

Chapter 21: The Evolution of Populations

This chapter begins with the idea that we focused on as we closed the last chapter: Individuals do not evolve! Populations evolve.

Study Tip: Always study the figures and pictures and their legends carefully as they have been chosen to illustrate and explain important ideas.

1. What are the three main mechanisms that can cause the evolution of populations?

Natural selection, genetic drift, and gene flow are mechanisms that can cause the evolution of population.

2. What is microevolution?

Microevolution is a change in allele frequencies in a population over generations.

2. Of the three mechanisms of evolution, you cited in your response to question 1, what is the only mechanism that is *adaptive*, or improves the match between organisms and their environment?

Natural selection is an adaptive mechanism where the organisms that are better adapted to their environment tend to survive and produce more offspring.

3. Perhaps because we tend to focus on mutations that cause changes in phenotypes, it is easy to think that every mutation will lead to a phenotypic change. Explain how a substitution error in an exon could have no effect on the amino acid sequence.

This is because only the genetic change will be passed on to the offspring not the phenotypic change. An example of this could be in a body builder. The muscles are not passed down from generation to generation.

4. Several sources of genetic variation are available. What is the ultimate source of new

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**David A. Baum, Douglas J.
Futuyma, Hopi E. Hoekstra, Richard E.
Lenski, Allen J. Moore, Catherine L.
Peichel, Dolph Schluter, Michael C.
Whitlock**

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The Princeton Guide to Evolution David A. Baum, Douglas J. Futuyma, Hopi E. Hoekstra, Richard E. Lenski, Allen J. Moore, Catherine L. Peichel, Dolph Schluter, Michael C. Whitlock, 2017-03-21 The essential one volume reference to evolution The Princeton Guide to Evolution is a comprehensive concise and authoritative reference to the major subjects and key concepts in evolutionary biology from genes to mass extinctions Edited by a distinguished team of evolutionary biologists with contributions from leading researchers the guide contains some 100 clear accurate and up to date articles on the most important topics in seven major areas phylogenetics and the history of life selection and adaptation evolutionary processes genes genomes and phenotypes speciation and macroevolution evolution of behavior society and humans and evolution and modern society Complete with more than 100 illustrations including eight pages in color glossaries of key terms suggestions for further reading on each topic and an index this is an essential volume for undergraduate and graduate students scientists in related fields and anyone else with a serious interest in evolution Explains key topics in some 100 concise and authoritative articles written by a team of leading evolutionary biologists Contains more than 100 illustrations including eight pages in color Each article includes an outline glossary bibliography and cross references Covers phylogenetics and the history of life selection and adaptation evolutionary processes genes genomes and phenotypes speciation and macroevolution evolution of behavior society and humans and evolution and modern society

Learning Assessment Techniques
Elizabeth F. Barkley, Claire H. Major, 2016-01-19 50 Techniques for Engaging Students and Assessing Learning in College Courses Do you want to Know what and how well your students are learning Promote active learning in ways that readily integrate assessment Gather information that can help make grading more systematic and streamlined Efficiently collect solid learning outcomes data for institutional assessment Provide evidence of your teaching effectiveness for promotion and tenure review Learning Assessment Techniques provides 50 easy to implement active learning techniques that gauge student learning across academic disciplines and learning environments Using Fink s Taxonomy of Significant Learning as its organizational framework it embeds assessment within active learning activities Each technique features purpose and use key learning goals step by step implementation online adaptation analysis and reporting concrete examples in both on site and online environments and key references all in an easy to follow format The book includes an all new Learning Goals Inventory as well as more than 35 customizable assessment rubrics to help teachers determine significant learning goals and appropriate techniques Readers will also gain access to downloadable supplements including a worksheet to guide teachers through the six steps of the Learning Assessment Techniques planning and implementation cycle College teachers today are under increased pressure to teach effectively and provide evidence of what and how well students are learning An invaluable asset for college teachers of any subject Learning Assessment Techniques provides a practical framework for seamlessly integrating teaching learning and assessment

