Dynamical Systems In Population Biology

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Dynamical Systems In Population Biology
A means to better estimate COVID-19 occurrence and trends in populations has recently been outlined by a new study led by the US Geological Survey ...

New study helps in fight against COVID pandemic
A new study led by the US Geological Survey outlines a means to better estimate COVID-19 occurrence and trends in populations ...

Strategic approach to COVID-19 testing
Monographs in Population Biology is a continuing series of books intended ... Furthermore, in studying the effects of natural selection in generally... The Dynamics of Arthopod Predator-Prey Systems. ...

Monographs in Population Biology
coli populations, the roles of gene transfer and recombination, the distribution and evolution of plasmids and antibiotic resistance, population genetics of phase-variable systems, population dynamics ...

Population Genetics of Bacteria
While these tests are useful for individual medical treatment and contact tracing, they do not provide health officials with a complete picture of the disease across the population ... better ...

Study Shows How Public Health Agencies Can Better Estimate COVID-19 Occurrence and Trends
While these tests are useful for individual medical treatment and contact tracing, they do not provide health officials with a complete picture of the disease across the population. "Coordinated ...

Study on coordinated sampling helps in the fight against the coronavirus pandemic
To tackle this challenge, areas of conservation biology that are disparate ought ... or hinder evolutionary responses in ecological systems? How do such responses affect population viability, ...

Evolutionary Conservation Biology
Dr. Lovreet Shergill, Montana State University assistant professor and weed scientist, will be speaking about management of herbicide resistant weeds in sugarbeet cropping systems in Montana at 12:50 ...

Shergill To Discuss Herbicide Resistant Weeds At EARC Field Day
A new study led by the US Geological Survey outlines a means to better estimate COVID-19 occurrence and trends in populations.

Coronavirus: Scientists provide more strategic approach to COVID-19 testing
While these tests are useful for individual medical treatment and contact tracing, they do not provide health officials with a complete picture of the disease across the population ... better ...

USGS-led study helps in the fight against the coronavirus pandemic
Bahamian mosquitofish in habitats fragmented by human activity are more willing to explore their environment, more stressed by change and have smaller brain regions associated with fear response than ...

Human-driven habitat change leads to physical, behavioral change in mosquitofish
And with a growing population, this is going to be a big problem. We need to start thinking about how we can keep these soils diverse, dynamic and efficient. Soils are living, dynamic systems ...

Meet the researcher whose explosive work aims to keep our soils healthy
While these tests are useful for individual medical treatment and contact tracing, they do not provide health officials with a complete picture of the disease across the population ... better ...

New study outlines a means to better estimate COVID-19 occurrence and trends
New research focused on muskrat population dynamics ... Biology, demonstrates the vulnerability of even this most protected landscape to human-driven changes to water systems and the global ...

Muskrats as a bellwether for a drying delta
Andrews, for one, is a pioneer of functional genomics and has dedicated her career to studying cells as dynamic systems composed of ... Her tier one chair in systems genetics and cell biology includes ...

In fields ranging from math to medicine, U of T researchers awarded 27 Canada Research Chairs
A new study led by the US Geological Survey outlines a means to better estimate COVID-19 occurrence and trends in populations.

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.

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.

"The mathematical theory of persistence answers questions such as which species, in a mathematical model of interacting species, will survive over the long term. It applies to infinite-dimensional as well as to finite-dimensional dynamical systems, and to discrete-time as well as to continuous-time semiflows. This monograph provides a self-contained treatment of persistence theory that is accessible to graduate students. The key results for deterministic autonomous systems are proved in full detail such as the acyclicity theorem and the tripartition of a global compact attractor. Suitable conditions are given for persistence to imply strong persistence even for nonautonomous semiflows, and time-heterogeneous persistence results are developed using so-called 'average Lyapunov functions'. Applications play a large role in the monograph from the beginning. These include ODE models such as an SEIRS infectious disease in a meta-population and discrete-time nonlinear matrix models of demographic dynamics. Entire chapters are devoted to infinite-dimensional examples including an SI epidemic model with variable infectivity, microbial growth in a tubular bioreactor, and an age-structured model of cells growing in a chemostat."--Publisher's description.

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.

