

Chapter 16 Evolution Of Populations Genes And Variation

In response to many requests, the Third Edition of A Primer of Population Genetics has been dramatically shortened and streamlined for greater accessibility. Designed primarily for undergraduates, it will also serve for graduate students and professionals in biology and other sciences who desire a concise but comprehensive overview of the field with a primary focus on the integration of experimental results with theory. The abundance of experimental data generated by the use of molecular methods to study genetic polymorphisms sparked a transformation in the field of population genetics. Present in virtually all organisms, molecular polymorphisms allow populations to be studied without regard to species or habitat, and without the need for controlled crosses, mutant genes, or for any prior genetic studies. Thus a familiarity with population genetics has become essential for any biologist whose work is at the population level. These fields include evolution, ecology, systematics, plant breeding, animal breeding, conservation and wildlife management, human genetics, and anthropology. Population genetics seeks to understand the causes of genetic differences within and among species, and molecular biology provides a rich repertoire of techniques for identifying these differences.

Human-induced environmental change currently represents the single greatest threat to global biodiversity. Species are typically adapted to the local environmental conditions in which they have evolved. Changes in environmental conditions initially influence behaviour, which in turn affects species interactions, population dynamics, evolutionary processes and, ultimately, biodiversity. How animals respond to changed conditions, and how this influences population viability, is an area of growing research interest. Yet, despite the vital links between environmental change, behaviour, and population dynamics, surprisingly little has been done to bridge these areas of research. Behavioural Responses to a Changing World is the first book of its kind devoted to understanding behavioural responses to environmental change. The volume is comprehensive in scope, discussing impacts on both the mechanisms underlying behavioural processes, as well as the longer-term ecological and evolutionary consequences. Drawing on international experts from across the globe, the book covers topics as diverse as endocrine disruption, learning, reproduction, migration, species interactions, and evolutionary rescue.

Urban Evolutionary Biology fills an important knowledge gap on wild organismal evolution in the urban environment, whilst offering a novel exploration of the fast-growing new field of evolutionary research. The growing rate of urbanization and the maturation of urban study systems worldwide means interest in the urban environment as an agent of evolutionary change is rapidly increasing. We are presently witnessing the emergence of a new field of research in evolutionary biology. Despite its rapid global expansion, the urban environment has until now been a largely neglected study site. In contrast to its conspicuous altered ecological dynamics, it stands in stark contrast to the natural environments traditionally used as cornerstones for evolutionary ecology research. Urbanization can offer a great range of new opportunities to test for rapid evolutionary processes as a consequence of human activity, both because of replicate contexts for hypothesis testing, but also because cities are characterized by an array of easily quantifiable environmental axes of variation and thus testable agents of selection. Thanks to a wide possible breadth of inference (in terms of taxa) that may be studied, and a great variety of analytical methods, urban evolution has the potential to stand at a fascinating multi-disciplinary crossroad, enriching the field of evolutionary biology with emergent yet incredibly potent new research themes where the urban habitat is key. Urban Evolutionary Biology is an advanced textbook suitable for graduate level students as well as professional researchers studying the genetics, evolutionary biology, and ecology of urban environments. It is also highly relevant to urban ecologists and urban wildlife practitioners.

Studies the biological characteristics and internal structure of animal species, and analyzes the significance of the genetic factor in evolution

Conservation and the Genetics of Populations
In the Light of Evolution

Strickberger's Evolution
Demographic Methods Across the Tree of Life
Populations, Species, and Evolution
Principles of Genome Function

In 1990 Sibley and Monroe compiled a list of the world's birds. On that list were 9,672 species. In what has been something of a taxonomic revolution more have been added as vocalizations have been studied and DNA sequenced. Now there are likely to be close to 10,000 recognized extant species of birds, and many times that number that have gone extinct over the past 145 million years or so since the first know fossil bird, Archaeopteryx. Speciation in Birds is an authoritative synthesis on the behavioral and genetic causes and consequences of speciation in birds.

