

the cambrian explosion the construction of animal biodiversity

the cambrian explosion the construction of animal biodiversity represents one of the most significant evolutionary events in Earth's history, marking the rapid emergence of complex multicellular life forms. Occurring approximately 541 million years ago, this period witnessed an unprecedented diversification of animal phyla, laying the foundation for modern biodiversity. The Cambrian explosion not only introduced a wide array of body plans but also established ecological interactions that shaped subsequent evolutionary trajectories. Understanding the mechanisms and outcomes of this event is essential for comprehending the construction of animal biodiversity as we observe it today. This article explores the causes, key developments, and lasting impacts of the Cambrian explosion, providing a detailed examination of how it constructed the rich tapestry of animal life.

- Overview of the Cambrian Explosion
- Causes and Environmental Factors
- Evolutionary Innovations During the Cambrian
- Impact on Animal Biodiversity
- Fossil Evidence and Key Discoveries

Overview of the Cambrian Explosion

The Cambrian explosion refers to a relatively brief geological interval during the early Cambrian period when most major animal phyla appeared in the fossil record. This event is characterized by a sudden increase in the complexity and diversity of multicellular organisms. Prior to the Cambrian, life was predominantly simple and microscopic, but the explosion introduced a wide variety of large, morphologically complex animals. The period lasted roughly 20 to 25 million years, a short span in geological terms, yet it produced a profound transformation in the biosphere.

Timeline and Duration

The Cambrian explosion began around 541 million years ago and lasted until approximately 520 million years ago. This brief interval saw the rapid emergence of diverse animal forms, including the ancestors of most modern phyla. The relatively sudden appearance of complex organisms in the fossil record distinguishes this event from the gradual patterns of evolution observed in other periods.

Significance in Evolutionary History

This event is critical for understanding the construction of animal

biodiversity because it set the stage for the biological complexity seen in subsequent eras. The Cambrian explosion effectively established the basic body plans and developmental pathways that persist in many animal groups today, making it a cornerstone in the study of evolutionary biology and paleontology.

Causes and Environmental Factors

The precise causes of the Cambrian explosion remain a subject of scientific inquiry, but several environmental and biological factors likely contributed to this rapid diversification. A combination of geological, chemical, and ecological changes created conditions favorable for evolutionary innovation and complexity.

Oxygen Levels and Atmospheric Changes

One of the primary environmental drivers was the increase in atmospheric and oceanic oxygen concentrations. Elevated oxygen levels enabled higher metabolic rates and larger body sizes, supporting more complex tissue structures and active lifestyles. This oxygenation event is considered a prerequisite for the development of complex animal life.

Genetic and Developmental Innovations

Genetic mechanisms, including the evolution of regulatory genes such as Hox genes, facilitated the development of diverse body plans. These genetic innovations allowed for the modular construction of complex organisms, enabling rapid morphological diversification during the Cambrian.

Ecological Interactions and Predation

The appearance of predation introduced new selective pressures that accelerated evolutionary arms races. This dynamic fostered the development of defensive structures like shells and exoskeletons, thereby increasing morphological diversity and complexity within marine ecosystems.

Evolutionary Innovations During the Cambrian

The Cambrian explosion saw the advent of numerous evolutionary innovations that contributed to the construction of animal biodiversity. These biological advancements include the development of hard body parts, complex sensory organs, and diversified locomotion strategies.

Hard Parts and Skeletonization

The evolution of mineralized skeletons and shells was a key innovation. These structures provided protection and support, allowing animals to exploit new ecological niches. Skeletonization also enhanced the fossilization potential of organisms, preserving evidence of this evolutionary milestone.

Body Plan Diversification

During the Cambrian, animals evolved a variety of body plans, including bilateral symmetry, segmentation, and specialized appendages. These morphological features facilitated different modes of life such as burrowing, swimming, and predation, contributing to ecological diversity.

