Human adults appear different from other animals in their ability to form abstract mental representations that go beyond perceptual similarity. In short, they can conceptualize the world. When and how does this abstract system come into being? To answer this question we need to explore the origins of adult concepts. When does the developing child acquire the ability to use abstract concepts? Does the transition occur around 2 years, with the onset of symbolic representation and language, or is it independent of the emergence of language? When in evolutionary history did an abstract representational system emerge? How would a computational system operating on the basis of perceptual associations develop into a system operating on the basis of abstract relations? Is this ability present in other species, but masked by their inability to verbalise abstractions? This book tackles the age-old puzzle of what might be unique about human concepts. Intuitively, we have a sense that our thoughts are somehow different from those of animals and young children such as infants. If true, this raises the question of where and how this uniqueness arises. What are the factors that have played out during the life course of the individual and over the evolution of humans that have contributed to the emergence of this apparently unique ability? This volume brings together a collection of world specialists who have grappled with these questions from different perspectives to try to resolve the issue. It includes contributions from leading psychologists, neuroscientists, child and infant specialists, and animal cognition specialists. Taken together, this story leads to the idea that there is no unique ingredient in the emergence of human concepts, but rather a powerful and potentially unique mix of biological abilities and personal and social history that has led to where the human mind now stands.
This chapter examines the way in which evolutionary biologists accomplish the goal of uncovering evolutionary history through the comparative method. This method is contrasted with that of the creationists, who claim that supernatural intervention was required to produce the complexly adaptive attributes of orchids and other organisms. Darwin’s views on this matter are discussed.

The ABC Model in Evolution
Beverley J. Glover

Flower development operates through the activities of a set of transcription factors regulating the structural genes necessary for correct organ development in the correct position. The majority of these ABC genes encode MADS box transcription factors, a very ancient family of DNA binding proteins. By tracing the evolutionary history of this gene family, the molecular processes which lie behind the evolution of flowers can be investigated. Since flowers are one of the key distinguishing features of the angiosperms, and have been argued to be responsible for their astonishing radiation into the most species rich plant division by far, the evolution of the MADS box family is of particular interest in reconstructing plant evolutionary history.

Evolution
Andrew N. Iwaniuk
This chapter discusses the evolution of the laboratory rat from the origins of rodents in general to the speciation of the genus Rattus. It provides a summary of the evolutionary events leading to R. norvegicus. Because palaeontology, taxonomy, and phylogenetics are intimately related to one another, the chapter is organized in terms of the taxonomy of R. norvegicus. Evolutionary relationships and palaeontological history are discussed with reference to other groups of the same taxonomic rank. For example, the order Rodentia is placed in the context of other mammalian orders. Summarizing the evolutionary history of R. norvegicus provides a basic understanding of how the species has evolved that may be instructive in interpreting the results of behavioral experimentation and/or comparative analyses.

Mind the Gap; or Why Humans are Not Just Great Apes
R. I. M. DUNBAR

in Proceedings of the British Academy, Volume 154, 2007 Lectures
Published in print: 2008 Published Online: January 2012
Item type: chapter

This lecture presents the text of the speech about humans and apes delivered by the author at the 2007 Joint British Academy/British Psychological Society Annual Lecture held at the British Academy. It comments on the claim that an evolutionary perspective is not a competing paradigm for conventional explanations in the social sciences, and explains the why humans are so different from other apes and monkeys, despite the fact that we share so much of our evolutionary history with them.

Taxonomy, Phylogenetics, and Evolution
Philip S. Ward

in Ant Ecology
Published in print: 2009 Published Online: February 2010
Item type: chapter

As the most species-rich and biologically eclectic of all social insects, ants present considerable challenges to the process of cataloguing and understanding their remarkable diversity. Substantial progress has been made in recent years, however, in identifying the major clades of ants and in clarifying their evolutionary history. We now have a higher
classification of ants in which most of the subfamilies and tribes appear to be monophyletic and well diagnosed, with a few notable exceptions. Uncertainty persists regarding the phylogenetic relationships among old lineages at the base of the ant tree and concerning the time frame of ant evolution. The species-level taxonomy of ants has advanced more fitfully, and ant ecologists have an extensive but far-from-complete set of resources for identifying ant species. Ongoing and sustained effort is needed in the area of species discovery and delimitation, and in the delivery of this information to potential users.

Evolution of Oxygenic Photosynthesis
Donald Eugene Canfield

in Oxygen: A Four Billion Year History
Published in print: 2014 Published Online: October 2017
Publisher: Princeton University Press
DOI: 10.23943/princeton/9780691145020.003.0003

This chapter discusses the evolution of oxygen-producing organisms by considering the evolution and assembly of its basic constituent parts. It focuses on the following key questions: (1) What is the evolutionary history of chlorophyll? (2) What are the evolutionary histories of photosystem I and photosystem II (PSII)? (3) What is the origin of the oxygen-evolving complex in PSII? And finally, (4) what is the evolutionary history of Rubisco? In addressing these, the chapter seeks to understand the complex path leading to the evolution of oxygenic photosynthesis on Earth. This event was one of the major transforming events in the history of life. With no oxygenic photosynthesis, there would be no oxygen in the atmosphere; there would also be no plants, no animals, and nobody to tell this story.