Evolution: Components and Mechanisms introduces the many recent discoveries and insights that have added to the discipline of organic evolution, and combines them with the key topics needed to gain a fundamental understanding of the mechanisms of evolution. Each chapter covers an important topic or factor pertinent to a modern understanding of evolutionary theory, allowing easy access to particular topics for either study or review. Many chapters are cross-referenced. Modern evolutionary theory has expanded significantly within only the past two to three decades. In recent times the definition of a gene has evolved, the definition of organic evolution itself is in need of some modification, the number of known mechanisms of evolutionary change has increased dramatically, and the emphasis placed on opportunity and contingency has increased. This book synthesizes these changes and presents many of the novel topics in evolutionary theory in an accessible and thorough format. This book is an ideal, up-to-date resource for biologists, geneticists, evolutionary biologists, developmental biologists, and researchers in, as well as students and academics in these areas and professional scientists in many subfields of biology. Discusses many of the mechanisms responsible for evolutionary change Includes an appendix that provides a brief synopsis of these mechanisms with most discussed in greater detail in respective chapters Aids readers in their organization and understanding of the material by addressing the basic concepts and topics surrounding organic evolution Covers some topics not typically addressed, such as opportunity, contingency, symbiosis, and progress

Sequenced biological macromolecules have revitalized systematic studies of evolutionary history. Molecular Systematics of Fishes is the first authoritative overview of the theory and application of these sequencing data to fishes. This volume explores the phylogeny of fishes at multiple taxonomic levels, uses methods of analysis of molecular data that apply both within and between fish populations, and employs molecule-based phylogenies to address broader questions of evolution. Targeted readers include ichthyologists, marine scientists, and all students, faculty, and researchers interested in fish evolution and ecology and vertebrate systematics. Focuses on the phylogeny and evolutionary biology of fishes Contains phylogenies of fishes at multiple taxonomic levels Applies molecule-based phylogenies to broader questions of evolution Includes methods for critique of analysis of molecular data

At a glance, most species seem adapted to the environment in which they live. Yet species relentlessly evolve, and populations within species evolve in different ways. Evolution, as it turns out, is much more dynamic than biologists realized just a few decades ago. In Relentless Evolution, John N. Thompson explores why adaptive evolution never ceases and why natural selection acts on species in so many different ways. Thompson presents a view of life in which ongoing evolution is essential and inevitable. Each chapter focuses on one of the major problems in adaptive evolution: How fast is evolution? How strong is natural selection? How do species co-opt the genomes of other species as they adapt? Why does adaptive evolution sometimes lead to more, rather than less, genetic variation within populations? How does the process of adaptation drive the evolution of new species? How does coevolution among species continually reshape the web of life? And, more generally, how are our views of adaptive evolution changing? Relentless Evolution draws on studies of all the major forms of life—from microbes that evolve in microcosms within a few weeks to plants and animals that sometimes evolve in detectable ways within a few decades. It shows evolution not as a slow and stately process, but rather as a continual and sometimes frenetic process that favors yet more evolutionary change.

Volume X: Comparative Phylogeography
Specialization, Speciation, and Radiation
A Practical Guide

Essays on the Nature of Species
Evolution and Selection of Quantitative Traits

Introduction to Population Biology
A fresh, distinctive approach to the teaching of molecular biology. With its focus on key principles, its emphasis on the commonalities that exist between the three kingdoms of life, and its integrated coverage of experimental methods and approaches, Molecular Biology is the perfect companion to any molecular biology course.

Conservation and the Genetics of Populations gives comprehensive overview of the essential background, concepts, and tools needed to understand how genetic information can be used to develop conservation plans for species threatened with extinction. Provides a thorough understanding of the genetic basis of biological problems in conservation. Uses a balance of data and theory, and basic and applied research, with examples taken from both the animal and plant kingdoms. An associated website contains example data sets and software programs to illustrate population genetic processes and methods of data analysis. Discussion questions and problems are included at the end of each chapter to aid understanding. Features Guest Boxes written by leading people in the field including James F. Crow, Nancy FitzSimmons, Robert C. Lacy, Michael W. Nachman, Michael E. Soule, Andrea Taylor, Loren H. Rieseberg, R.C. Vrijenhoek, Lisette Waits, Robin S. Waples and Andrew Young. Supplementary information designed to support Conservation and the Genetics of Populations including: Downloadable sample chapter Answers to questions and problems Data sets illustrating problems from the book Data analysis software programs Website links An Instructor manual CD-ROM for this title is available. Please contact our Higher Education team at ahref="mailto:HigherEducation@wiley.com">HigherEducation@wiley.com for more information.

