CONTENTS

Preface, v

Chapter 1

Introduction to Science of Pattern Formation

R. Takaki, 1

Chapter 2

An Aspect of Katachi (≈Form)

T. Ogawa, 11

Generalization of Golden Ratio: Any Regular Polygon Contains Self-Similarity

T. Ogawa, 23

Projections of Four-Dimensional Regular Space Fillings

K. Miyazaki and M. Shiozaki, 43

Derivation of Some Equilateral Zonohedra and Star Zonohedra

Y. Watanabe and T. Betsumiya, 55

Topological Index and Some Counting Polynomials for Characterizing the Topological Structure and Properties of Molecular Graphs

H. Hosoya, 63

Map Fold a La Miura Style, Its Physical Characteristics and Application to the Space Science

K. Miura, 77

A Note on Intrinsic Geometry of Origami

K. Miura, 91

Chapter 3

Theoretical Study of Growth Patterns of Snow Crystals

E. Yokoyama and T. Kuroda, 103

Morphology and Formation Mechanism of Snow Polycrystals

Y. Furukawa, 111

Experimental Studies of Dendritic Ice Crystals Growing from the Vapor Phase

T. Gonda, 121

viii Contents

Monte Carlo Simulation and Single Nucleation Theory of Growth Shapes of a Crystal

T. Ueta and Y. Saito, 131

Mathematics of Crystal Growth

Y. Shikata, 155

Fractal Growth of Sodium Tartrate Crystals

H. Ninomiya and S. Oki, 163

Chapter 4

Experiments on Aggregations

M. Matsushita, 169

Hidden Singularities, Phase Transitions and Conservation Law in Multifractal Patterns

K. Honda and M. Matsushita, 177

Percolation Pattern in Continuous Media and Its Topology

H. Tomita and C. Murakami, 197

Various Growing Modes of Crystal in Diffusion Field

H. Honjo, 205

Diffusion-Limited Aggregation and Crystal Growth

S. Ohta, 217

Cluster Formation of Cr-Spinel during Magmatic Differnentiation in the Upper Mantle

M. Toriumi, 239

Vesicular Structure in a Lava Flow

M. Obata and T. Mizuta, 259

Chapter 5

Formation and Transitions of Patterns in Thermal Convection

O. Sano, 265

The Motion of a Vortex Sheet in an Ideal Fluid

Y. Kaneda, 289

Chemically Driven Dynamic Patterns at an Oil-Water Interface: Experimental Analysis of Nonlinear Waves and Oscillations

S. Kai, S. C. Müller, T. Mori, and M. Miki, 301

Chemically Driven Dynamic Patterns at an Oil-Water Interface: Wave Form Analysis and Computer Simulation

S. Kai, M. Miki, and T. Mori, 329

Pattern Formations in Magnetically and Electrically Induced Freedericksz Transitions and in Multiplicative Stochastic Processes

S. Kai, M. Imasaki, S. Yamaguchi, and F. Sagues, 343

Self-Induced Vibration of an Evaporating Drop

R. Takaki, N. Yoshiyasu, Y. Arai, and K. Adachi, 363

Contents ix

Chapter 6

Mechanical Properties of Vertex Model for Two-Dimensional Random Cellular Structures

K. Kawasaki, T. Okuzono, and T. Nagai, 377

Dynamics of Cellular Pattern in Two Dimensions

T. Nagai and K. Kawasaki, 389

Elastic Instability of Gels upon Swelling

K. Sekimoto and K. Kawasaki, 401

Evolution of Antiphase Ordered Domain Structure and Phase Separation Activated by Ordering

K. Shiiyama, H. Ninomiya, and T. Eguchi, 411

Phase Transition, Spinodal Decomposition, and Pattern Formation in Polymer Gels

S. Hirotsu, 431

Chapter 7

Selfsimilar Natures of Drainage Basins

E. Tokunaga, 445

Application of the Variation Principle to Geographic Pattern Analysis

M. Hirano, 469

Chapter 8

The Analysis of 3-D Organ Microstructure Assisted by Computers: Its Application to Histopathological Studies

T. Takahashi, H. Yaegashi, T. Chiba, R. Chiba, and M. Suzuki, 485

Cell Mosaic Patterns under the Direct Lateral Inhibition Rule of Differentiation

H. Honda and M. Tanemura, 497

Particle Number and Sizes Estimated from Sections — A History of Stereology

K. Miyamoto, 507

Stereology on Crack Geometry

M. Oda, 517

Chapter 9

Role of Digital Image Processing in Morphology

J. Toriwaki, 537

The State of the Art of Medical 3-D Image Processing

S. Yokoi and T. Yasuda, 549

Image Analyzers: Its Development and New Application for 3-Dimentional Image Processing

A. Kimura, 565

x Contents

1/f Fluctuation in Japanese Brush Calligraphy

S. Ozawa, 571

A Study on Graphic Languages

E. Izuhara, 581