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6UVRRR - MOORE JOHNSON

This book contains about 20 invited papers and 40 contributed papers in the research areas of theoretical continuum mechanics, kinetic theory and numerical applications of continuum mechanics. Collectively these papers give a good overview of the activities and developments in these fields in the last few years.The proceedings have been selected for coverage in: ? Index to Scientific & Technical Proceedings? (ISTP? / ISI Proceedings)? Index to Scientific & Technical Proceedings (ISTP CDROM version / ISI Proceedings)? CC Proceedings ? Engineering & Physical Sciences

This volume is an interdisciplinary book which introduces, in a very readable way, state-of-the-art research in the fundamental topics of mathematical modelling of Biosystems. In short, the book offers an overview of mathematical and computational modelling of biosystems including biological phenomena in general. There is also a special introduction to Protein Physics which aims to explain the all-or-none first order phase transitions from native to denatured states.

First organized in 1981, the WASCOM conference to bring together researchers and scientists from all over the world to discuss problems, promote collaborations and shape future directions for research in the field of stability and wave propagation in continuous media. This book constitutes the proceedings of the 11th edition of the conference, the first of the third millennium. The main topics are: (1) Linear and nonlinear hyperbolic equations, conservation laws and specific aspects of wave propagation; (2) stability of systems of PDEs, with particular reference to those of fluid and solid mechanics; (3) extended thermodynamics and passage from microscopic to macroscopic description of the medium for systems characterized also by inelastic interactions at the kinetic scale. The proceedings have been selected for coverage in: • Index to Scientific & Technical Proceedings (ISTP CDROM version / ISI Proceedings) Contents:Recovering the Potential in the Schrödinger Equation from the N-D Map (S Avdonin et al.)Space Homogeneous Solutions of the Linear Boltzmann Equation for Semiconductors: A Semigroup Approach (J Banasiak et al.)Grad's Closure in the Kinetic Theory of a Chemically Reacting Gas (M Bisi et al.)Characteristic Shocks in Exceptional Directions (G Boillat & A Muracchini)Continuum Mechanics and Dynamical Permutations (Y Brenier)Continuum Equations for Rarefied Gases (X Chen & E A Spiegel)Decay and Other Properties of Cross-Sectional Measures in Elasticity (J N Flavin)Dynamics of Lines in the Spreading of Liquids on Solid Surfaces (H Gouin)Integration and Segregation in a Population — A Short Account of Socio-Thermodynamics (I Müller)Second Sound Propagation in Superfluid Helium via Extended Thermodynamics (A Muracchini et al.)An H-Theorem in a Simple Model of Chemically Reactive Dense Gases (J Polewczak)Modelling of Dissipative Processes (K R Rajagopal)On the Geometry of Spatial Hydrodynamic Motions. Solitonic Connections (C Rogers)Thermodynamics and Balance Laws for Processes of Inelastic Deformations (E I Romenski)Kinetic and Fluidynamic Approaches to Four-Wave-Mixing and Thermal Acoustic Phenomena in Quantum Optics (F Schürrer er al.)Unconditional Nonlinear Stability Via the Energy Method (B Straughan)Entropy Methods for the Asymptotic Behaviour of Fourth-order Nonlinear Diffusion Equations (G Toscani)and other papers Readership: Academics, researchers and graduate students in mathematical modeling, mathematical physics, fluid mechanics and thermodynamics. Keywords:Discontinuity and Shock Waves;Hyperbolic Systems;Stability in Fluid Dynamics;Small Parameter Problems;Kinetic Theories towards Continuum Models;Non Equilibrium Thermodynamics;Extended Thermodynamics;Chemically Reacting Mixtures;Mathematical Models of Biology;Numerical Methods of Fluid Dynamics

This work presents the proceedings from the International Conference on Differential Equations and Control Theory, held recently in Wuhan, China. It provides an overview of current developments in a range of topics including dynamical systems, optimal control theory, stochastic control, chaos, fractals, wavelets and ordinary, partial, functional and stochastic differential equations.