Thoroughly updated and reorganized, Strickberger's Evolution, Fourth Edition, presents biology students with a basic introduction to prevailing knowledge and ideas about evolution, discussing how, why, and where the world and its organisms changed throughout history. Keeping consistent with Strickberger's engaging writing style, the authors carefully unfold a broad range of philosophical and historical topics that frame the theories of today including cosmological and geological evolution and its impact on life, the origins of life on earth, the development of molecular pathways from genetic systems to organismic morphology and function, the evolutionary history of organisms from microbes to animals, and the numerous molecular and populational concepts that explain the earth's dynamic evolution. Important Notice: The digital edition of this book is missing some of the images or content found in the physical edition.

Polyorphism or variation in DNA sequence can affect individual phenotypes such as color of skin or eyes, susceptibility to diseases, and response to drugs, vaccines, chemicals, and pathogens. Especially, the interfaces between genetics, disease susceptibility, and pharmacogenomics have recently been the subject of intense research activity. This book is a self-contained collection of valuable scholarly papers related to genetic diversity and disease susceptibility, pharmacogenomics, ongoing advances in technology, and analytic methods in this field. The book contains nine chapters that cover the three main topics of genetic polymorphism, genetic diversity, and disease susceptibility and pharmacogenomics. Hence, this book is particularly useful to academics, scientists, physicians, pharmacists, practicing researchers, and postgraduate students whose work relates to genetic polymorphisms.

Components and Mechanisms
Concepts, Models, Evidence
Relentless Evolution

Conceptual Breakthroughs in Evolutionary Ecology
Molecular Biology

From Field Observations to Mechanisms

Provides a quantitative and Darwinian perspective on population biology, with problem sets, simulations and worked examples to aid the student.

Now that so many ecological and mechanistic changes, the ability of species to respond to these changes by dispersing or moving between different patches of habitat can be crucial to ensuring their survival. Understanding dispersal has become key to understanding how populations may persist. Dispersal Ecology and Evolution provides a timely and wide-ranging overview of the fast expanding field of dispersal ecology, incorporating the very latest research. The causes, mechanisms, and consequences of dispersal at the individual, population, species, and community levels are considered. Perspectives and insights are offered from the fields of evolution, behavioural ecology, conservation biology, and genetics. Throughout the book theoretical approaches are combined with empirical data, and care has been taken to include examples from as wide a range of species as possible - both plant and animal.

This book adopts an experimental approach to understanding the mechanisms of evolution and the nature of evolutionary processes, with examples drawn from microbial, plant and animal systems. It incorporates insights from remarkable recent advances in theoretical modelling, and the fields of molecular genetics and environmental genomics. Adaptation is caused by selection continually winnowing the genetic variation created by mutation. In the last decade, our knowledge of how selection operates on populations in the field and in the laboratory has increased enormously, and the principal aim of this book is to provide an up-to-date account of selection as the principal agent of evolution. In the classical Fisherian model, weak selection acting on many genes of small effect over long periods of time is responsible for driving slow and gradual change. However, it is now clear that adaptation in laboratory populations often involves strong selection acting on a few genes of large effect, while in the wild selection is often strong and highly variable in space and time. Indeed these results are changing our perception of how evolutionary change takes place. This book summarizes our current understanding of the causes and consequences of selection, with an emphasis on quantitative and experimental studies. It includes the latest research into experimental evolution, natural selection in the wild, artificial selection, selfish genetic elements, selection in social contexts, sexual selection, and speciation.

An ethologist shows man to be a gene machine whose world is one of savage competition and deceit

Behavioural Responses to a Changing World
Genetics and Evolution of Infectious Diseases
Urban Evolutionary Biology

The Experimental Analysis of Distribution and Abundance
An Abridgment of Animal Species and Evolution

