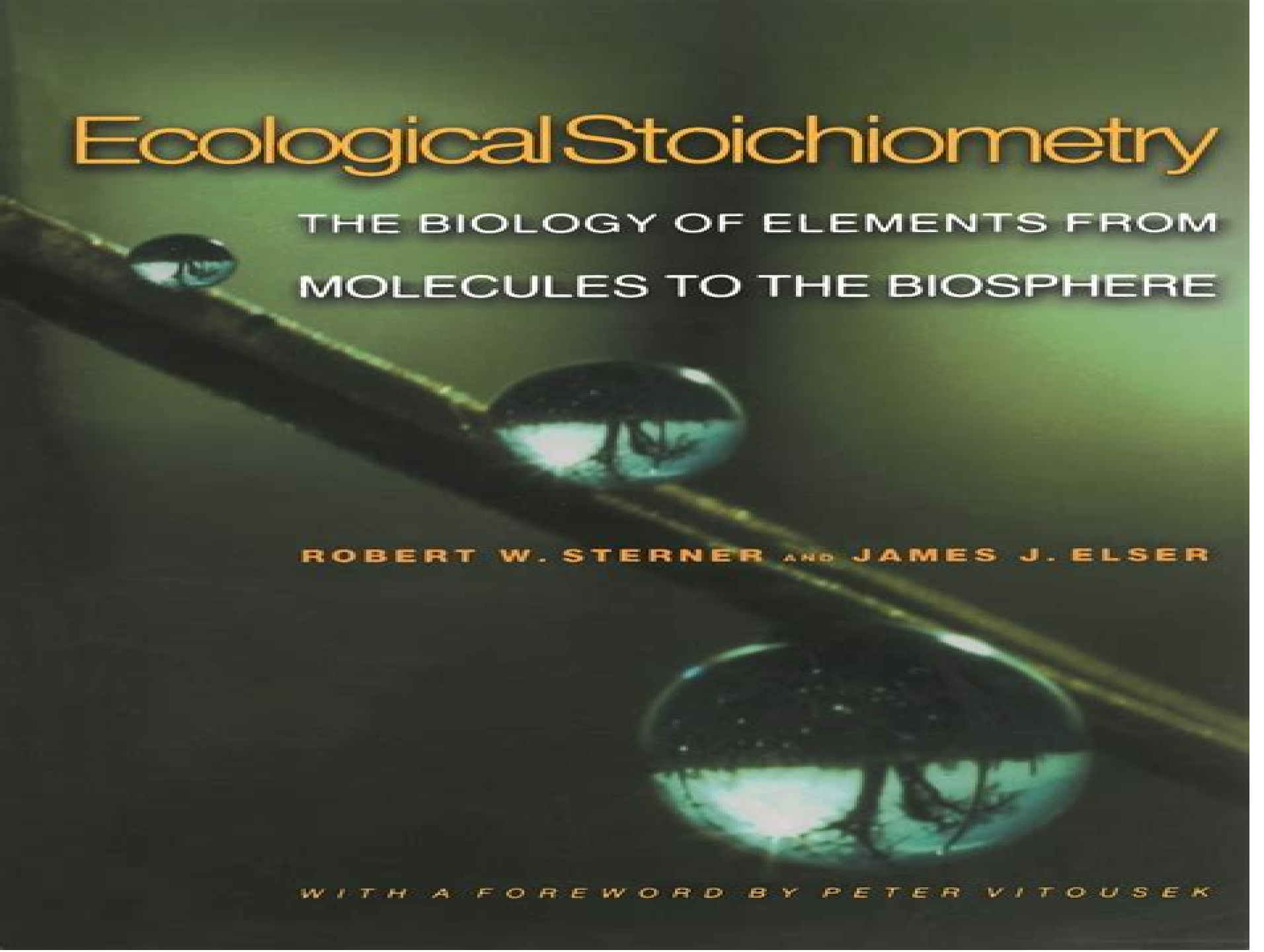
Ecological Stoichiometry
THE BIOLOGY OF ELEMENTS FROM MOLECULES TO THE BIOSPHERE
ROBERT W. STERNER AND JAMES J. ELSER
WITH A FOREWORD BY PETER VITOUSEK