Mathematical and computational modeling approaches in biological and medical research are experiencing rapid growth globally. This Special Issue Book intends to scratch the surface of this exciting phenomenon. The subject areas covered involve general mathematical methods and their applications in biology and medicine, with an emphasis on work related to mathematical and computational modeling of the complex dynamics observed in biological and medical research. Fourteen rigorously reviewed papers were included in this Special Issue. These papers cover several timely topics relating to classical population biology, fundamental biology, and modern medicine. While the authors of these papers dealt with very different modeling questions, they were all motivated by specific applications in biology and medicine and employed innovative mathematical and computational methods to study the complex dynamics of their models. We hope that these papers detail case studies that will inspire many additional mathematical modeling efforts in biology and medicine

First organized in 1981, the WASCOM conference to bring together researchers and scientists from all over the world to discuss problems, promote collaborations and shape future directions for research in the field of stability and wave propagation in continuous media.This book constitutes the proceedings of the 11th edition of the conference, the first of the third millennium. The main topics are: (1) Linear and nonlinear hyperbolic equations, conservation laws and specific aspects of wave propagation; (2) stability of systems of PDEs, with particular reference to those of fluid and solid mechanics; (3) extended thermodynamics and passage from microscopic to macroscopic description of the medium for systems characterized also by inelastic interactions at the kinetic scale.The proceedings have been selected for coverage in: ? Index to Scientific & Technical Proceedings (ISTP CDROM version / ISI Proceedings)

Chlorinated ethenes are common groundwater contaminants that may be treated through in-situ bioremediation. Relationships between the reducing environment, available electron donors and acceptors, reaction kinetics, and microbial community composition must be further understood to successfully engineer remediation schemes in the complex subsurface environment. This thesis work investigated the effect of sulfate reduction on a dehalogenating culture grown under very controlled conditions. Two chemostats containing the Point Mugu (PM) culture were maintained using an influent containing tetrachloroethene (PCE) as an electron acceptor and lactate as a fermenting electron donor. One of these chemostats, PM-5L, was used as a control, while the influent to the PM-2L chemostat was amended with sulfate on an equal electron-equivalent basis to PCE. The effluent composition of these two chemostats was monitored over time, and periodic batch rate tests and molecular analyses were performed with cells harvested from the chemostat to elucidate the changes in performance and microbial composition within the chemostat culture. A numerical model based on Monod kinetics with competitive inhibition was developed to fit data from batch PCE-to-ethene rate tests by simultaneously solving for the k[subscript m]X parameters of each CAH dechlorination step given a standard set of Ks values. Non-linear regression of multi-equilibrium VC Monod test data provided the Monod parameters (k[subscript m]X and K[subscript s]) for VC dechlorination. These parameters were used to quantify changes in dechlorinating performance of each chemostat over time and compare the performance of the two chemostats. The effluent chemical composition of the PM-5L chemostat appeared to be steady after approximately six residence times, with 1120 uM PCE being transformed to 98% ethene and 2% VC, H2 tensions remaining between 2-3 nM, acetate around 4.3 mM, and biomass around 23 mg protein/L. Batch rate tests during this time showed rapid rates of transformation for all CAHs, agreeing well with chemostat performance. The k[subscript m]X parameters derived from the PCE-to-ethene data and the pseudo-mixed order rate coefficient of VC dechlorination determined through multi-equilibrium VC Monod tests also remained essentially constant over the one-year period of study. Changes in the PM-2L chemostat performance following the initiation of sulfate reduction were observed. Sulfate reduction began almost immediately after its addition to the chemostat, and total sulfide concentrations rose to 100-300 uM. Chemostat performance with respect to CAH and H2 concentrations was roughly steady over approximately 250 days, with PCE being dechlorinated to 9 uM cis-DCE, 230 uM VC, and 860 uM ethene under H2 tensions around 4 nM. Total protein levels nearly doubled during this period, increasing from 25 to 47 mg protein/L. Sulfate reduction then rapidly increased to completion, resulting in 620-720 uM dissolved sulfide and a decrease in the H2 concentration to 2 nM. At this time, the extent of PCE dechlorination also decreased to 280, 760, and 80 uM cis-DCE, VC, and ethene, respectively. Batch rate tests showed a decrease in all chlorinated ethene reduction rates; however, VC dechlorination was the most effected by sulfate reduction, showing a 97% reduction in rate following sulfate addition. Multi-equilibrium VC rate tests were impossible to conduct following the sharp increase in sulfate reduction in the chemostat due to lack of measurable dechlorination over a days' time. A simple chemostat model employed Monod kinetics for the series of CAH reactions to determine the steady-state extent of dechlorination in the chemostat predicted by the best-fit kinetic parameters of each PCE-to-ethene rate test. The extent of dechlorination was well-modeled for the PM-5L chemostat when a H2 limitation factor of 0.3 was applied to the rate of each CAH. Using a dual Monod kinetic model with H2 as the electron donor, the limitation factor corresponded with a half-velocity coefficient (K[subscript H]) of 4.6 nM. When this same K[subscript H] was used to model the PM-2L chemostat, a greater extent of dechlorination was predicted than what was observed in the chemostat, possibly suggesting other inhibitory factors of dechlorination were present in the PM-2L chemostat. DNA and RNA analyses of cells periodically harvested from the chemostat were performed by Ian P.G. Marshall at Stanford University. His work revealed shifts in the chemostats' Dehalococcoides population over time. Analysis of the PM-5L culture using the H2ase chip he developed and a clone library of hupL genes showed that the Dehalococcoides population was predominately related to strains BAV-1 or CBDB1/GT and did not undergo a significant shift over time. Clone libraries constructed for cells harvested from the PM-2L chemostat revealed two shifts in the chemostat Dehalococcoides population. A genetically homogenous strain relative of BAV-1 was eliminated following a decline in chemostat H2 tensions from around 27 nM to 2 nM and a corresponding increase in dehalogenation efficiency. In a second shift, a strain 195 relative outcompeted the CBDB1/GT relatives following enhanced sulfate reduction. A general decrease in the Dehalococcoides concentration within the chemostat culture was also suggested by qPCR analysis of Dehalococcoides 16S genes. These molecular results correlated well with the decline in VC reduction rates reported in batch kinetic tests given the characteristic co-metabolic VC reduction of the dominant strain 195 relative and overall lower concentrations of Dehalococcoides. Our work suggests that sulfate reduction in the anaerobic chemostat environment caused a shift in the dechlorinating microbial population to a strain with less efficient VC reduction. This shift was also accompanied by a decline in Dehalococcoides concentration within the culture. Both of these factors contributed to the decline in chlorinated ethene transformation rates observed through batch rate tests. Competition for H2 was not expected to be the primary cause for the changes observed in the PM-2L chemostat. Long-term batch tests involving the control culture are proposed to elucidate whether sulfide or other factors of sulfate reduction are responsible for this shift, and to confirm the suspected role of H2 competition between dechlorination and sulfate reduction in the chemostat-grown PM culture.