Principles and Processes

Part 1: What is ecology? Chapter 1: Introduction to the science of ecology. Chapter 2: Evolution and ecology. Part 2: The problem of distribution: populations. Chapter 3: Methods for analyzing distributions. Chapter 4: Factors that limit distributions: dispersal. Chapter 5: Factors that limit distributions: habitat selections. Chapter 6: Factors that limit distributions: Interrelations with other species. Chapter 7: Factors that limit distributions: temperature, moisture, and other physical-chemical factors. Chapter 8: The relationship between distribution and abundance. Part 3: The problem of abundance: populations. Chapter 9: Population parameters. Chapter 10: Demographic techniques: vital statistics. Chapter 11: Population growth. Chapter 12: Species interactions: competition. Chapter 13: Species interactions: predation. Chapter 14: Species interactions: Herbivory and mutualism. Chapter 15: Species interactions: disease and parasitism. Chapter 16: Population regulation. Chapter 17: Applied problems I: harvesting populations. Chapter 18: Applied problems II: pest control. Chapter 19: Applied problems III: Conservation biology. Part 4: Distribution and abundance at the community level. Chapter 20: The nature of the community. Chapter 21: Community change. Chapter 22: Community organization I: biodiversity. Chapter 23: Community organization II: Predation and competition in equilibrial communities. Chapter 24: Community organization III: disturbance and nonequilibrium communities. Chapter 25: Ecosystem metabolism I: primary production. Chapter 26: Ecosystem metabolism II: secondary production. Chapter 27: Ecosystem metabolism III: nutrient cycles. Chapter 28: Ecosystem health: human impacts.

This volume captures the state-of-the-art in the study of insect-plant interactions, and marks the transformation of the field into evolutionary biology. The contributors present integrative reviews of uniformly high quality that will inform and inspire generations of academic and applied biologists. Their presentation together provides an invaluable synthesis of perspectives that is rare in any discipline.--Brian D. Farrell, Professor of Organic and Evolutionary Biology, Harvard University Timon has assembled a truly wonderful and rich volume, with contributions from the lion's share of fine minds in evolution and ecology of herbivorous insects. The topics comprise a fascinating and deep coverage of what has been discovered in the prolific recent decades of research with insects on plants. Fascinating chapters provide deep analyses of some of the most interesting research on these interactions. From insect plant ecology, behavior and host shifting to phylogenetics, co-evolution, Life-history evolution, and invasive plant-insect interaction, one is hard pressed to name a substantial topic not included. This volume will launch a hundred graduate seminars and find itself on the shelf of everyone who is anyone working in this rich landscape of disciplines.--Donald R. Strong, Professor of Evolution and Ecology, University of California, Davis Seldom have so many excellent authors been brought together to write so many good chapters on so many important topics in organismic evolutionary biology. Tom Wood, always unassuming and inspired by living nature, would have been amazed and pleased by this tribute.--Mary Jane West-Eberhard, Smithsonian Tropical Research Institute

Genetic diversity, biodiversity, population management. The Fundamentals series introduces students to the principles of the law by way of clear text combined with visual aids, tools and diagrams to enable an easy understanding of the subject without sacrificing the detail that is required for proper comprehension. Each title assumes no level of prior knowledge, allowing the book to be used for those new to the subject and for distance learning. Criminal Law - The Fundamentals includes full coverage of all topics likely to be studied on Criminal Law courses and it includes summaries of the key Law Commission's proposals for reform where relevant.

Introduction to Conservation Genetics

Mechanisms of Life History Evolution

Speciation in Birds

Microbial Ecology of Leaves

The Selfish Gene

Adaptation in Natural Populations

New viral diseases are emerging continuously. Viruses adapt to new environments at astounding rates. Genetic variability of viruses jeopardizes vaccine efficacy. For many viruses mutants resistant to antiviral agents or host immune responses arise readily, for example, with HIV and influenza. These variations are all of utmost importance for human and animal health as they have prevented us from controlling these epidemic pathogens. This book focuses on the mechanisms that viruses use to evolve, survive and cause disease in their hosts. Covering human, animal, plant and bacterial viruses, it provides both the basic foundations for the evolutionary dynamics of viruses and specific examples of emerging diseases. * NEW - methods to establish relationships among viruses and the mechanisms that affect virus evolution * UNIQUE - provides a detailed analysis of the evolution of important virus groups * SPECIFIC - Bacterial, plant, animal and human viruses are compared regarding their interaction with their hosts