Ecological Stoichiometry The Biology Of Elements From Molecules To The Biosphere

Brian D. Fath

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 T his 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 thelevel achieved in this book I can t wait to get on with it *Ecological Stoichiometry* Robert W. Sterner,James J. Elser,2017-02-15 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 T his 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 **Progress in Ecological Stoichiometry** Dedmer B. Van de Waal,James J. Elser, Adam C. Martiny,Robert W. Sterner,James B. Cotner,2018 Ecological stoichiometry concerns the way that the elemental composition of organisms shapes their ecology It deals with the balance or imbalance of elemental ratios and how that affects organism growth nutrient cycling and the interactions with the biotic and abiotic worlds The elemental composition of organisms is a set of constraints through which all the Earth s biogeochemical cycles must pass All organisms consume nutrients and acquire compounds from the environment proportional to their needs Organismal elemental needs are determined in turn by the energy required to live and grow the physical and chemical constraints of their environment and their requirements for relatively large polymeric biomolecules such as RNA DNA lipids and proteins as well as for structural needs including stems bones shells etc These materials together constitute most of the biomass of living organisms Although there may be little variability in elemental ratios of many of these biomolecules changing the proportions of different biomolecules can have important effects on organismal elemental composition Consequently the variation in elemental composition both within and across organisms can be tremendous which has important implications for Earth s biogeochemical cycles It has been over a decade since the publication of Sterner and Elser s book Ecological Stoichiometry 2002 In the intervening years hundreds of papers on stoichiometric topics ranging from evolution and regulation of nutrient content in organisms to the role of stoichiometry in populations communities ecosystems and global biogeochemical dynamics have been published Here we present a collection of contributions from the broad scientific community to highlight recent insights in the field of Ecological Stoichiometry **Stoichiometry and Research** Alessio Innocenti,2012-03-07 The aim of this book is to provide an overview of the importance of stoichiometry in the biomedical field It proposes a collection of selected research articles and reviews which provide up to date information related to stoichiometry at various levels The first section deals with host guest chemistry focusing on selected calixarenes cyclodextrins and crown ethers derivatives In the second and third sections the book presents some issues concerning stoichiometry of metal complexes and lipids and polymers architecture The fourth section aims to clarify the role of stoichiometry in the determination of protein interactions while in the fifth section some selected experimental techniques applied to specific systems are introduced The last section of the book is an attempt at showing some interesting connections between biomedicine and the environment introducing the concept of biological stoichiometry On this basis the present volume would definitely be an ideal source of scientific information to researchers and scientists involved in biomedicine biochemistry and other areas involving stoichiometry evaluation 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 Seagrasses: Biology, Ecology and Conservation Anthony Larkum,Robert J. Orth,Carlos Duarte,2007-02-22 Seagrasses are unique plants the only group of flowering plants to recolonise the sea They occur on every continental margin except Antarctica and form ecosystems which have important roles in fisheries fish nursery grounds prawn fisheries habitat diversity and sediment stabilisation Over the last two decades there has been an explosion of research and information on all aspects of seagrass biology However the compilation of all this work into one book has not been attempted previously In this book experts in 26 areas of seagrass biology present their work in chapters which are state of the art and designed to be useful to students and researchers alike The book not only focuses on what has been discovered but what exciting areas are left to discover The book is divided into sections on taxonomy anatomy reproduction ecology physiology fisheries management conservation and landscape ecology It is destined to become the chosen text on seagrasses for any marine biology course 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 *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 **Phytoplankton Whispering: An Introduction to the Physiology and Ecology of Microalgae** Patricia M. Glibert,2024-08-12 Phytoplankton or algae are the engines of the Earth They form the base of the aquatic food web and although microscopic they produce 50% of the oxygen in the air Many of our ideas of what makes these cells tick come from ideas developed decades ago But lakes and oceans are changing and so too are phytoplankton Our understanding has to change accordingly Nutrient pollution is a major problem worldwide and climate is changing altering temperature CO2 and pH as well as the physics that control water stratification All of these factors control which species of phytoplankton may grow well at any particular time While algae grow in all types of aquatic systems not all algae are favorable for the production of fish and other food resources The prevalence of harmful algal blooms HABs has increased At the core of this effort is a drive to understand and to convey to researchers students and managers what kinds of phytoplankton are likely to thrive as conditions change and why this matters There has not yet been a synthetic summary that unravels the mysteries of phytoplankton in a modern world This book aims to provide such a resource

