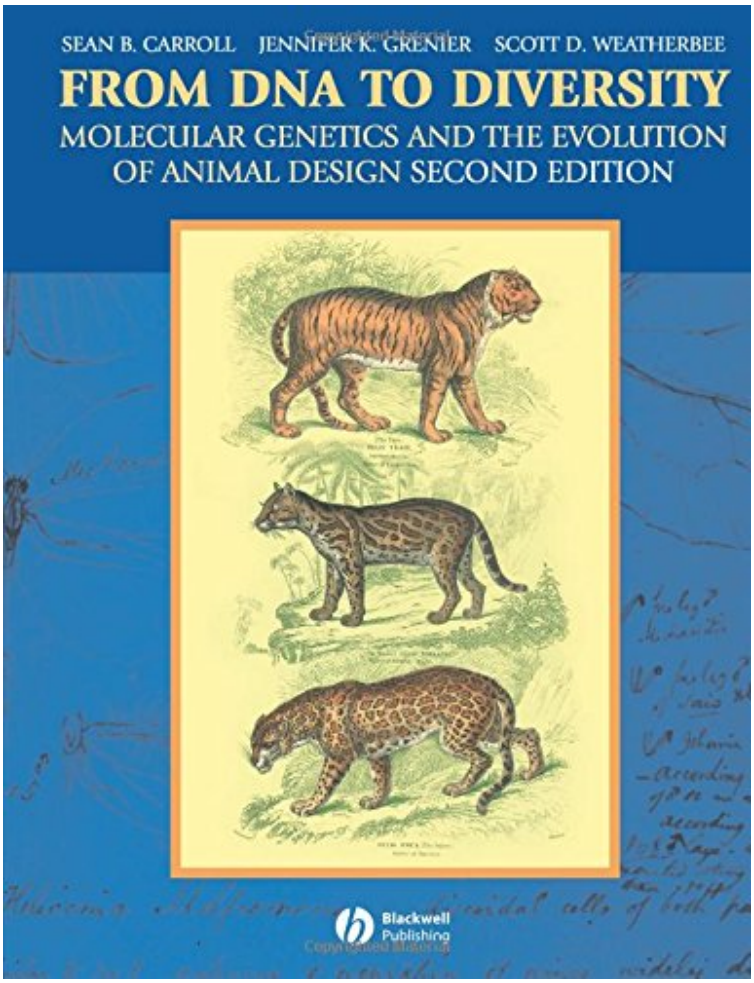
From DNA to Diversity: Molecular Genetics and the Evolution of Animal Design

Sean B. Carroll, Jennifer K. Grenier, Scott D. Weatherbee
*audiobook | *ebooks | Download PDF | ePub | DOC*



#425829 in Books Wiley-Blackwell 2004 2009-02-20Original language:EnglishPDF # 1 9.70 x .60 x 7.50l, 1.45 #File Name: 1405119500268 pages | File size: 69.Mb

Sean B. Carroll, Jennifer K. Grenier, Scott D. Weatherbee : From DNA to Diversity: Molecular Genetics and the Evolution of Animal Design before purchasing it in order to gage whether or not it would be worth my time, and all praised From DNA to Diversity: Molecular Genetics and the Evolution of Animal Design:

15 of 15 people found the following review helpful. Evo-Devo For The Graduate StudentBy The SpinozanatorWe have about 25,000 genes. Some of these are "tool kit" genes that we share with all other animals. They evolved well before the Cambrian explosion over 540 million years ago from a bilaterally symmetrical common ancestor. Almost exact counterparts are found in apes and mice, and close counterparts in arthropods and worms. Next to most genes is a stretch of so-called "junk DNA" that does not code for genes. These DNA segments contain from three to twenty (or more) switches that collectively turn that gene on or off. The switches are activated or repressed by the differing