The expansion of selection theory
Henry Plotkin

in Evolutionary Worlds without End
Published in print: 2010 Published Online: September 2010
Publisher: Oxford University Press
DOI: 10.1093/acprof:oso/9780199544950.003.003

The extraordinary power of explanation of evolutionary theory is considered; so too is the rise of genetics and the near death of Darwinism; then the revival of Darwinian theory in the form of the "synthesis" is considered, as are post-synthesis advances, especially
the rise in the understanding that individual development needs to be included in any theory of evolution, as well as so-called selfish gene theory; selection theory is examined in greater detail, especially through the work of Darden and Cain and Lewontin; finally the extension of selection theory to how science works is considered as well as to brain development.

The Evolutionary History and a Systematic Revision of Woodrats of the Neotoma lepida Group
James Patton

Published in print: 2008 Published Online: March 2012
Item type: book

This book details the evolutionary history of the desert woodrat complex (lepida group, genus Neotoma) of western North America. The analyses include standard multivariate morphometrics of museum specimens coupled with mitochondrial and nuclear DNA sequences and microsatellite loci. The work also traces the spatial and temporal diversification of this group of desert-dwelling rodents, revising species boundaries and delineating subspecies considered valid.

Phylogeny and Evolution of the Mollusca
Winston Ponder (ed.)

Published in print: 2008 Published Online: March 2012
Item type: book

This book brings together thirty-six experts on the evolution of the Mollusca to provide an up-to-date review of its evolutionary history. The Mollusca are the second largest animal phylum and boast a fossil record of over 540 million years. They exhibit remarkable anatomical diversity and include the bivalves (scallops, oysters, and clams), gastropods (limpets, snails, and slugs), and cephalopods (squid, cuttlefish, and octopus). This study treats each major taxon and supplies general information as well as overviews of evolution and phylogeny using data from different sources—morphological, ultrastructural, molecular, developmental, and from the fossil record.
Other Inductive Arguments
Herman Philipse

in God in the Age of Science?: A Critique of Religious Reason
Published in print: 2012 Published Online: May 2012
Item type: chapter

Six C-inductive arguments for and against the existence of God are critically discussed in this chapter: the Argument from Consciousness, the Argument from Moral Truth, the Argument from Moral Awareness, the Argument from Providence, the Argument from Evil, and the Argument from Hiddenness. The first four are either not correct C-inductive arguments for the existence of God because the relevance condition is not satisfied, or not good C-inductive arguments for the existence of God because the evidence has not been established. However, both the many prima facie pointless evils in the world, and the fact of God’s hiddenness, provide strong C-inductive arguments against God’s existence, in spite of the various defences put forward by Richard Swinburne.

The Recognition of Rotated Objects in Animals
Jessie J. Peissig and Tamara Goode

in How Animals See the World: Comparative Behavior, Biology, and Evolution of Vision
Published in print: 2012 Published Online: May 2012
Item type: chapter

This chapter reviews studies of rotation, both planar and rotation in depth, in animals. Although the current research has yielded many interesting findings, a complete picture of how animals, both human and nonhuman, recognize rotated objects is not yet clear. In particular, what is lacking is a concise theoretical account that considers both the differences and similarities in the recognition abilities of different organisms. One interesting direction for this research is to take into consideration the unique evolutionary histories of the organisms under study, while continuing to collect new data.
This chapter attempts to reconstruct evolutionary history. Inferring phylogenetic relationships between taxa and character evolution requires relatively sophisticated methods. The chapter describes several techniques and concepts widely used in modern evolutionary biology, first discussing the principles of nomenclature and then looking at modern phylogenetics and the use of cladistics to infer character history and phylogeny. Cladistics can be used to infer character history based on parsimony, a principle that requires as few character transformations as possible. The chapter also discusses the construction of evolutionary trees, paleontological dating of taxa, and molecular dating.

Diversity of a Form
Wade C. Sherbrooke

This chapter focuses on the characteristics, evolutionary history, and historical distribution of horned lizards. It discusses adaptive radiation, an evolutionary process that enabled horned lizards to diversify into a number of closely related species of similar form. It is believed that the ancestral group of horned lizards separated into what later became a southern group of species (southern radiation) and a northern group of species (northern radiation).

Historical Perspective
Eric R. Pianka and Laurie J. Vitt

This chapter focuses on the characteristics, evolutionary history, and historical distribution of horned lizards. It discusses adaptive radiation, an evolutionary process that enabled horned lizards to diversify into a number of closely related species of similar form. It is believed that the ancestral group of horned lizards separated into what later became a southern group of species (southern radiation) and a northern group of species (northern radiation).
This chapter focuses on the evolutionary history of lizards. It first examines aspects of the fossil record and then reviews the morphological, behavioral, physiological, and ecological aspects of lizards within the context of their evolutionary history. The chapter also examines the evolution of major lizard clades and appraise diversification within each. Finally, the chapter speculates on global scenarios and suggests a working hypothesis for the evolution of diversity within lizards.