Sensory and Nervous System Advances

The development of complex sensory organs, such as eyes and antennae, allowed animals to better interact with their environment. Enhanced nervous systems improved coordination and behavior, promoting survival and diversification.

Impact on Animal Biodiversity

The Cambrian explosion was instrumental in shaping the trajectory of animal biodiversity by establishing foundational biological frameworks. The resulting diversification influenced ecological structures and evolutionary pathways that persist to the present day.

Establishment of Major Phyla

Most modern animal phyla first appeared during the Cambrian explosion. This rapid emergence of distinct lineages provided the basic morphological and genetic templates for future evolution, underscoring the event's importance in biodiversity construction.

Ecological Complexity and Food Webs

The diversification of animals led to more complex ecosystems with intricate food webs. Predation, competition, and symbiosis became more pronounced, driving further evolutionary innovation and ecological balance in marine environments.

Long-Term Evolutionary Consequences

The Cambrian explosion set evolutionary trends that influenced subsequent periods. Its legacy includes the persistence of body plans, developmental pathways, and ecological roles that continue to define the animal kingdom's diversity.

Fossil Evidence and Key Discoveries

Fossil records provide critical insights into the Cambrian explosion and the construction of animal biodiversity. Various fossil sites and discoveries have illuminated the morphology, ecology, and evolutionary relationships of Cambrian organisms.

Burgess Shale and Exceptional Preservation

The Burgess Shale in Canada is one of the most famous fossil sites, preserving an extraordinary array of soft-bodied Cambrian animals. This site has revealed detailed anatomical features, shedding light on the diversity and complexity of early animal life.

Chengjiang Fossils

The Chengjiang biota in China offers another exceptional window into Cambrian biodiversity. Its fossils include well-preserved specimens of early chordates, arthropods, and other groups, providing valuable information about evolutionary origins.

Key Fossil Groups

Important Cambrian fossil groups include trilobites, anomalocaridids, early mollusks, and sponges. These fossils demonstrate a wide range of morphological innovations and ecological roles, highlighting the rapid construction of animal biodiversity during this period.

- Trilobites: Early arthropods with segmented exoskeletons
- Anomalocaridids: Large predators with specialized appendages
- Early Mollusks: Diverse forms including shelled organisms
- Sponges: Simple filter feeders foundational to animal life

Frequently Asked Questions

What is the Cambrian Explosion?

The Cambrian Explosion refers to a relatively short period around 541 million years ago during the Cambrian period when most major animal phyla appeared in the fossil record, marking a rapid diversification of life forms.

Why is the Cambrian Explosion important for animal biodiversity?

The Cambrian Explosion is important because it represents the time when complex multicellular organisms with diverse body plans emerged, laying the foundation for the vast animal biodiversity we see today.

What factors contributed to the Cambrian Explosion?

Several factors likely contributed, including increased oxygen levels, genetic innovations like the development of Hox genes, ecological interactions such as predation, and environmental changes.

How did the Cambrian Explosion change marine ecosystems?

It transformed marine ecosystems by introducing new predator-prey relationships, complex food webs, and diverse ecological niches, leading to more dynamic and structured communities.

What kinds of animals appeared during the Cambrian Explosion?

During the Cambrian Explosion, many animal groups appeared, including early arthropods, mollusks, echinoderms, chordates, and various enigmatic organisms like the anomalocaridids.

How do fossils from the Cambrian Explosion help scientists understand animal evolution?

Fossils from this period provide evidence of early complex body structures, developmental patterns, and evolutionary relationships, helping scientists trace the origins and diversification of modern animal groups.

What role did genetic developments play in the Cambrian Explosion?

Genetic developments, particularly the evolution of regulatory genes like Hox genes, allowed for greater complexity in body plans and the differentiation of tissues, enabling the rapid diversification of animal forms.

Is the Cambrian Explosion considered a rapid event in geological terms?

Yes, although it spanned millions of years, the Cambrian Explosion is considered rapid geologically because it represents a swift increase in the complexity and diversity of animal life compared to prior periods.