According to the National Institute of Health, a genome-wide association study is defined as any study of genetic variation across the entire human genome that is designed to identify genetic associations with observable traits (such as blood pressure or weight), or the presence or absence of a disease or condition. Whole genome information, when combined with clinical and other phenotype data, offers the potential for increased understanding of basic biological processes affecting human health, improvement in the prediction of disease and patient care, and ultimately the realization of the promise of personalized medicine. In addition, rapid advances in understanding the patterns of human genetic variation and maturing high-throughput, cost-effective methods for genotyping are providing powerful research tools for identifying genetic variants that contribute to health and disease. This burgeoning science merges the principles of statistics and genetics studies to make sense of the vast amounts of information available with the mapping of genomes. In order to make the most of the information available, statistical tools must be tailored and translated for the analytical issues which are original to large-scale association studies. Analysis of Complex Disease Association Studies will provide researchers with advanced biological knowledge who are entering the field of genome-wide association studies with the groundwork to apply statistical analysis tools appropriately and effectively. With the use of consistent examples throughout the work, chapters will provide readers with best practice for getting started (designing, analyzing, and interpreting data according to their research interests. Frequently used tests will be highlighted and a critical analysis of the advantages and disadvantage complemented by case studies for each will provide readers with the information they need to make the right choice for their research. Additional tools including links to analysis tools, tutorials, and references will be available electronically to ensure the latest information is available. Easy access to key information including advantages and disadvantages of tests for particular applications, identification of databases, languages and their capabilities, data management risks, frequently used tests Extensive list of references including links to tutorial websites Case studies and Tips and Tricks

If you want to know whether evolution is a science, how life began, what Charles Darwin really said about evolution, why a fungus is more closely related to humans than to a plant, how experiments in evolution can be carried out, why birds are flying dinosaurs, how we manipulate the evolution of other species, and if you want a clear treatment of the processes that result in evolution, then this is the book for you! Written for those with a minimal science background, Evolution: Principles and Processes provides a concise introduction of evolutionary topics for the one-term course. Using an engaging writing style and a wealth of full-color illustrations, Hall covers all topics from the origin of universe, Earth, the origin of life, and on to how humans influence the evolution of other species. He brings together the principles and processes that explain evolutionary change and discusses the patterns of life that have resulted from the operation of evolution over the past 3.5 billion years. This overview, coupled with numerous case studies and examples, helps readers understand and truly appreciate the origin and diversity of life.

Ecologists are aware of the importance of natural dynamics in ecosystems. Historically, the focus has been on the development in succession of equilibrium communities, which has generated an understanding of the composition and functioning of ecosystems. Recently, many have focused on the processes of disturbances and the evolutionary significance of such events. This shifted emphasis has inspired studies in diverse systems. The phrase "patch dynamics" (Thompson, 1978) describes their common focus. The Ecology of Natural Disturbance and Patch Dynamics brings together the findings and ideas of those studying varied systems, presenting a synthesis of diverse individual contributions.

The Mechanism of Evolution

The Molecular Landscape

A Primer of Population Genetics

Molecular Systematics of Fishes

Population in the Human Sciences

Principles of Behavioral Genetics

The leaf surface or phyllosphere is a major habitat for microorganisms. Microbes on or within leaves play important roles in plant ecology, and these microbes can be manipulated to enhance plant growth or reduce plant disease. This book presents a number of critical reviews by internationally recognized experts on the microbial ecology of leaves. Topics include methods of assessment of microbial populations on leaf surfaces, leaves as reservoirs of ice nucleation phenomenon, and leaves as microbial habitats in both aquatic and terrestrial environments. The book will be of interest to students and scientists in numerous disciplines, including botany, aerobiology, meteorology, ecology, agriculture, and microbiology.

Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which for many students is their only college-level science course. As such, this course represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives. For these reasons, Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand. We also strive to show the interconnectedness of topics within this extremely broad discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of Concepts of Biology is that instructors can customize the book, adapting it to the approach that works best in their classroom. Concepts of Biology also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts.

This novel book provides the reader with the fundamentals of data collection, model construction, analyses, and interpretation across a wide repertoire of demographic techniques and protocols, clearly guided throughout with fully reproducible R scripts.

A range of theories on the rates of evolution-from static to gradual to punctuated to quantum-have been developed, mostly by comparing morphological changes over geological timescales as described in the fossil record.