Evolutionary Biology as a Historical Science
Jonathan B. Losos

in Lizards in an Evolutionary Tree: Ecology and Adaptive Radiation of Anoles
Published in print: 2009 Published Online: March 2012
california/9780520255913.003.0001
Item type: chapter

This chapter discusses the role of evolutionary biology as a historical science, and attempts to understand how and why evolutionary diversification has occurred. It is important to know what processes occurred in the past and how these they shaped the diversity we see today. Depending on the quality of the historical record, we can infer, with a greater or lesser degree of confidence, what happened. Historical analysis (either examination of fossils or phylogenetic inference) can investigate the evolutionary history of a group, or whether evolutionary diversification has occurred.

Using Phylogenetic Information to Make Better Conservation Decisions
Marc W. Cadotte and T. Jonathan Davies

Published in print: 2016 Published Online: January 2018
princeton/97806911157689.003.0009
Item type: chapter

This chapter explains how phylogenetic information can be used to make better conservation decisions. Evidence shows that human-caused climate change is likely to be the dominant cause of extinction in the near future. Phylogeny can provide a powerful tool for aiding decision making in species conservation. The chapter first considers the importance of preserving evolutionary history by focusing on the tree of life, the phylogenetic tree connecting all living organisms.
that provides a powerful metaphor for conservation biology. It then examines phylogenetically based metrics for quantifying evolutionary history, including phylogenetic diversity for evaluating sites and evolutionary distinctiveness for comparing species. It also discusses the integration of evolutionary history with extinction probabilities for conservation prioritization using relative extinction risk to weight evolutionary distinctiveness, or EDGE (evolutionarily distinct and globally endangered). Finally, it describes how to prioritize biodiversity hotspots of evolutionary distinctiveness and how to apply metrics to conservation prioritization.

Economics, Sex, and the Emergence of Society
Douglas T. Kenrick and Luis Gomez-Jacinto

in Advances in Culture and Psychology

Cultural variations in social norms have sometimes been taken as evidence against evolved universal predispositions. This chapter discusses several cultural variations—including male competitiveness, ages of marriage partners preferred by men and women, prevalence of bride price versus dowry, and polygyny versus polyandry. The chapter reviews these cultural variations in light of relevant principles from evolutionary life history theory. An evolutionary life history model considers behavioral variation through the lens of evolutionary economics—asking how any given pattern of behavior might be a manifestation of universal tradeoffs that all organisms must make as they attempt to optimally allocate their inherently limited resources. Discussion considers how cultural norms can emerge dynamically from interactions between individuals making selfish choices based on underlying evolved decision-biases.

Host-parasite (co-)evolution
Paul Schmid-Hempel

in Evolutionary Parasitology: The Integrated Study of Infections, Immunology, Ecology, and Genetics
This chapter examines the interaction of hosts and parasites throughout the generations, and how the respective evolutionary process can lead to a range of different host-parasite evolutionary histories. It looks at host-parasite macro-evolutionary history, noting scenarios such as co-speciation and host-switching that are both capable of shaping such histories. Micro-evolution in host and parasite population is much better understood, as the evolution of antibiotic resistance is one example of rapid parasite evolution. This is evidently observed to occur in response to the human cultural habit of using antibiotics, which in turn creates antibiotic resistance by bacteria. Furthermore, the chapter dives deeper into co-evolution with parasites. Host-parasite co-evolution is both antagonistic and asymmetric due to the fact that the parasite often is under stronger selection to infect than the host to defend. As a result, parasites are thought to adapt faster to their hosts than vice versa. The rest of the chapter further explores the other concepts and nuances involved in host-parasite evolution.

Evolution and the ‘Species’: The Individual in Deep Time

Kate Hext

in Walter Pater: Individualism and Aesthetic Philosophy

Published in print: 2013 Published Online: January 2014
Published Online: DOI: 10.3366/edinburgh/9780748646258.003.0007
Item type: chapter

This chapter argues that deep time is the most vivid challenge posed to the ‘awed and fragile human subject in Pater’s writings. It explores Pater’s knowledge of, and belief in, Darwinian science, Spencer’s social Darwinism, and Thompson’s theory of entropy drawing examples from works such as ‘Coleridge’ and Plato and Platonism. It suggests though that Pater’s attitude toward Darwinism is more complex and inconsistent than critics have hitherto accounted for. Specifically, it suggests that Pater is able to accept Darwin’s theory of evolution in the abstract, on his own terms, with the idea of deep time and constant evolution aestheticised into a beautiful spectacle. However, Pater is unable to accept the idea that the individual is one of a ‘species’ and this chapter discusses how precisely he distances himself from Darwinism as it conceives the individual as part of a ‘species.’