Seeking Sustainability in an Age of Complexity Graham Harris,2007-06-14 Seeking Sustainability in an Age of Complexity explains the difficulties of sustainability and why collapse can occur In the last twenty years the theory of complexity has been developed complex systems science CSS speaks to natural systems and particularly to ecological social and economic systems and their interaction Due to the growing concern over the huge changes occurring in the global environment such as climate change deforestation habitat fragmentation and loss of biodiversity Graham Harris sets out what has been learned in an attempt to understand the implications of these changes and suggests ways to move forward This book discusses a number of emerging tools for the management of unruly complexity which facilitate stronger regional dialogues about knowledge and values which will be of interest to ecologists sociologists economists natural resource managers and scientists in State and local governments and those involved in water and landscape management **Instant Insights: Nitrogen-use efficiency** Various authors,Prof J. F. Angus,Samantha Earl-Goulet,Professor Claudia Wagner-Riddle,Laura Van Eerd,Kate Congreves,Dinesh Kumar Jaiswal,Professor Nandula Raghuram,Prof Malcolm J.

Hawkesford,Dr William R. Whalley,Jacques Le Gouis,2024-10-29 Considers the impact of nitrogen overuse on crop yield grain quality and profit Discusses recent advances in understanding nitrogen cycling in soil Highlights the need to develop more efficient varieties of wheat with improved traits related to nitrogen uptake assimilation and remobilisation **Improving nitrogen use efficiency in crop production** Professor Claudia Wagner-Riddle,Professor Brent Kaiser,Professor Nandula Raghuram,Professor Brenda Tubana,Dr Bijay Singh,Professor Deli Chen,Dr Chelsea K. Janke,Professor Harold Van Es,Professor Masoud Hashemi,Dr Alan Franzluebbers,Dr Iris Vogeler,Dr Lucie Chmelikova,Professor David Pannell,Professor Ignacio Ciampitti,2024-03-12 Considers the role of fertiliser use in agriculture as a major contributor to the imbalance of the global nitrogen cycle Reviews the effectiveness of inorganic nitrogen fertilisers and organic sources of nitrogen in optimising nitrogen use efficiency Highlights recent developments in the use of enhanced efficiency nitrogen fertilisers to reduce nitrous oxide emissions Ecological Understanding Steward T.A. Pickett,Jurek Kolasa,Clive G. Jones,2010-08-04 This widely anticipated revision of the groundbreaking book Ecological Understanding updates this crucial sourcebook of contemporary philosophical insights for practicing ecologists and graduate students in ecology and environmental studies The second edition contains new ecological examples an expanded array of conceptual diagrams and illustrations new text boxes summarizing important points or defining key terms and new reference to philosophical issues and controversies Although the first edition was recognized for its clarity this revision takes the opportunity to make the exposition of complex topics still clearer to readers without a philosophical background Readers will gain an understanding of the goals of science the structure of theory the kinds of theory relevant to ecology the way that theory changes what constitutes objectivity in contemporary science and the role of paradigms and frameworks for synthesis within ecology and in integration with other disciplines Finally how theory can inform and anchor the public use of ecological knowledge in civic debates is laid out This new edition refines the understanding of how the structure and change of theory can improve the growth and application of one of the 21st century s key sciences Explains the philosophical basis of ecology in plain English Contains chapter overviews and summaries Text boxes highlight key points examples or controversies Diagrams explain structure and development of theory and integration Evaluates and relates paradgims in ecology Illustrates philosophical issues with classic and new ecological research Oceanography and Marine Biology R. N. Gibson,R. J. A. Atkinson,J. D. M. Gordon,2008-06-05 Increasing interest in marine biology and its relevance to environmental issues creates a demand for authoritative reviews of recent research Oceanography and Marine Biology has addressed this demand for nearly 40 years This annual review considers basics of marine research special topics and emerging new areas Regarding the marine sciences as a unified field the text features contributors who are actively engaged in biological chemical geological and physical aspects of marine science This edition includes a full color insert and covers such topics as the ecological status of the Great Barrier Reef the effects of coral bleaching on fisheries and the biology of octopus larvae **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 *Plant Physiological Ecology* Hans Lambers,F Stuart Chapin III,Thijs L. Pons,2008-10-08 Box 9E 1 Continued FIGURE 2 The C S R triangle model Grime 1979 The strategies at the three corners are C competiti winning species S stress tolerating s cies R ruderalspecies Particular species can engage in any mixture of these three primary strategies and the m ture is described by their position within the triangle comment briefly on some other dimensions that Grime s 1977 triangle Fig 2 see also Sects 6 1 are not yet so well understood and 6 3 of Chapter 7 on growth and allocation is a two dimensional scheme A C S axis Com tition winning species to Stress tolerating spe Leaf Economics Spectrum cies reflects adaptation to favorable vs unfavorable sites for plant growth and an R Five traits that are coordinated across species are axis Ruderal species reflects adaptation to leaf mass per area LMA leaf life span leaf N disturbance concentration and potential photosynthesis and dark respiration on a mass basis In the five trait Trait Dimensions space 79%ofallvariation worldwideliesalonga single main axis Fig 33 of Chapter 2A on photo A recent trend in plant strategy thinking has synthesis Wright et al 2004 Species with low been trait dimensions that is spectra of varia LMA tend to have short leaf life spans high leaf tion with respect to measurable traits Compared nutrient concentrations and high potential rates of mass based photosynthesis These species with category schemes such as Raunkiaer s trait occur at the quick return end of the leaf e dimensions have the merit of capturing cont nomics spectrum