How does the Cambrian Explosion relate to the construction of animal biodiversity today?

The Cambrian Explosion set the stage for modern animal biodiversity by establishing the fundamental body plans and evolutionary lineages from which current species have evolved.

Are there still mysteries surrounding the Cambrian Explosion?

Yes, many aspects remain unclear, including the exact triggers, the role of environmental versus genetic factors, and why such a rapid diversification occurred after a long period of simpler life forms.

Additional Resources

1. *Wonderful Life: The Burgess Shale and the Nature of History*

Stephen Jay Gould's classic work explores the Burgess Shale fossils, which provide key evidence of the Cambrian Explosion. The book discusses the rapid diversification of early animal life and challenges traditional views of evolutionary progress. Gould uses these fossils to illustrate the role of contingency in shaping the history of life on Earth.

2. *Evolution's Big Bang: The Cambrian Explosion and the Origins of Animal Diversity*

This book delves into the scientific discoveries surrounding the Cambrian Explosion, a pivotal event approximately 540 million years ago. It examines the sudden appearance of complex animal forms and the genetic, environmental, and ecological factors that may have driven this rapid diversification. Readers gain insight into how modern animal phyla emerged during this period.

3. *The Cambrian Explosion: The Construction of Animal Biodiversity*

Edited by Douglas Erwin and James Valentine, this comprehensive volume gathers contributions from leading paleontologists and evolutionary biologists. It provides an in-depth analysis of the fossil record, developmental biology, and molecular data related to the Cambrian Explosion. The book highlights the interplay of genetics, ecology, and environmental changes that influenced early animal evolution.

4. *Before the Dinosaur: The Cambrian Origins of Animal Life*

This work focuses on the pre-dinosaur era, emphasizing the Cambrian period as the foundational time for animal biodiversity. It explores fossil evidence and evolutionary theories explaining how complex body plans and ecosystems originated. The book also discusses the significance of early developmental mechanisms in shaping animal diversity.

5. *Animals Into Ancestry: The Cambrian Explosion and the Origins of Modern Life*

This title investigates the transition from simple multicellular organisms to the establishment of modern animal lineages during the Cambrian Explosion. It addresses the evolutionary innovations that allowed animals to diversify rapidly and adapt to various ecological niches. The narrative connects paleontological findings with molecular biology to provide a holistic view of early animal history.

6. *The Rise of Animals: Evolution and Diversification of the Kingdom Animalia*

Focusing on the evolutionary processes behind animal diversification, this book covers the Cambrian period as a critical phase in the rise of animal life. It discusses fossil evidence alongside genetic data to explain the emergence of key animal groups. The book also considers environmental factors that may have triggered the rapid expansion of animal diversity.

7. *The Fossil Record and the Cambrian Explosion: Insights into Early Animal Evolution*

This book presents a detailed examination of the fossil evidence from the Cambrian period, highlighting major discoveries that shed light on early animal evolution. It reviews the taxonomy, morphology, and ecological dynamics of Cambrian fauna. The work emphasizes the importance of the fossil record in understanding the origins and diversification of animal life.

8. *Developmental Biology and the Cambrian Explosion: Origins of Animal Body Plans*

Exploring the role of developmental biology, this book discusses how genetic

and embryological mechanisms contributed to the formation of diverse animal body plans during the Cambrian Explosion. It integrates molecular biology with paleontological data to explain how developmental pathways evolved rapidly. The book provides a modern perspective on the evolutionary construction of animal biodiversity.

9. Ecology and Evolution in the Cambrian Explosion: Building the Animal Biosphere

This title investigates the ecological interactions and evolutionary dynamics that shaped the Cambrian Explosion. It analyzes how predator-prey relationships, environmental changes, and ecological competition drove the rapid diversification of animal life. The book offers a comprehensive view of how early ecosystems were constructed during this transformative period.