The Evolutionary Biology of Herbivorous Insects

Ecology

Analysis of Complex Disease Association Studies

Integrating Phenotypic and Genetic Perspectives

Dispersal Ecology and Evolution

Selection

Biodiversity-the genetic variety of life-is an exuberant product of the evolutionary past, a vast human-supportive resource (aesthetic, intellectual, and material) of the present, and a rich legacy to cherish and preserve for the future. Two urgent challenges, and opportunities, for 21st-century science are to gain deeper insights into the evolutionary processes that foster biotic diversity, and to translate that understanding into workable solutions for the regional and global crises that biodiversity currently faces. A grasp of evolutionary principles and processes is important in other societal arenas as well, such as education, medicine, sociology, and other applied fields including agriculture, pharmacology, and biotechnology. The ramifications of evolutionary thought also extend into learned realms traditionally reserved for philosophy and religion. The central goal of the In the Light of Evolution (ILE) series is to promote the evolutionary sciences through state-of-the-art colloquia-in the series of Arthur M. Sackler colloquia sponsored by the National Academy of Sciences-and their published proceedings. Each installment explores evolutionary perspectives on a particular biological topic that is scientifically intriguing but also has special relevance to contemporary societal issues or challenges. This tenth and final edition of the In the Light of Evolution series focuses on recent developments in phylogeographic research and their relevance to past accomplishments and future research directions.

Examines theories and methods used to study age-structured populations.

This impressive author team brings the wealth of advances in conservation genetics into the new edition of this introductory text, including new chapters on population genomics and genetic issues in introduced and invasive species. They continue the strong learning features for students - main points in the margin, chapter summaries, vital support with the mathematics, and further reading - and now guide the reader to software and databases. Many new references reflect the expansion of this field. With examples from mammals, birds,...

Although biologists recognize evolutionary ecology by name, many only have a limited understanding of its conceptual roots and historical development. Conceptual Breakthroughs in Evolutionary Ecology fills a thought-provoking and readable format. Written by a world-renowned evolutionary ecologist, this book embeds a unique blend of expertise in population genetics and ecology. Following an easily-accessible structure, this book encapsulates and chronologizes the history behind evolutionary ecology. It also focuses on the integration of age-structure and density-dependent selection into an understanding of life-history evolution. Covers over 60 seminal breakthroughs and paradigm shifts in the field of evolutionary biology and ecology Modular format permits ready access to each described subject Historical overview of a field whose concepts are central to all of biology and relevant to a broad audience of biologists, science historians, and philosophers of science

The Units of Evolution

Mechanisms and Consequences

Evolution

In Search of the Causes of Evolution

The Genetics and Physiology of Life History Traits and Trade-Offs

Concepts of Biology

This volume is based on presentations by the world-renowned investigators who gathered at the 74th annual Cold Spring Harbor Symposium on Quantitative Biology to celebrate the 150th anniversary of the publication of Charles Darwin's On the Origin of Species. It reviews the latest advances in research into evolution, focusing on the molecular bases for evolutionary change. The topics covered include the appearance of the first genetic material, the origins of cellular life, evolution and development, selection and adaptation, and genome evolution. Human origins, cognition, and cultural evolution are also covered, along with social interactions. The line-up of speakers comprised a stellar list of preeminent scientists and thinkers such as the zoologist and prolific author E. O. Wilson (Harvard University), Jack W. Szostak (Harvard Medical School), a 2009 Nobel Prize winner who studies the chemistry of life's origins; and Nobel Prize winner and former president of HHMI Thomas Cech (Colorado Institute for Molecular Biotechnology), to name just a few.

Quantitative traits-be they morphological or physiological characters, aspects of behavior, or genome-level features such as the amount of RNA or protein expression for a specific gene-usually show considerable variation within and among populations. Quantitative genetics, also referred to as the genetics of complex traits, is the study of such characters and is based on mathematical models of evolution in which many genes influence the trait and in which non-genetic factors may also be important. Evolution and Selection of Quantitative Traits presents a holistic treatment of the subject, showing the interplay between theory and data with extensive discussions on statistical issues relating to the estimation of the biologically relevant parameters for these models. Quantitative genetics is viewed as the bridge between complex mathematical models of trait evolution and real-world data, and the authors have clearly framed their treatment as such. This is the second volume in a planned trilogy that summarizes the modern field of quantitative genetics, informed by empirical observations from wide-ranging fields (agriculture, evolution, ecology, and human biology) as well as population genetics, statistical theory, mathematical modeling, genetics, and genomics. Whilst volume 1 (1998) dealt with the genetics of such traits, the main focus of volume 2 is on their evolution, with a special emphasis on detecting selection (ranging from the use of

genetic and historical data through to ecological field data) and examining its consequences.