Dynamical Systems for Biological Modeling: An Introduction prepares both biology and mathematics students with the understanding and techniques necessary to undertake basic modeling of biological systems. It achieves this through the development and analysis of dynamical systems. The approach emphasizes qualitative ideas rather than explicit computations. Some technical details are necessary, but a qualitative approach emphasizing ideas is essential for understanding. The modeling approach helps students focus on essentials rather than extensive mathematical details, which is helpful for students whose primary interests are in sciences other than mathematics need or want. The book discusses a variety of biological modeling topics, including population biology, epidemiology, immunology, intraspecies competition, harvesting, predator-prey systems, structured populations, and more. The authors also include examples of problems with solutions and some exercises which follow the examples quite closely. In addition, problems are included which go beyond the examples, both in mathematical analysis and in the development of mathematical models for biological problems, in order to encourage deeper understanding and an eagerness to use mathematics in learning about biology.

This volume highlights problems from a range of biological and medical applications that can be interpreted as questions about system behavior or control. Topics include drug resistance in cancer and malaria, biological fluid dynamics, auto-regulation in the kidney, anti-coagulation therapy, evolutionary diversification and photo-transduction. Mathematical techniques used to describe and investigate these biological and medical problems include ordinary, partial and stochastic differentiation equations, hybrid discrete-continuous approaches, as well as 2 and 3D numerical simulation.

How to understand evolution in mathematical terms, i.e. how to model natural selection by game theory.

Why do organisms become extremely abundant one year and then seem to disappear a few years later? Why do population outbreaks in particular species happen more or less regularly in certain locations, but only irregularly (or never at all) in other locations? Complex population dynamics have fascinated biologists for decades. By bringing together mathematical models, statistical analyses, and field experiments, this book offers a comprehensive new synthesis of the theory of population oscillations. Peter Turchin first reviews the conceptual tools that ecologists use to investigate population oscillations, introducing population modeling and the statistical analysis of time series data. He then provides an in-depth discussion of several case studies--including the larch budmoth, southern pine beetle, red grouse, voles and lemmings, snowshoe hare, and ungulates--to develop a new analysis of the mechanisms that drive population oscillations in nature. Through such work, the author argues, ecologists can develop general laws of population dynamics that will help turn ecology into a truly quantitative and predictive science. Complex Population Dynamics integrates theoretical and empirical studies into a major new synthesis of current knowledge about population dynamics. It is also a pioneering work that sets the course for ecology's future as a predictive science.

Dynamic Models in Biology offers an introduction to modern mathematical biology. This book provides a short introduction to modern mathematical methods in modeling dynamical phenomena and treats the broad topics of population dynamics, epidemiology, evolution, immunology, morphogenesis, and pattern formation. Primarily employing differential equations, the author presents accessible descriptions of difficult mathematical models. Recent mathematical results are included, but the author's presentation gives intuitive meaning to all the main formulae. Besides mathematicians who want to get acquainted with this relatively new field of applications, this book is useful for physicians, biologists, agricultural engineers, and environmentalists. Key Topics Include: Chaotic dynamics of populations The spread of sexually transmitted diseases Problems of the origin of life Models of immunology Formation of animal hide patterns The intuitive meaning of mathematical formulae explained with many figures Applying new mathematical results in modeling biological phenomena Miklos Farkas is a professor at Budapest University of Technology where he has researched and instructed mathematics for over thirty years. He has taught at universities in the former Soviet Union, Canada, Australia, Venezuela, Nigeria, India, and Columbia. Prof. Farkas received the 1999 Bolyai Award of the Hungarian Academy of Science and the 2001 Albert Szentgyorgyi Award of the Hungarian Ministry of Education. A 'down-to-earth' introduction to the growing field of modern mathematical biology Also includes appendices which provide background material that goes beyond advanced calculus and linear algebra

Taking more of a qualitative rather than computational approach, this text presents the techniques required to undertake basic modeling of biological systems through the development and analysis of dynamical systems. It includes many different types of applications from population biology and epidemiology. Keeping technical details to a minimum, the text only requires a basic understanding of calculus. It provides examples of problems with solutions followed by exercises to reinforce the examples. Many of the problems are somewhat challenging so as to encourage a deeper understanding and prompt the use of mathematics in learning about biology.