The Cambrian Explosion The Construction Of Animal Biodiversity

The Cambrian Explosion: The Construction of Animal Biodiversity

The Cambrian Explosion represents a pivotal moment in Earth's history, a relatively short period of time during which the vast majority of animal phyla – the major body plans – appeared in the fossil record. Understanding this event is crucial for comprehending the evolution of life on Earth, the origins of complex ecosystems, and the incredible diversity of animals we see today. This ebook will delve into the mysteries surrounding the Cambrian Explosion, exploring its causes, consequences, and ongoing research.

Ebook Title: Unlocking the Cambrian Explosion: A Journey into the Dawn of Animal Life

Contents Outline:

Introduction: Setting the stage for the Cambrian Explosion, introducing key concepts and geological context.

Chapter 1: The Fossil Evidence: Examining the key fossil sites and the types of fossils found, highlighting the diversity and sudden appearance of animals.

Chapter 2: Environmental Triggers: Exploring potential environmental factors that may have facilitated the Cambrian Explosion, such as rising oxygen levels, changes in ocean chemistry, and the evolution of predation.

Chapter 3: Developmental Innovations: Discussing the genetic and developmental changes that may have enabled the evolution of new body plans and morphologies.

Chapter 4: The "Pre-Cambrian" World: Examining the fossil record preceding the Cambrian Explosion to understand the evolutionary precursors and the build-up to this event.

Chapter 5: Ecological Interactions and the Cambrian Food Web: Exploring the complex interplay of predator-prey relationships and the development of diverse ecological niches.

Chapter 6: Recent Research and Ongoing Debates: Summarizing the latest research findings and addressing the ongoing controversies and unanswered questions about the Cambrian Explosion.

Chapter 7: The Cambrian Explosion's Legacy: Exploring the long-term consequences of the Cambrian Explosion on the evolution of life and the formation of modern ecosystems.

Conclusion: Synthesizing the key findings and highlighting the continuing importance of studying the Cambrian Explosion for understanding evolutionary biology.

Detailed Explanation of Outline Points:

Introduction: This section provides background information on the geological time scale, the Ediacaran biota (pre-Cambrian life), and introduces the concept of body plans and phyla, setting the stage for the subsequent chapters. Keywords: Cambrian period, Ediacaran biota, geological timescale, animal phyla, body plan evolution.

Chapter 1: The Fossil Evidence: This chapter will focus on significant fossil locations such as the Burgess Shale in Canada and Chengjiang in China, detailing the types of fossils discovered (e.g., *Anomalocaris*, *Opabinia*), emphasizing their morphological diversity and the sudden appearance of complex life forms. Keywords: Burgess Shale, Chengjiang biota, fossil evidence, *Anomalocaris*, *Opabinia*, Cambrian fauna.

Chapter 2: Environmental Triggers: This chapter explores hypotheses regarding environmental factors driving the Cambrian Explosion, including rising oxygen levels (oxygenation hypothesis), changes in ocean chemistry (e.g., calcium availability), and the emergence of predation as a selective pressure. Keywords: oxygenation hypothesis, calcium carbonate, ocean chemistry, predation, selective pressure, environmental triggers.

Chapter 3: Developmental Innovations: This chapter examines the genetic and developmental mechanisms that underpinned the rapid diversification of body plans. Topics include Hox genes, developmental plasticity, and the evolution of novel developmental pathways. Keywords: Hox genes, developmental biology, gene regulation, developmental plasticity, morphological innovation.

Chapter 4: The "Pre-Cambrian" World: This chapter explores the Ediacaran biota, examining their morphology, ecology, and potential relationship to Cambrian animals. It also discusses the evolutionary processes that paved the way for the Cambrian Explosion. Keywords: Ediacaran biota, pre-Cambrian life, evolutionary precursors, Ediacaran-Cambrian transition.