concentration gradients of the protein products of other genes produced by neighboring cells. By virtue of the servo-feedback loops creating unique combinations of the protein products of tool kit genes, cells of the early embryo create a geographical map of their future body.An escalating orchestra of domino effects builds complexity, each new development affecting the others. The tool kit genes and the other core genes that control biochemical function from bacteria to man are resistant to mutation. Novelty and speciation comes from the infinite variety of changes that come from the readily mutable genetic switches - allowing for changes in a segment without mortally wounding the rest of the animal. Not a single biologist 40 years ago would have predicted these discoveries.The exciting developments of evo-devo have sent jolts of electricity through the evolutionary community. Nothing basic has been overturned; much has been enhanced. For example: It used to be thought that eyes had evolved independently many, many times - after all, the lumps of light sensitivity in primitive wormlike creatures, the compound eyes of insects, and the eyes of mammals have more differences than commonalities. As it turns out, the making of each eye-like organ is directed by a PAX6 tool kit gene. Not only that, if the PAX6 gene from the mouse is artificially introduced into the genetic material destined for the leg of the fly, an eye will form on the fly leg...and it's not a mouse eye - it's a fly eye. The mouse PAX6 gene switches - influenced by chemical gradients from adjacent tissue in the fly embryo - cause the gene to produce a fly eye! Astounding!Tool kit genes (and other genes) are frequently named after the anomaly that doesn't develop when that gene is absent. The TINMAN gene controls development of the heart and circulatory system from butterflies to badgers - named after the Wizard of Oz character who had no heart. The wealth of information presented in this book will surprise, educate, and entertain the reader - and evo-devo researchers have just scratched the surface. New graduates in biology are surging into this explosive and previously neglected science.There are three other books that I know of that cover these captivating discoveries of the last 30 years:"Coming to Life," by Christiane Nusslein-Volhard. This fine book, written by a Nobel Prize winner for her meticulous ground-breaking work on fruit flies emphasizes the concentration gradients, which are indeed central to the story."The Plausibility of Life," by Kirschner and Gerhart. These authors are so excited about the new findings, they think it deserves a name - facilitated variation - and of course, they thought of the name. It is an excellent book with more basic sciences than the book under review, emphasizing how evo-devo facilitates novelty through an enhanced Baldwin Effect."Endless Forms Most Beautiful," also by Sean B. Carroll, written more for the college graduate who has taken a little biology.I have studied them all. For the general public, "Endless Forms Most Beautiful" is the best. For those more familiar with molecular biochemistry and genetics, "DNA to Diversity" contains much more specific information - although anyone who would like one book would like the other."From DNA to Diversity" is a superbly written book -essential reading for the advanced reader who wishes to keep up with the stunning advances that have occurred in evolutionary knowledge during the past thirty years.9 of 9 people found the following review helpful. Prelude to a TextBy John E. MackIn a sense, Carroll has written the same book three times. "The making of the Fittest" is a work for the general reader explaining how our knowledge of genetics and embryonic development impacts and expands our knowledge of evolutionary biology (and vice-versa). His most famous book, "Endless Forms Most Beautiful," is aimed at college upperclassmen, and deal in more detail with the science of "Evo-Devo," evolutionary development. "From DNA to Diversity" covers much the same ground, but does so in a more technical and sophisticated manner. It appears aimed at graduate students and upper-division zoology majors. Presumably Carroll's next step it to write a graduate-level textbook. Toward the ent, "From DNA" reads like one. It is a marvellous book, and like a text, it requires and rewards re-reading. Unlike a text, however, it virtually demands to be read in order; not only do the latter chapters build on the earlier ones, but the degree of difficulty in the presentation increases dramatically as the pages turn. As befits a book which assumes a sophisticated readership, there are fewer "detours" into polemics supporting green politics or mocking creationist theory. The photograpsh and the charts are terrific -- full color, clear, and as easy to read and interpret as the difficult subject matter will allow. Because of the nature of the book, the discussion is less "thesis-bound" than Carrroll's other writings. Rather, he begins with a history of animal life, brings in detail about how embryonic development and genetic control of that process produces the diversity upon which natural selection can act, and weaves the two themes together to demonstrate how the process of forming animal bodies interacts with the changing environment to produce the multiplicity of animal forms we see today. And, Carroll goes on to show, the process is endless and at once aleatory and highly constrained. I recall an episode of the old "Twilight Zone" series where a British World War One fighter pilot flies through a time warp and lands on an American Air Force base, circa 1960. He talks to one of the airman, and says, "We had no idea how advanced you are." The reader of Carroll's book is likely to have the same thoughts about the field of evo-devo. In Thirty years, these people have gone from the discovery of the nature of the DNA molecule to the brink of an ability to create life a test-tube. I had no idea they had advanced so far so fast.1 of 1 people found the following review helpful. A fine introduction and exploration of the way in which genetic ...By Kipp Hunter McMichaelA fine introduction and exploration of the way in which genetic diversity and selection/evolution underlay the diversity of animal forms.It assumes an mid-to-upper level familiarity with some aspects of genetics but explains these concepts well enough for the reader to keep up.

