

# Ecological Stoichiometry

THE BIOLOGY OF ELEMENTS FROM  
MOLECULES TO THE BIOSPHERE

ROBERT W. STERNER AND JAMES J. ELSER

WITH A FOREWORD BY PETER VITOUSEK

# Ecological Stoichiometry The Biology Of Elements From Molecules To The Biosphere

**James Samuel Clark**

## **Ecological Stoichiometry The Biology Of Elements From Molecules To The Biosphere:**

*Ecological Stoichiometry* Robert W. Sterner, James J. Elser, 2002-11-17 Biochemistry energy flow **Ecological Stoichiometry** Robert Warner Sterner, James J. Elser, Peter Vitousek, 2002-10-01 All life is chemical. That fact underpins the developing field of ecological stoichiometry, the study of the balance of chemical elements in ecological interactions. This long awaited book brings this field into its own as a unifying force in ecology and evolution. Synthesizing a wide range of knowledge, Robert Sterner and Jim Elser show how an understanding of the biochemical deployment of elements in organisms from microbes to metazoa provides the key to making sense of both aquatic and terrestrial ecosystems. After summarizing the chemistry of elements and their relative abundance in Earth's environment, the authors proceed along a line of increasing complexity and scale from molecules to cells, individuals, populations, communities, and ecosystems. The book examines fundamental chemical constraints on ecological phenomena such as competition, herbivory, symbiosis, energy flow in food webs, and organic matter sequestration. In accessible prose and with clear mathematical models, the authors show how ecological stoichiometry can illuminate diverse fields of study from metabolism to global change. Set to be a classic in the field, *Ecological Stoichiometry* is an indispensable resource for researchers, instructors, and students of ecology, evolution, physiology, and biogeochemistry. From the foreword by Peter Vitousek: This book represents a significant milestone in the history of ecology. Love it or argue with it, and I do both; most ecologists will be influenced by the framework developed in this book. There are points to question here, and many more to test, and if we are both lucky and good, this questioning and testing will advance our field beyond the level achieved in this book. I can't wait to get on with it.

**Ecological Stoichiometry** Robert Warner Sterner, James J. Elser, 2002 Biochemistry energy flow *Encyclopedia of Theoretical Ecology* Dr. Alan Hastings, Dr. Louis Gross, 2012-05-31 This major reference is an overview of the current state of theoretical ecology through a series of topical entries centered on both ecological and statistical themes. Coverage ranges across scales from the physiological to populations, landscapes, and ecosystems. Entries provide an introduction to broad fields such as Applied Ecology, Behavioral Ecology, Computational Ecology, Ecosystem Ecology, Epidemiology, and Epidemic Modeling, Population Ecology, Spatial Ecology, and Statistics in Ecology. Others provide greater specificity and depth, including discussions on the Allee effect, ordinary differential equations, and ecosystem services. Descriptions of modern statistical and modeling approaches and how they contributed to advances in theoretical ecology are also included. Succinct, uncompromising, and authoritative, a must have for those interested in the use of theory in the ecological sciences.

**The Cycling of Biogenic Elements and Their Microbial Transformations in Marine Ecosystems** Feng Chen, Junfu Dong, Li Jianlon, 2024-12-11 With global climate change and the deterioration of the marine environment, the biogeochemical processes of the main biogenic elements in the ocean have received considerable attention. The spatiotemporal distribution, patterns, migration, and transformation processes of marine biogenic elements, as well as the responses to environmental factors such as global

warming atmospheric sedimentation eutrophication ocean acidification and hypoxia have attracted widespread attention Microorganisms are the main drivers of the biogenic factor cycle Climate change and the deterioration of the marine environment have profoundly affected the structure and function of microbial communities leading to changes in the biogenic factor cycle mediated by microorganisms and changing the position and role of the oceans in the global biogenic factor cycle and climate change

**Encyclopedia of Ecology** Brian D. Fath, 2014-11-03 The groundbreaking Encyclopedia of Ecology provides an authoritative and comprehensive coverage of the complete field of ecology from general to applied It includes over 500 detailed entries structured to provide the user with complete coverage of the core knowledge accessed as intuitively as possible and heavily cross referenced Written by an international team of leading experts this revolutionary encyclopedia will serve as a one stop shop to concise stand alone articles to be used as a point of entry for undergraduate students or as a tool for active researchers looking for the latest information in the field Entries cover a range of topics including Behavioral Ecology Ecological Processes Ecological Modeling Ecological Engineering Ecological Indicators Ecological Informatics Ecosystems Ecotoxicology Evolutionary Ecology General Ecology Global Ecology Human Ecology System Ecology The first reference work to cover all aspects of ecology from basic to applied Over 500 concise stand alone articles are written by prominent leaders in the field Article text is supported by full color photos drawings tables and other visual material Fully indexed and cross referenced with detailed references for further study Writing level is suited to both the expert and non expert Available electronically on ScienceDirect shortly upon publication