Chapter 5: Ecological Interactions and the Cambrian Food Web: This chapter examines the complex trophic interactions within Cambrian ecosystems, including the evolution of predation, herbivory, and other ecological relationships, highlighting the impact of these interactions on diversification. Keywords: trophic interactions, food web, predation, herbivory, Cambrian ecosystem, ecological niches.

Chapter 6: Recent Research and Ongoing Debates: This chapter will discuss recent advances in molecular phylogenetics, geochemical analysis, and other fields, focusing on the ongoing debates about the pace and causes of the Cambrian Explosion. It will also address the challenges in interpreting the fossil record. Keywords: molecular phylogenetics, geochemical analysis, dating methods, controversies, unanswered questions, Cambrian explosion debate.

Chapter 7: The Cambrian Explosion's Legacy: This chapter explores the long-term evolutionary consequences of the Cambrian Explosion, including the evolution of major animal groups and the establishment of modern ecosystems. It discusses the impact on subsequent evolutionary radiations.

Keywords: evolutionary legacy, biodiversity, ecosystem development, Phanerozoic life, evolutionary radiations.

Conclusion: This section summarizes the key findings of the ebook, highlighting the significance of the Cambrian Explosion in the history of life and emphasizing the ongoing research efforts to unravel its mysteries. Keywords: summary, significance, future research, evolutionary biology.

Frequently Asked Questions (FAQs):

1. What exactly is the Cambrian Explosion? The Cambrian Explosion refers to the relatively rapid appearance of most major animal phyla in the fossil record during the Cambrian period (approximately 541 to 485 million years ago).
2. How long did the Cambrian Explosion last? The duration is debated, but it likely spanned tens of millions of years, a relatively short time in geological terms.
3. What are the major hypotheses explaining the Cambrian Explosion? Leading hypotheses include increased oxygen levels, changes in ocean chemistry, the evolution of predation, and developmental innovations.
4. What are Hox genes and their role in the Cambrian Explosion? Hox genes are master regulatory genes that control body plan development. Their evolution and diversification likely played a crucial role in the emergence of new body plans.
5. What are some key fossil sites from the Cambrian period? The Burgess Shale in Canada and the Chengjiang biota in China are renowned for their exceptional preservation of Cambrian fossils.
6. What is the significance of the Ediacaran biota? The Ediacaran biota represents the pre-Cambrian life forms that may have been ancestors or evolutionary precursors to Cambrian animals.
7. How does the Cambrian Explosion relate to modern biodiversity? The Cambrian Explosion laid the foundation for the vast majority of animal phyla we see today, shaping the course of animal evolution.
8. What are some ongoing debates about the Cambrian Explosion? Ongoing debates include the pace of the event, the relative importance of different contributing factors, and the interpretation of the fossil record.
9. Where can I learn more about the Cambrian Explosion? You can find more information in scientific journals, books, and online resources dedicated to paleontology and evolutionary biology.

Related Articles:

1. The Burgess Shale: A Window into the Cambrian Explosion: This article will explore the Burgess Shale fossil site in detail, highlighting its significance and the diverse organisms found there.

2. The Chengjiang Biota: Another Glimpse into the Cambrian Explosion: A similar article focusing on the Chengjiang biota in China, comparing and contrasting it with the Burgess Shale.
3. Oxygenation and the Cambrian Explosion: A Causal Link?: This article will delve deeper into the oxygenation hypothesis, exploring the evidence and counterarguments.
4. Hox Genes and the Evolution of Animal Body Plans: This article will explore the role of Hox genes in developmental biology and their impact on animal evolution.
5. Predation and the Cambrian Explosion: An Evolutionary Arms Race: This article will explore the role of predation as a driving force in Cambrian diversification.
6. The Ediacaran Biota: Precursors to the Cambrian Explosion?: A detailed examination of the Ediacaran biota and its potential relationship to Cambrian animals.
7. Developmental Plasticity and the Cambrian Explosion: An analysis of the role of developmental plasticity in generating morphological diversity.
8. The Cambrian Food Web: Complexity and Coevolution: This article will analyze the complex interactions within Cambrian ecosystems.
9. Dating the Cambrian Explosion: Refining the Timeline: An exploration of the methods used to date the Cambrian Explosion and the challenges involved.