This must-have student resource contains complete solutions to all end-of-chapter problems in Genetics: Analysis of Genes and Genomes, Eighth Edition, by Daniel L. Hartl and Maryellen Ruvolo, as well as a wealth of supplemental problems and exercises with full solutions, a complete chapter summary, and keyword section. The supplemental problems provided in this manual are designed as learning opportunities rather than exercises to be completed by rote. They are organized into chapters that parallel those of the main text, and all problems can be solved through application of the concepts and principles explained in Genetics, Eighth Edition.

Continuous cultures, i.e. chemostats with an continuous dilution rate, are model ecosystems for the study of general regulation principles in plankton communities. Further to an introduction, general continuous culture methods and especially the characteristics of rotifer continuousculture systems are presented. Sections on metabolism and energetics in chemostats, growth models, competition and predator-prey interactions, as well as the application of rotifer continuous cultures to ecotoxicology and their use in aquaculture are included.

This book presents comprehensive treatment of a rapidly developing area with many potential applications: the theory of monotone dynamical systems and the theory of competitive and cooperative differential equations. The primary aim is to provide potential users of the theory with techniques, results, and ideas useful in applications, while at the same time providing rigorous proofs. Among the topics discussed in the book are continuous-time monotone dynamical systems, and quasimonotone and nonquasimonotone delay differential equations. The book closes with a discussion of applications to quasimonotone systems of reaction-diffusion type. Throughout the book, applications of the theory to many mathematical models arising in biology are discussed. Requiring a background in dynamical systems at the level of a first graduate course, this book is useful to graduate students and researchers working in the theory of dynamical systems and its applications.