Global Change in Multispecies Systems: Part I Guy Woodward,Ute Jacob,2012-11-29 Advances in Ecological Research is one of the most successful series in the highly competitive field of ecology Each volume publishes topical and important reviews interpreting ecology as widely as in the past to include all material that contributes to our understanding of the field

Topics in this invaluable series include the physiology populations and communities of plants and animals as well as landscape and ecosystem ecology Advances in Ecological Research is one of the most successful series in the highly competitive field of ecology Each volume publishes topical and important reviews interpreting ecology as widely as in the past to include all material that contributes to our understanding of the field **Emerging Frontiers in Ecological Stoichiometry** Michelle Evans-White,James Joseph Elser,2020-01-16 *Groundwater Ecology and Evolution* Florian Malard,Christian Griebler,Sylvie Retaux,2023-03-11 Groundwater Ecology and Evolution Second Edition is designed to meet a multitude of audience needs The state of the art in the discipline is provided by the articulation of six sections The first three sections successively carry the reader into the basic attributes of groundwater ecosystems section 1 the drivers and patterns of biodiversity section 2 and the roles of organisms in groundwater ecosystems section 3 The next two sections are devoted to evolutionary processes driving the acquisition of subterranean biological traits section 4 and the way these traits are differently expressed among groundwater organisms section 5 Finally section 6 shows how knowledge acquired among multiple research fields sections 1 to 5 is used to manage groundwater biodiversity and ecosystem services in the face of future groundwater resource use scenarios Emphasis on the coherence and prospects of the whole book is given in the introduction and conclusion Provides a modern synthesis of research dedicated to the study of groundwater biodiversity and ecosystems Bridges the gap between community ecology evolution and functional ecology three research fields that have long been presented isolated from each other Explains how this trans disciplinary integration of research contributes to understanding and managing of groundwater ecosystem functions Reveals the contribution of groundwater ecology and evolution in solving scientific questions well beyond the frontiers of groundwater systems

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