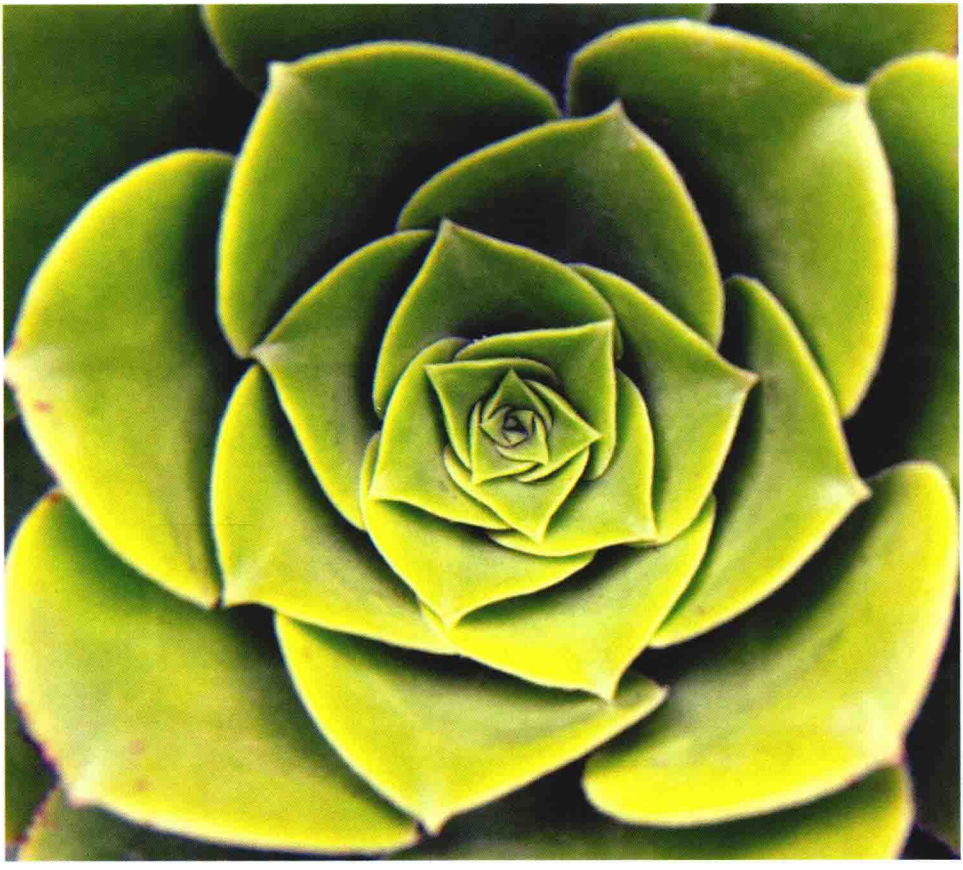
Series on the Foundations of Natural Science and Technology — Vol. 12

Qinyi Zhao

The Origin of Natural Order

An Axiomatic Theory of Biology



World Scientific

The Origin of Natural Order

An Axiomatic Theory of Biology

All sorts of biological activities are processed thermodynamically, and at the utmost fundamental level, the laws of biology must be thermodynamics. However, the current laws of thermodynamics are unable to give reasonable explanation of biological processes. In order to do so, irreversible thermodynamics has been theorized to describe the basic mechanism for the origin of natural order or the development of things (related to developmental biology). The scientific definition of the system theory concept has been obtained and the properties of a biological system can be analyzed by applying principles of it. Irreversible thermodynamics and system theory act as the theoretical foundation for theoretical biology. By applying principles of irreversible thermodynamics and system theory, the axiomatic theory of biology has been developed.

World Scientific
www.worldscientific.com
10428 hc

ISBN 978-981-3209-26-8

Zhao

The Origin of Natural Order

Series on the Foundations of Natural Science and Technology — Vol. 12

The Origin of Natural Order

An Axiomatic Theory of Biology

Qinyi Zhao

Medical Institute of China Rehabilitation Research Centre, China

World Scientific

NEW JERSEY • LONDON • SINGAPORE • BEIJING • SHANGHAI • HONG KONG • TAIPEI • CHENNAI • TOKYO

Published by

World Scientific Publishing Co. Pte. Ltd.

