

The natural science is established through activities of observing phenomena around ourselves and understanding their mechanism. Even in the present days, where technologies are extremely advanced, this fundamental attitude remains unchanged. It is most clearly stated in the phase by a Japanese physicist Ukichiro Nakaya, "The snow flake is a letter from the sky." Similarly, an English physicist F.C. Frank said, "The diamond is a letter from the underground."

It is remarkable that both of these phases are concerned with patterns in nature, which are formed by themselves owing to certain physical processes. In fact, pattern in nature have been attracting interests of scientists, and a lot of researches were motivated by these interests. In Japan Torahiko Terada, who died about sixty years ago, should be first nominated as a scientist who paid attention to various forms around ourselves. His works have given strong influence on many Japanese people including Nakaya. The influence can not be denied also in the recent activities by several research groups in Japan which are engaged in problems of pattern formation and spatial geometry.

One of such activities has been maintained since 1980 by persons from many fields, such as mathematics, physics, chemistry, biology, geomorphology and civil engineering. The main interests in this group have been problems of mathematical frameworks for study of forms and of basic mechanism of pattern formation.

Another important activity has been promoted by a group of stereology. The term "stereology" means a science of three-dimentional structures and is a unified technology to reconstract spatial structure from observed two-dimensional shapes. This measurement technology was established around the year of 1960 and has been applied in many fields, examples being analyses of human organs, alloy structures, soils and other composite materials.

As mutual contacts within respective groups and also between these groups were repeated, we began to desire to construct a new field of science and to have closer cooperation. This movement after enthusiastic discussion resulted in establishment of The Society for Science on Form, Japan in 1985. At the same time a Cooperative Research Project 'Research of Pattern Formation" was conducted by nearly the same members (chief: R. Takaki).

In this research project joint researches were organized among the members for interdiciprinary problems, and conferences were held several times to discuss on their results and also on future prospect. At each conference the proceedings

were published written in Japanese. They proved to be good references to know the present status of activities in Japan in this field, and were expected to be suitable introductions of these activities to foreign scientists if they are translated into English. It would be the main reason why a new foundation was approved for translating the proceedings and publishing as a monograph after the research project was over. The present volume is the outcome of this foundation.

Since a few years have passed after the period of the research project and since this field is rapidly developing, recent results are included in addition to the original contents and several new authors are invited.

The present authors believe that this volume provides the best information of the recent situation in Japan about researches of pattern formation and pattern measurement and the information of persons engaged in these fields. It will also serve as an introductory source book for students who are inclined to working in these fascinating fields.

Needless to say, this volume still misses important works and important persons in Japan, although some of them can be found in references in related articles. It is hoped, therefore, that the publication of this volume will act as a trigger to a more complete version which will be hopefully edited in future.

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