the cambrian explosion the construction of animal biodiversity: CAMBRIAN EXPLOSION D Erwin, 2013-01-18 The Cambrian Period records one of the most extraordinary transitions in the history of life. Although animals may have first appeared nearly 700 million years ago, with the earliest sponges, their initial diversifications appear to have been modest until a richly diverse fossil fauna appeared abruptly about 170 million years later. In *The Cambrian Explosion*, Erwin and Valentine synthesize research from many fields to explain why there was such remarkable novelty of animal forms.

the cambrian explosion the construction of animal biodiversity: Handbook of Paleoanthropology Winfried Henke, Ian Tattersall, 2007-05-10 This 3-volume handbook brings together contributions by the world's leading specialists that reflect the broad spectrum of modern palaeoanthropology, thus presenting an indispensable resource for professionals and students alike. Vol. 1 reviews principles, methods, and approaches, recounting recent advances and state-of-the-art knowledge in phylogenetic analysis, palaeoecology and evolutionary theory and philosophy. Vol. 2 examines primate origins, evolution, behaviour, and adaptive variety, emphasizing integration of fossil data with contemporary knowledge of the behaviour and ecology of living primates in natural environments. Vol. 3 deals with fossil and molecular evidence for the evolution of *Homo sapiens* and its fossil relatives.

the cambrian explosion the construction of animal biodiversity: *Extinction* Douglas H. Erwin, 2015-03-22 Some 250 million years ago, the earth suffered the greatest biological crisis in its history. Around 95 percent of all living species died out—a global catastrophe far greater than the dinosaurs' demise 185 million years later. How this happened remains a mystery. But there are many competing theories. Some blame huge volcanic eruptions that covered an area as large as the continental United States; others argue for sudden changes in ocean levels and chemistry, including burps of methane gas; and still others cite the impact of an extraterrestrial object, similar to what caused the dinosaurs' extinction. Extinction is a paleontological mystery story. Here, the world's foremost authority on the subject provides a fascinating overview of the evidence for and against a

whole host of hypotheses concerning this cataclysmic event that unfolded at the end of the Permian. After setting the scene, Erwin introduces the suite of possible perpetrators and the types of evidence paleontologists seek. He then unveils the actual evidence--moving from China, where much of the best evidence is found; to a look at extinction in the oceans; to the extraordinary fossil animals of the Karoo Desert of South Africa. Erwin reviews the evidence for each of the hypotheses before presenting his own view of what happened. Although full recovery took tens of millions of years, this most massive of mass extinctions was a powerful creative force, setting the stage for the development of the world as we know it today. In a new preface, Douglas Erwin assesses developments in the field since the book's initial publication.

the cambrian explosion the construction of animal biodiversity: *On the Origin of Phyla* James W. Valentine, 2004-06-18 Owing its inspiration and title to *On the Origin of Species*, James W. Valentine's ambitious book synthesizes and applies the vast treasury of theory and research collected in the century and a half since Darwin's time. By investigating the origins of life's diversity, Valentine unlocks the mystery of the origin of phyla. One of the twentieth century's most distinguished paleobiologists, Valentine here integrates data from molecular genetics, evolutionary developmental biology, embryology, comparative morphology, and paleontology into an analysis of interest to scholars from any of these fields. He begins by examining the sorts of evidence that can be gleaned from fossils, molecules, and morphology, then reviews and compares the basic morphology and development of animal phyla, emphasizing the important design elements found in the bodyplans of both living and extinct phyla. Finally, Valentine undertakes the monumental task of developing models to explain the origin and early diversification of animal phyla, as well as their later evolutionary patterns. Truly a magnum opus, *On the Origin of Phyla* will take its place as one of the classic scientific texts of the twentieth century, affecting the work of paleontologists, morphologists, and developmental, molecular, and evolutionary biologists for decades to come. A magisterial compendium . . . Valentine offers a judicious evaluation of an astonishing array of evidence.—Richard Fortey, *New Scientist* Truly a magnum opus, *On the Origin of Phyla* has already taken its place as one of the classic scientific texts of the twentieth century, affecting the work of paleontologists, morphologists, and developmental, molecular, and evolutionary biologists for decades to come.—Ethology, Ecology & Evolution Valentine is one of the Renaissance minds of our time. . . . Darwin wisely called his best-known work *On the Origin of the Species*; the origin of the phyla is an even stickier problem, and Valentine deserves credit for tackling it at such breadth . . . A magnificent book.—Stefan Bengtson, *Nature*