In this landmark work, the author team led by Dr. Sean Carroll presents the general principles of the genetic basis of

morphological change through a synthesis of evolutionary biology with genetics and embryology. In this extensively revised second edition, the authors delve into the latest discoveries, incorporating new coverage of comparative genomics, molecular evolution of regulatory proteins and elements, and microevolution of animal development. An accessible text, focusing on the most well-known genes, developmental processes and taxa. Builds logically from developmental genetics and regulatory mechanisms to evolution at different genetic morphological levels. Adds major insights from recent genome studies, new evo-devo biology research findings, and a new chapter on models of variation and divergence among closely related species. Provides in-depth focus on key concepts through well-developed case studies. Features clear, 4-color illustrations and photographs, chapter summaries, references and a glossary. Presents the research of Dr. Carroll, a pioneer in the field and the past president of the Society for Developmental Biology. An Instructor manual CD-ROM for this title is available. Please contact our Higher Education team at HigherEducation@wiley.com for more information.

Sean Carroll, author of one of the books under review and a coauthor of another, has made important contributions to the understanding of evolution and development. From DNA to Diversity, written with two other scientists, is the second edition of a book that has become a classic for students of evolution." The New York of Books, Volume LIII, Number 8 "With almost poetic ease, the authors tell a highly complex story without distorting its scientific substance. The story line goes through the levels of biological hierarchy all the way to the details of gene regulation and emerges with a deeper understanding of biological diversity. In Sean Carroll developmental evolution has found its Darwin." Gunter Wagner, Yale University "This book will be an excellent introductory text, exciting newcomers to the field, be they students in biology, or experts in either evolutionary biology or embryology who want to gain an appreciation for the insights developmental genetics is providing into the evolution of animal diversity." Cliff Tabin, Harvard University Medical School "From DNA to Diversity is written for a general audience, including undergraduates, with an interest in developmental and evolutionary biology, and it is a joy to read. Using striking examples, the authors summarize the current state of thinking on the interconnectedness between developmental genetics and evolutionary diversification." Axel Meyer, University of Konstanz; Nature "This book helps to fill a gap in the teaching of evolutionary theory that arose because developmental biology was not a direct participant in the evolutionary synthesis.This is an outstanding account of the latest findings in molecular developmental biology." James W. Valentine, Professor Emeritus, University of California, Berkeley "The authors have done an excellent job of distilling the large and complex literature on molecular genetics that is pertinent to understanding how gene networks evolve... The writing is consistently clear, concise, and engaging. " Gregory A. Wray, Duke University; Science "Carroll, Weatherbee, and Grenier have produced a wonderful and exciting introduction to the field of evolutionary developmental biology....Newcomers and aficionados will find this a compelling read." Martin J. Cohn, University of Florida; Evolution and Development "...this is one book that everybody should read who wants to know why 'evo-devo' is such a hot topic right now." Manfred Laubichler, Arizona State University "From DNA to Diversity can be, and should be read by College and University students as well as scientists out of the field, who want to be informed of what is new and promising in biology." Jean Deutsch, Universite Phillippe et Marie Curie, Paris; BioEssays "An engaging style, clear, four-colour illustrations, and up-to-date content all combine to make this text a highly accessible and definitive synthesis of the field." Ethology, Ecology and Evolution This highly technical textbook facilitates learning by its conversational tone, summarization of important points [and] exciting case studiesBeautifully illustrated this book is a pleasure to read. Southeastern NaturalistFrom the Back CoverAnimals diverge from common ancestry through changes in their DNA, but what are the genes that control morphology? In this landmark work, the author team led by Dr. Sean Carroll presents the general principles of the genetic basis of morphological change through a synthesis of evolutionary biology with genetics and embryology. The text first addresses the history of animal evolution, model system developmental genetics, and genetic regulatory mechanisms, and then examines case studies of evolutionary change at different genetic and morphological levels. In this extensively revised second edition, the authors delve into the latest discoveries, incorporating new coverage of comparative genomics, molecular evolution of regulatory proteins and elements, and microevolution of animal development. This new edition also includes major insights from recent genome studies, incorporates new findings from evo-devo biology research, and adds a new chapter focusing on models of variation and divergence among closely related species. An engaging style, clear, four-color illustrations, and up-to-date content all combine to make this text a highly accessible and definitive synthesis of the field.About the AuthorSean B. Carroll is currently an investigator of the Howard Hughes Medical Institute and Professor of Molecular Biology and Genetics at the University of Wisconsin. His research for the past twenty years has focused on the genetics of animal development and evolution, and yielded many original discoveries as to the mechanisms underlying the making and evolution of animal form. Jennifer K. Grenier is currently a senior scientist in the Microarray Group at Mirus Corporation in Madison, Wisconsin. Her scientific interests include the evolution of development, comparative genomics, and innovative technologies for functional genomics research. Scott D. Weatherbee is a research fellow at the Memorial Sloan Kettering Cancer Center in New York City. He studies the

developmental genetics of limb formation and patterning.