A Practical Guide for Genetic Management of Fragmented Animal

and Plant Populations Richard Frankham, Jonathan D. Ballou, Katherine Ralls, Mark Eldridge, Michele R. Dudash, Charles B. Fenster, Robert C. Lacy, Paul Sunnucks, 2019-10-23 The habitats of most species have been fragmented by human actions isolating small populations that consequently develop genetic problems Millions of small isolated fragmented populations are likely suffering from inbreeding depression and loss of genetic diversity greatly increasing their risk of extinction Crossing between populations is required to reverse these effects but managers rarely do so A key reason for such inaction is that managers are often advised to manage populations in isolation whenever molecular genetic methods indicate genetic differences among them Following this advice will often doom small populations to extinction when the habitat fragmentation and genetic differences were caused by human activities A paradigm shift is required whereby evidence of genetic differentiation among populations is a trigger to ask whether any populations are suffering genetic problems and if so whether they can be rescued by augmenting gene flow Consequently there is now an urgent need for an authoritative practical guide to facilitate this paradigm shift in genetic management of fragmented populations *The Genetics of Human Populations* Luigi Luca Cavalli-Sforza, Walter Fred Bodmer, 1999-01-01 Comprehensive advanced treatment of nature and source of inherited characteristics with treatment of mathematical techniques Mendelian populations mutations polymorphisms genetic demography much more Emphasizes interpretation of data in relation to theoretical models *A Biologist's Guide to Mathematical Modeling in Ecology and Evolution* Sarah P. Otto, Troy Day, 2011-09-19 Thirty years ago biologists could get by with a rudimentary grasp of mathematics and modeling Not so today In seeking to answer fundamental questions about how biological systems function and change over time the modern biologist is as likely to rely on sophisticated mathematical and computer based models as traditional fieldwork In this book Sarah Otto and Troy Day provide biology students with the tools necessary to both interpret models and to build their own The book starts at an elementary level of mathematical modeling assuming that the reader has had high school mathematics and first year calculus Otto and Day then gradually build in depth and complexity from classic models in ecology and evolution to more intricate class structured and probabilistic models The authors provide primers with instructive exercises to introduce readers to the more advanced subjects of linear algebra and probability theory Through examples they describe how models have been used to understand such topics as the spread of HIV chaos the age structure of a country speciation and extinction Ecologists and evolutionary biologists today need enough mathematical training to be able to assess the power and limits of biological models and to develop theories and models themselves This innovative book will be an indispensable guide to the world of mathematical models for the next generation of biologists A how to guide for developing new mathematical models in biology Provides step by step recipes for constructing and analyzing models Interesting biological applications Explores classical models in ecology and evolution Questions at the end of every chapter Primers cover important mathematical topics Exercises with answers Appendixes summarize useful rules Labs and advanced material available *Adaptive Individuals In*

Evolving Populations Richard K. Belew, Melanie Mitchell, 2018-05-04 This book is out of a workshop organized to address questions like these The meeting was sponsored by the Santa Fe Institute and held at Sol y Sam bra in Santa Fe New Mexico during July 1993 It brought together a group of about 20 scientists from the disciplines of biology psychology and computer science all studying interactions between the evolution of populations and individuals adaptations in those populations and all of whom make some use of computational tools in their work

The Dynamics of Discrete Populations and Series of Events Keith Iain Hopcraft, Eric Jakeman, Kevin D. Ridley, 2014-01-17 Discrete phenomena are an important aspect of various complex systems acting both as underlying driving mechanisms and as manifestations of diverse behaviours However the characterisation of these discrete phenomena requires models that go beyond those featured in existing books Largely concerned with mathematical models used to describe time v

Stellar Populations Alvio Renzini, Laura Greggio, 2012-09-19 This up to date reference on stellar populations and development models includes coverage of distant galaxies chemical evolution and supernovae Written by highly acclaimed authorities in the field the book makes use of specific problems to reveal the kitchen secrets

Population Harvesting Wayne M. Getz, Robert G. Haight, 2020-03-31 Whether in felling trees for wood rearing insects for biological control or culling animals for conservation purposes efficient management of biological systems requires quantitative analysis of population growth and harvesting policies Aiming to encourage the exchange of ideas among scientists involved in the management of fisheries wildlife forest stands and pest control the authors of this work present a general framework for modeling populations that reproduce seasonally and that have age or stage structure as an essential component of management strategy The book represents the first time that examples from such diverse areas of biological resource management have been brought together in a unified modeling framework using the standard notation of mathematical systems theory In addition the authors combine a nonlinear extension of Leslie matrix theory and certain linear elements thereby permitting interesting analytical results and the creation of compact realistic simulation models of resource systems

China, the Belt and Road Initiative, and the Century of Great Migration Michele Bruni, 2022-04-13 The book argues whether future migrations will be organized by destination countries or by criminal organizations whether migrants will travel in a humane way or will continue to die along the road whether properly trained migrants will boost the productivity of arrival countries or these countries will continue to squander money to build useless walls possibly far from their border and pay neighbours not certainly in the top list from the human right perspective to keep workers they need in concentration camps It suggests that it is in the interest of more developed countries to stop denying their structural shortage of labour and start co managing with one or more potential departure countries migration flows coherent with the quantitative and qualitative needs of their labour market Economic fairness and sound economic thinking would also require destination countries to finance the training of potential migrants in the country of departure in substance to build schools and vocational centres not walls China represents an ideal case study in this regard not only because of its

history institutional setting and international relationships but because in the next decades it will be the country most affected by the largest shortage of labour

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