5 Toh Tuck Link, Singapore 596224

USA office: 27 Warren Street, Suite 401-402, Hackensack, NJ 07601

UK office: 57 Shelton Street, Covent Garden, London WC2H 9HE

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

Series on the Foundations of Natural Science and Technology — Vol. 12

THE ORIGIN OF NATURAL ORDER

An Axiomatic Theory of Biology

ISBN 978-981-3209-26-8

Desk Editor: Christopher Teo

Typeset by Stallion Press

Email: enquiries@stallionpress.com

Printed in Singapore

The Origin of Natural Order

An Axiomatic Theory of Biology

Series on the Foundations of Natural Science and Technology

ISSN: 2010-1961

Published:

Vol. 12 *The Origin of Natural Order: An Axiomatic Theory of Biology*
by Q. Zhao

Vol. 9 *The Timeless Approach: Frontier Perspectives in 21st Century Physics*
by D. Fiscaletti

Vol. 8 *Quantum Effects, Heavy Doping, and the Effective Mass*
by K. P. Ghatak

Vol. 7 *Magneto Thermoelectric Power in Heavily Doped Quantized Structures*
by K. P. Ghatak

Vol. 6 *Nano-Engineering in Science and Technology: An Introduction to the World of Nano-Design*
by M. Rieth

Vol. 5 *Grasping Reality: An Interpretation-Realistic Epistemology*
by H. Lenk

Vol. 4 *What is Life? Scientific Approaches and Philosophical Positions*
by H.-P. Dürr, F.-A. Popp and W. Schommers

Vol. 3 *The Visible and the Invisible: Matter and Mind in Physics*
by W. Schommers

Vol. 2 *Symbols, Pictures and Quantum Reality: On the Theoretical Foundations of the Physical Universe*
by W. Schommers

*For further details, please visit: http://www.worldscientific.com/series/sfnst

(Continued at end of book)

Preface

The precise concepts, strict logic, and description of a confined system of deductions of axiomatic theories make them the gold standard of scientific pursuit. When a scientific theory becomes mature enough, it should approach an axiomatic theory. Currently there is no axiomatic theory in the field of biology and all theoretical models of biology are in substance experimental or empirical. In order to gain a comprehensive understanding of biology and science, an axiomatic theory of biology should be developed. Although historically such approaches have only produced failure, many scientists have devoted themselves to such a task.

The belief established in the past 50 years is if there is such a theory of biology, it should lie on the basis of irreversible thermodynamics, which establishes the natural origin of order. With regards to this tendency, Prigogine has already made a remarkable contribution. In China, Xuesen Qian was an advocate of such research. Related research includes dissipative structure theory, system theory, synergtics theory, chaos theory, nonlinear science, catastrophe theory and cybernetics. These approaches have shown that our understanding of science and biology should be thoroughly changed at the most basic level. However, there is so far no matured theory in existence.

Inspired by such thoughts, we have (over the past 30 years) gradually developed an axiomatic theory of biology on the basis of irreversible thermodynamics and system theory. It includes protein thermodynamic structure theory and protein folding theory, biosignal theory, signal conduction theory or neural conduction, and biosignal

network theory, and indeed covers all fields of biology. Most importantly, our theory has revealed the general relationship between protein thermodynamics and biological function (corresponding to one signaling network), and it provides a new way to understand biology thermodynamically. Two famous scientific debates in biology, namely the traditional Chinese medical theory and Michurin genetics, could be settled and agree with our theory of biology in full. This book comprises a chronological summary of our approaches.

The book comprises three parts. The first part describes the basic principles of irreversible thermodynamics which describes the laws of irreversible processes and acts as a physical exaplanation for the origin of natural order. Our approaches differ from conventional theories in two major aspects. First we have proposed criteria between irreversible process and reversal process, which results in the establishment of protein thermodynamic structure theory. Second, we clarify the partition function of a complex thermodynamic system which makes it possible to handle complex thermal systems by the laws of statistics.

The second part describes system theory and system logic. It provides a scientific definition of the system concept, and on this basis, the logic foundation for system theory is proposed. The system theory is completely compatible to the theory of the origin of natural order. In fact, it is a theory for the evolution of logic.

The third part describes the axiomatic theory of biology.

Although great achievements have been achieved in modern science and our understanding of nature has been widely expanded, many problems of nature and science had not been well studied. One of these great problems of science is the origin of natural order.

The origin of natural order acts as the utmost fundamental theory of our research and scientific theory and here we briefly discuss its general meaning. The reason is quite simple for we need to give an explanation for the origin of diversified matters of nature, such as people, animal, birds, stones, mountains, rivers, tables, food, soil, water, vapor, liquid, cars, culture, scientific thought itself, etc. The ancient people have known that different matters of nature are changeable and transformable and people hope to know the real

mechanism for it. In biology, the protein folding, biological evolution, and biological development are typical processes within the origin of natural order. Without it, a comprehensive understanding of biology cannot be obtained. So this book was named "The Origin of Natural Order".