Life history theory seeks to explain the evolution of the major features of life cycles by analyzing the ecological factors that shape age-specific schedules of growth, reproduction, and survival and by investigating the trade-offs that constrain the evolution of these traits. Although life history theory has made enormous progress in explaining the diversity of life history strategies among species, it traditionally ignores the underlying proximate mechanisms. This novel book argues that many fundamental problems in life history evolution, including the nature of trade-offs, can only be fully resolved if we begin to integrate information on developmental, physiological, and genetic mechanisms into the classical life history framework. Each chapter is written by an established or up-and-coming leader in their respective field: they not only represent the state of the art but also offer fresh perspectives for future research. The text is divided into 7 sections that cover basic concepts (Part 1), the mechanisms that affect different parts of the life cycle (growth, development, and maturation; reproduction; and aging and somatic maintenance) (Parts 2-4), life history plasticity (Part 5), life history integration and trade-offs (Part 6), and concludes with a synthesis chapter written by a prominent leader in the field and an editorial postscript (Part 7).

This title addresses the need for review and assessment of the framework of interdisciplinary population studies. Limitations to prevailing post-war paradigms like the Evolutionary Synthesis and Demographic Transition were becoming evident by the 1970s. Subsequent decades have witnessed an immense expansion of population modelling and related empirical inquiry. The volume presents revised papers of an international symposium marking 40 years of the Human Sciences programme at the University of Oxford.

The Ecology of Natural Disturbance and Patch Dynamics

Origin and Evolution of Viruses

Genetic Diversity and Disease Susceptibility

Evolution in Age-Structured Populations

Rapidly Evolving Genes and Genetic Systems

Evolutionary biology has witnessed breathtaking advances in recent years. Some of its most exciting insights have come from the crossover of disciplines as varied as paleontology, molecular biology, ecology, and genetics. This book brings together many of today's pioneers in evolutionary biology to describe the latest advances and explain why a cross-disciplinary and integrated approach to research questions is so essential. Contributors discuss the origins of biological diversity, mechanisms of evolutionary change at the molecular and developmental levels, morphology and behavior, and the ecology of adaptive radiations and speciation. They highlight the mutual dependence of organisms and their environments, and reveal the different strategies today's researchers are using in the field and in the laboratory to explore this interdependence. Peter and Rosemary Grant--renowned for their influential work on Darwin's finches in the Galápagos--provide concise introductions to each section and identify the key questions future research needs to address. In addition to the editors, the contributors are Myra Awoodey, Christopher N. Balakrishnan, Rowan D. H. Barrett, May R. Berendbaum, Paul M. Brakefield, Philip J. Currie, Scott V. Edwards, Douglas J. Emlen, Joshua B. Gross, Hopi E. Hoekstra, Richard Hudson, David Jablonski, David T. Johnston, Mathieu Joron, David Kingsley, Andrew H. Knoll, Mimi A. R. Koehl, June Y. Lee, Jonathan B. Losos, Isabel Santos Magalhães, Albert B. Phillimore, Trevor Price, Dolph Schluter, Ole Seehausen, Clifford J. Tabin, John N. Thompson, and David B. Wake.