Basic modelling, analysis and simulation of systems that have proven effective in real ecological applications.

This volume is based on the proceedings of the International Workshop on Dynamical Systems and their Applications in Biology held at the Canadian Coast Guard College on Cape Breton Island (Nova Scotia, Canada). It presents a broad picture of the current research surrounding applications of dynamical systems in biology, particularly in population biology. The book contains 19 papers and includes articles on the qualitative and/or numerical analysis of models involving ordinary, partial, functional, and stochastic differential equations. Applications include epidemiology, population dynamics, and physiology. The material is suitable for graduate students and research mathematicians interested in ordinary differential equations and their applications in biology. Also available by Ruan, Wolkowicz, and Wu is Differential Equations with Applications to Biology, Volume 21 in the AMS series Fields Institute Communications.

This book constitutes the refereed proceedings of the 22nd International Conference on Nonlinear Dynamics of Electronic Systems, NDES 2014, held in Albena, Bulgaria, in July 2014. The 47 revised full papers presented were carefully reviewed and selected from 65 submissions. The papers are organized in topical sections on nonlinear oscillators, circuits and electronic systems; networks and nonlinear dynamics and nonlinear phenomena in biological and physiological systems.

Mathematical Biology has grown at an astonishing rate and has established itself as a distinct discipline. Mathematical modeling is now being applied in every major discipline in the biological sciences. Though the field has become increasingly large and specialized, this book remains important as a text that introduces some of the exciting problems which arise in the biological sciences and gives some indication of the wide spectrum of questions that modeling can address.

This book uses fundamental ideas in dynamical systems to answer questions of a biologic nature, in particular, questions about the behavior of populations given a relatively few hypotheses about the nature of their growth and interaction. The principal subject treated is that of coexistence under certain parameter ranges, while asymptotic methods are used to show competitive exclusion in other parameter ranges. Finally, some problems in genetics are posed and analyzed as problems in nonlinear ordinary differential equations.

Invented by J. Monod, and independently by A. Novick and L. Szilard, in 1950, the chemostat is both a micro-organism culturing device and an abstracted ecosystem managed by a controlled nutrient flow. This book studies mathematical models of single species growth as well as competition models of multiple species by integrating recent work in theoretical ecology and population dynamics. Through a modeling approach, the hypotheses and conclusions drawn from the main mathematical results are analyzed and interpreted from a critical perspective. A large emphasis is placed on numerical simulations of which prudent use is advocated. The Chemostat is aimed at readers possessing degree-level mathematical knowledge and includes a detailed appendix of differential equations relating to specific notions and results used throughout this book.

Volume 2.

A ubiquitous tool in mathematical biology and chemical engineering, the chemostat often produces instabilities that pose safety hazards and adversely affect the optimization of bioreactive systems. Singularity theory and bifurcation diagrams together offer a useful framework for addressing these issues. Based on the authors' extensive work in this field, Dynamics of the Chemostat: A Bifurcation Theory Approach explores the use of bifurcation theory to analyze the static and dynamic behavior of the chemostat. Introduction The authors first survey the major work that has been carried out on the stability of continuous bioreactors. They next present the modeling approaches used for bioreactive systems, the different kinetic expressions for growth rates, and tools, such as multiplicity, bifurcation, and singularity theory, for analyzing nonlinear systems. Application The text moves on to the static and dynamic behavior of the basic unstructured model of the chemostat for constant and variable yield coefficients as well as in the presence of wall attachment. It then covers the dynamics of interacting species, including pure and simple microbial competition, biodegradation of mixed substrates, dynamics of plasmid-bearing and plasmid-free recombinant cultures, and dynamics of predator–prey interactions. The authors also examine dynamics of the chemostat with product formation for various growth models, provide examples of bifurcation theory for studying the operability and dynamics of continuous bioreactor models, and apply elementary concepts of bifurcation theory to analyze the dynamics of a periodically forced bioreactor. Using singularity theory and bifurcation techniques, this book presents a cohesive mathematical framework for analyzing and modeling the macro- and microscopic interactions occurring in chemostats. The text includes models that describe the intracellular and operating elements of the bioreactive system. It also explains the mathematical theory behind the models.