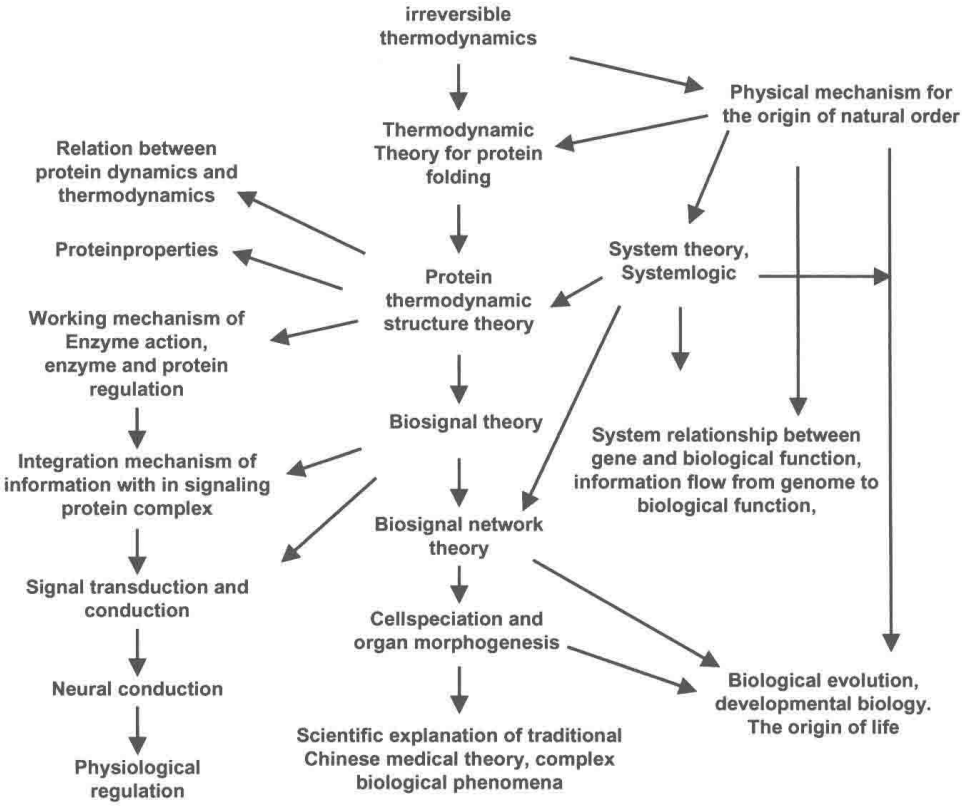
Throughout history, many different schools of philosophy, such as Taoism and Confucianism in China as well as Hegelism in Germany have studied this topic and many valuable viewpoints have been proposed. In fact, ancient Chinese culture was developed alongside the debate over this topic. But this book will be limited to the physical (rather than philosophical) mechanisms governing these phenomena.

Introduction

Currently, biology is generally considered experimental science. The task of experimental science is to learn new facts and phenomena, or to test the application of physical theories to known facts of biology. Historically, an axiomatic theory of biology has not yet been developed. There are considerable differences between creating models which capture the results of experiments, as compared with an axiomatic theory, the existence of which may fundamentally alter the research methods, logic, and structure of the scientific knowledge. The transformation from models of experimental science to an axiomatic theory of science is dramatic, and it requires us to change our thinking method and to recheck our knowledge of basic science and biology.

One can only understand a theory after he/she has read and understood its contents in full. Here, it is helpful to provide a logic structure of axiomatic theory as follows and so that a reader can grasp key thoughts and logic relationships among the many concepts and matters of biology discussed. It must be pointed out that only key relationships among many concepts of biology are depicted in this figure.

By inspecting this figure, we can see that irreversible thermodynamics and system logic act as fundamental theories of biology although they also rest on physical theory and logic theory.



The general and fundamental relation between biological function (or network of signaling activity) and protein thermodynamics has been clearly expressed as the principle that any biological function corresponds to one thermal system within a signaling protein complex. As one biological function corresponds to thermal system within a protein complex, its behaviors can be described by the laws of equilibrium thermodynamics. This is the key thought of our theory.

There are many differences between our theory and current predominated views of biology, some of which are outlined in the following table.

Topic	Our view	Current prevailed views
Protein theory	Thermodynamic structure	Three-dimensional structure
Protein properties	Multiple thermal system	Single system of thermodynamic
Protein structure	Multiple independent spaces	Single 3D space
Integration of information	Thermodynamic mechanism	Not defined
Protein regulation	Allodynamic	Allosteric
Signal	Protein conformational signal	Not defined
Neural conduction	Protein signal	Electric signal
Gene and biological function	System relation	Linear relation
System biology	Thermal system model	Dynamic system model
Logic	System logic	Elementary logic

Acknowledgements

I would like to thank all scientists who have supported me, given suggestions and granted me courage to explore a new world of science and overcome difficulties ahead in my life. This book is also dedicated to all people who have free will in their way perusing truth in the world.

Contents

Part I

Physical Foundation