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the cambrian explosion the construction of animal biodiversity: *The Cnidaria, Past, Present and Future* Stefano Goffredo, Zvy Dubinsky, 2016-09-07 This volume presents a broad panorama of the current status of research of invertebrate animals considered belonging to the phylum Cnidaria, such as hydra, jellyfish, sea anemone, and coral. In this book the Cnidarians are traced from the Earth's primordial oceans, to their response to the warming and acidifying oceans. Due to the role of corals in the carbon and calcium cycles, various aspects of cnidarian calcification are discussed. The relation of the Cnidaria with Mankind is approached, in accordance with the Editors' philosophy of bridging the artificial schism between science, arts and Humanities. Cnidarians' encounters with humans result in a broad spectrum of medical emergencies that are reviewed. The final section of the volume is devoted to the role of Hydra and Medusa in mythology and art.

the cambrian explosion the construction of animal biodiversity: *Darwin's Doubt* Stephen C. Meyer, 2013-06-18 When Charles Darwin finished *The Origin of Species*, he thought that he had explained every clue, but one. Though his theory could explain many facts, Darwin knew that there was a significant event in the history of life that his theory did not explain. During this event, the "Cambrian explosion," many animals suddenly appeared in the fossil record without apparent

ancestors in earlier layers of rock. In Darwin's Doubt, Stephen C. Meyer tells the story of the mystery surrounding this explosion of animal life—a mystery that has intensified, not only because the expected ancestors of these animals have not been found, but because scientists have learned more about what it takes to construct an animal. During the last half century, biologists have come to appreciate the central importance of biological information—stored in DNA and elsewhere in cells—to building animal forms. Expanding on the compelling case he presented in his last book, *Signature in the Cell*, Meyer argues that the origin of this information, as well as other mysterious features of the Cambrian event, are best explained by intelligent design, rather than purely undirected evolutionary processes.

the cambrian explosion the construction of animal biodiversity: Oxygen and the Evolution of Life Heinz Decker, Kensal E van Holde, 2010-12-03 This book describes the interlaced histories of life and oxygen. It opens with the generation of oxygen in ancient stars and its distribution to newly formed planets like the Earth. Free O₂ was not available on the early Earth, so the first life forms had to be anaerobic. Life introduced free O₂ into the environment through the evolution of photosynthesis, which must have been a disaster for many anaerobes. Others found ways to deal with the toxic reactive oxygen species and even developed a much more efficient oxygen-based metabolism. The authors vividly describe how the introduction of O₂ allowed the burst of evolution that created today's biota. They also discuss the interplay of O₂ and CO₂, with consequences such as worldwide glaciations and global warming. On the physiological level, they present an overview of oxidative metabolism and O₂ transport, and the importance of O₂ in human life and medicine, emphasizing that while oxygen is essential, it is also related to aging and many disease states.