Produced for unit SBB213 (Genetics) offered by the Faculty of Science and Technology's School of Biological and Chemical Sciences in Deakin University's Open Campus Program.

This book contains about 20 invited papers and 40 contributed papers in the research areas of theoretical continuum mechanics, kinetic theory and numerical applications of continuum mechanics. Collectively these papers give a good overview of the activities and developments in these fields in the last few years. The proceedings have been selected for coverage in: • Index to Scientific & Technical Proceedings® (ISTP® / ISI Proceedings) • Index to Scientific & Technical Proceedings (ISTP CDROM version / ISI Proceedings) • CC Proceedings — Engineering & Physical Sciences Contents:Chaos in Some Linear Kinetic Models (J Banasiak)Inverse Problems in Photon Transport. Part I: Determination of Physical and Geometrical Features of an Interstellar Cloud (A Belleni-Morante et al.)Inverse Problems in Photon Transport. Part II: Features of a Source Inside an Interstellar Cloud (A Belleni-Morante & R Riganti)The Riemann Problem for a Binary Non-Reacting Mixture of Euler Fluids (F Brini & T Ruggeri)Rate of Convergence toward the Equilibrium in Degenerate Settings (L Desvillettes & C Villani)Asymptotic and Other Properties of Positive Definite Integral Measures for Nonlinear Diffusion (J N Flavin)Thermocapillary Fluid and Adiabatic Waves Near its Critical Point (H Gouin)Constitutive Models for Atactic Elastomers (C O Horgan & G Saccomandi)Considerations about the Gibbs Paradox (I Müller)Transport Coefficients in Stochastic Models of the Revised Enskog and Square-Well Kinetic Theories (J Polewczak & G Stell)Some Recent Mathematical Results in Mixtures Theory of Euler Fluids (T Ruggeri)From Kinetic Systems to Diffusion Equations (F Salvarani & J L Vázquez)Non-Boussinesq Convection in Porous Media (B Straughan)and other papers Readership: Researchers, academics and graduate students working in the fields of continuum mechanics, wave propagation, stability in fluids, kinetic theory and computational fluid dynamics. Keywords:Discontinuity and Shock Waves;Stability in Fluid Mechanics;Small Parameter Problem;Kinetic Theories Towards Continuum Models;Non-Equilibrium Thermodynamics;Numerical Applications

Population dynamics is an important subject in mathematical biology. A cen tral problem is to study the long-term behavior of modeling systems. Most of these systems are governed by various evolutionary equations such as difference, ordinary, functional, and partial differential equations (see, e. g. , [165, 142, 218, 119, 55]). As we know, interactive populations often live in a fluctuating environment. For example, physical environmental conditions such as temperature and humidity and the availability of food, water, and other resources usually vary in time with seasonal or daily variations. Therefore, more realistic models should be nonautonomous systems. In particular, if the data in a model are periodic functions of time with commensurate period, a periodic system arises; if these periodic functions have different (minimal) periods, we get an almost periodic system. The existing reference books, from the dynamical systems point of view, mainly focus on autonomous biological systems. The book of Hess [106J is an excellent reference for periodic parabolic boundary value problems with applications to population dynamics. Since the publication of this book there have been extensive investigations on periodic, asymptotically periodic, almost periodic, and even general nonautonomous biological systems, which in turn have motivated further development of the theory of dynamical systems. In order to explain the dynamical systems approach to periodic population problems, let us consider, as an illustration, two species periodic competitive systems dUI dt = !I(t,UI,U2), (0.

As one of the most quantitative of ecological subdisciplines, resource competition is an important, central area of ecology. Recently research into this area has increased dramatically and resource competition models have become more complex. The characterisation of this phenomenon is therefore the aim of this book. Resource Competition seeks to identify the unifying principles emerging from experimental and theoretical approaches as well as the differences between organisms, illustrating that greater knowledge of resource competition will benefit human and environmental welfare. This book will serve as an indispensable guide to ecologists, evolutionary biologists and environmental managers, and all those interested in resource competition as an emerging discipline.