"A central goal of evolutionary biology is to understand how organisms adapt to their environment. Though much progress has been made in answering this question, many aspects of the process of adaptation remain mysterious. This is especially true for biologists' understanding of the genetic basis of adaptation in natural populations of organisms. My dissertation integrates phenotypic and genetic perspectives to advance our understanding of selection and adaptation in natural populations of organisms. I take multiple approaches to this question, combining meta-analysis, population surveys, and manipulative experiments in the field. In my first chapter, I explore the consequences of natural selection on genetic variants. In many population genetic models, selection is parameterized as the selection coefficient, s. Through a meta-analysis of over 3000 selection coefficients from 79 studies, I reveal generalities about how natural selection operates at the genetic level. I relate these results to population genetic theory and studies of phenotypic selection, and provide recommendations for the calculation, interpretation, and reporting of selection coefficients. In my second chapter, I consider natural selection and adaptation within a rapidly moving hybrid zone between two races of *Heliconius erato* butterfly that differ in colour pattern. Because the genetic loci responsible for variation in colour pattern in *H. erato* are well characterized, I consider selection at the phenotypic and genetic levels simultaneously. I develop new statistical methods for quantifying hybrid zone position and shape and apply these to show that over the last 15 years the *H. erato* hybrid zone has grown wider while its movement has slowed. I show that this is due to a decrease in the strength of selection on colour pattern and the underlying colour-pattern allele. I then use remotely-sensed data on forest loss and productivity to test hypotheses about the ecological forces that influence hybrid zone dynamics. In my final chapter, I examine whether phenotypic and genetic change are predictable. I take an experimental approach, using a large-scale, long-term, eco-evolutionary field study with *Anolis sagrei* lizards. Anoles are an exemplar of parallel evolution across an adaptive radiation, and their interactions with competitor and predator species have been well-studied in within-generation experiments. This provides clear predictions for how these ecological interactions might drive adaptive evolution over multiple generations. I test these predictions by manipulating the presence and absence of predator and competitor species in a factorial design across 16 small islands in the Bahamas. I measure changes in a suite of morphological traits relevant to habitat use and performance, and use DNA sequencing to characterize changes in allele frequency across the genome. Despite strong and consistent effects of predators and competitors on behavior, diet, and population size in *A. sagrei*, I found that phenotypic and genetic change were difficult to predict in advance. Phenotypic change was related to variation in vegetation structure and lizard densities across islands, making a priori prediction challenging. Genetic change, on the other hand, was unpredictable and unrelated to either our experimental manipulations, phenotypic change, or environmental differences. My work reveals the necessity of ecological data and knowledge of natural history for predicting natural selection, and shows how field experiments can be used to test and clarify hypotheses about how natural selection operates. Overall, my dissertation demonstrates that integrating phenotypic and genetic perspectives can help biologists understand how natural selection operates in the wild. In particular, it shows the value of combining these perspectives with detailed ecological data, novel statistical techniques, and experimentation to directly test hypotheses about evolution in natural populations"--

Genetics and Evolution of Infectious Diseases, Second Edition, discusses the constantly evolving field of infectious diseases and their continued impact on the health of populations, especially in resource-limited areas of the world. Students in public health, biomedical professionals, clinicians, public health practitioners, and decisions-makers will find valuable information in this book that is relevant to the control and prevention of neglected and emerging worldwide diseases that are a major cause of global morbidity, disability, and mortality. Although substantial gains have been made in public health interventions for the treatment, prevention, and control of infectious diseases during the last century, in recent decades the world has witnessed a worldwide human immunodeficiency virus (HIV) pandemic, increasing antimicrobial resistance, and the emergence of many new bacterial, fungal, parasitic, and viral pathogens. The economic, social, and political burden of infectious diseases is most evident in developing countries which must confront the dual burden of death and disability due to infectious and chronic illnesses. Takes an integrated approach to infectious diseases Includes contributions from leading authorities Provides the latest developments in the field of infectious disease

Principles of Behavioral Genetics provides an introduction to the fascinating science that aims to understand how our genes determine what makes us tick. It presents a comprehensive overview of the relationship between genes, brain, and behavior. Introductory chapters give clear explanations of basic processes of the nervous system and fundamental principles of genetics of complex traits without excessive statistical jargon. Individual chapters describe the genetics of social interactions, olfaction and taste, memory and learning, circadian behavior, locomotion, sleep, and addiction, as well as the evolution of behavior. Whereas the focus is on genetics, neurobiological and ecological aspects are also included to provide intellectual breadth. The book uses examples that span the gamut from classical model organisms to non-model systems and human biology, and include both laboratory and field studies. Samples of historical information accentuate the text to provide the reader with an appreciation of the

history of the field. This book will be a valuable resource for future generations of scientists who focus on the field of behavioral genetics. Defines the emerging science of behavioral genetics Engagingly written by two leading experts in behavioral genetics Clear explanations of basic quantitative genetic, neurogenetic and genomic applications to the study of behavior Numerous examples ranging from model organisms to non-model systems and humans Concise overviews and summaries for each chapter