**The Chemical Evolution of Phosphorus** Enrique Macia-Barber, 2019-11-21 Here is a fascinating reader friendly exploration of the phosphorus enigma The volume attempts to answer the questions How did phosphorus atoms which are produced inside the inner cores of a handful of huge stars become concentrated in relatively high proportions in the organisms composing Earth's biosphere And how did these phosphate derivatives manage to be included in such a great variety of organic molecules playing essential biochemical roles in all known life forms Due to the interdisciplinary nature of the topic the volume is arranged in three sections The first section introduces the fundamental concepts and notions of physics chemistry and biology necessary for the proper understanding of the topics discussed within an astronomical framework The author then focuses on the role of phosphorus and its compounds within the context of chemical evolution in galaxies considering its relevance in most essential biochemical functions as well as its peculiar chemistry under different physicochemical conditions The third section provides an overall perspective on the role of phosphorus and its compounds in current areas of research of solid state physics materials engineering nanotechnology or medicine

**Bio**, 2004 **Advances in Plant-Soil Nitrogen Management Strategies** Sumera Anwar, Shahbaz Khan, Fahad Shafiq, 2024-02-19 **Global Ecology** Sven Erik Jørgensen, 2010-04-16 Global Ecology focuses on the perception of the biosphere or the ecosphere as a unified cooperative system with numerous synergistic effects which describe the distinctive properties of this sphere This book is subdivided into

five parts dealing with diverse aspects in global ecology. The first part of the book provides comprehensive description of the biosphere including its unique characteristics and evolution. This part also describes various spheres in the biosphere such as the hydrosphere, noosphere and pedosphere as well as their composition. The next part focuses on the global cycles including calcium, carbon, iron, microbial, nitrogen, oxygen, phosphorus, sulfur and water cycles. In addition, global balances and flows are explained. Presented in the third part are the results of the global cycles and flows as well as the patterns of the climatic factors and marine currents. There is also a part discussing the climate interactions, climatic changes and its effect on the living organisms. The book concludes by covering the application of stoichiometry in the biosphere and in ecosystems. The book offers a comprehensive view of global ecology and ecological stoichiometry which will aid in the processes of global ecology. Provides an overview of the theory and application of global ecology. International focus and range of ecosystems makes Global Ecology an indispensable resource to scientists. Based on the bestselling Encyclopedia of Ecology. Full color figures and tables support the text and aid in understanding.

**Official Meeting Program** Ecological Society of America.

Meeting, 2002    **Biological Inorganic Chemistry** Ivano Bertini, Harry B. Gray, Edward Stiefel, Joan Valentine, 2007-01-01

Organized and edited by Ivano Bertini, Harry Gray, Ed Stiefel and Joan Valentine with contributions from many other world leaders in the field, this all new book is equally appropriate for graduate or senior undergraduate courses in bioinorganic chemistry. The long awaited text for 21st century courses in biological inorganic chemistry is now available. Organized and edited by Ivano Bertini, Harry Gray, Ed Stiefel and Joan Valentine with contributions from many other world leaders in the field, this all new book is equally appropriate for graduate or senior undergraduate courses in bioinorganic chemistry. The book has been extensively class tested at Princeton and UCLA and it includes tutorials in biology and biochemistry and in inorganic chemistry to aid students of varying backgrounds. The main text is divided into two parts. Part A: Overviews of Biological Inorganic Chemistry sets forth the unifying principles of the field. A full course in bioinorganic chemistry could be based entirely on this overview section which is a really a book within a book. Part B: Metal Ion Containing Biological Systems describes specific classes of systems in detail. A special feature is the strong connection to the genomic revolution that has dramatically enhanced our ability to define the function of gene products in living organisms. Throughout the book, protein data bank codes are given for structures discussed in the text and students are encouraged to learn to use the PDB in their courses and research. This exciting new book will be a must read for years to come for all students and researchers interested in the field of biological inorganic chemistry.

**Journal of Experimental Biology**, 2006

**The Dioxin Story, Episode II**

Richard Allen Maltby, 2005    Annual Review of Ecology, Evolution, and Systematics, 2008    **The Bulletin**, 2004    *The American Naturalist*, 2009    Morphological, Physiological, and Biochemical Aspects of Growth Rate in Plants Virginia Matzek, 2006    *Models for Ecological Data* James Samuel Clark, 2007

The environmental sciences are undergoing a revolution in the use of models and data. Facing ecological data sets of unprecedented size and complexity, environmental

scientists are struggling to understand and exploit powerful new statistical tools for making sense of ecological processes In Models for Ecological Data James Clark introduces ecologists to these modern methods in modeling and computation Assuming only basic courses in calculus and statistics the text introduces readers to basic maximum likelihood and then works up to more advanced topics in Bayesian modeling and computation Clark covers both classical statistical approaches and powerful new computational tools and describes how complexity can motivate a shift from classical to Bayesian methods Through an available lab manual the book introduces readers to the practical work of data modeling and computation in the language R Based on a successful course at Duke University and National Science Foundation funded institutes on hierarchical modeling Models for Ecological Data will enable ecologists and other environmental scientists to develop useful models that make sense of ecological data Consistent treatment from classical to modern Bayes Underlying distribution theory to algorithm development Many examples and applications Does not assume statistical background Extensive supporting appendixes Lab manual in R is available separately [John T. and Paige S. Smith Undergraduate Science Research Symposium Proceedings ,2008](#)

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