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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

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the cambrian explosion the construction of animal biodiversity: Ichnology Luis A. Buatois, M. Gabriela Mángano, 2011-08-11 Ichnology is the study of traces created in the substrate by living organisms. This is the first book to systematically cover basic concepts and applications in both paleobiology and sedimentology, bridging the gap between the two main facets of the field. It emphasizes the importance of understanding ecologic controls on benthic fauna distribution and the role of burrowing organisms in changing their environments. A detailed analysis of the ichnology of a range of depositional environments is presented using examples from the Precambrian to the recent, and the use of trace fossils in facies analysis and sequence stratigraphy is discussed. The potential for biogenic structures to provide valuable information and solve problems in a wide range of fields is also highlighted. An invaluable resource for researchers and graduate students in paleontology, sedimentology and sequence stratigraphy, this book will also be of interest to industry professionals working in petroleum geoscience.

the cambrian explosion the construction of animal biodiversity: The Rise of Animals Mikhail A. Fedonkin, 2007 An essential resource for paleontologists, biologists, geologists, and teachers, The Rise of Animals is the best single reference on one of earth's most significant events.

the cambrian explosion the construction of animal biodiversity: Dawkins Vs. Gould Kim Sterelny, 2007 Already an international bestseller, this completely revised edition updates the story of science's most bitter argument.

the cambrian explosion the construction of animal biodiversity: Freshwater Animal Diversity Assessment E.V. Balian, C. Lévêque, H. Segers, K. Martens, 2008-04-27 This book offers a comprehensive study of species- and genus-level diversity and chorology of the global freshwater fauna to date. It gives a state of the art assessment of the diversity and distribution of Metazoa in the continental waters of the world.

the cambrian explosion the construction of animal biodiversity: Carboniferous Giants and Mass Extinction George R. McGhee Jr., 2018-08-07 Picture a world of dog-sized scorpions and millipedes as long as a car; tropical rainforests with trees towering over 150 feet into the sky and a giant polar continent five times larger than Antarctica. That world was not imaginary; it was the earth more than 300 million years ago in the Carboniferous period of the Paleozoic era. In Carboniferous Giants and Mass Extinction, George R. McGhee Jr. explores that ancient world, explaining its origins; its downfall in the end-Permian mass extinction, the greatest biodiversity crisis to occur since the evolution of animal life on Earth; and how its legacies still affect us today.

McGhee investigates the consequences of the Late Paleozoic ice age in this comprehensive portrait of the effects of ancient climate change on global ecology. Carboniferous Giants and Mass Extinction examines the climatic conditions that allowed for the evolution of gigantic animals and the formation of the largest tropical rainforests ever to exist, which in time turned into the coal that made the industrial revolution possible—and fuels the engine of contemporary anthropogenic climate change. Exploring the strange and fascinating flora and fauna of the Late Paleozoic ice age world, McGhee focuses his analysis on the forces that brought this world to an abrupt and violent end. Synthesizing decades of research and new discoveries, this comprehensive book provides a wealth of insights into past and present extinction events and climate change.

the cambrian explosion the construction of animal biodiversity: The Ancient Origins of Consciousness Todd E. Feinberg, Jon M. Mallatt, 2016-03-25 How consciousness appeared much earlier in evolutionary history than is commonly assumed, and why all vertebrates and perhaps even some invertebrates are conscious. How is consciousness created? When did it first appear on Earth, and how did it evolve? What constitutes consciousness, and which animals can be said to be sentient? In this book, Todd Feinberg and Jon Mallatt draw on recent scientific findings to answer these questions—and to tackle the most fundamental question about the nature of consciousness: how does the material brain create subjective experience? After assembling a list of the biological and neurobiological features that seem responsible for consciousness, and considering the fossil record of evolution, Feinberg and Mallatt argue that consciousness appeared much earlier in evolutionary history than is commonly assumed. About 520 to 560 million years ago, they explain, the great “Cambrian explosion” of animal diversity produced the first complex brains, which were accompanied by the first appearance of consciousness; simple reflexive behaviors evolved into a unified inner world of subjective experiences. From this they deduce that all vertebrates are and have always been conscious—not just humans and other mammals, but also every fish, reptile, amphibian, and bird. Considering invertebrates, they find that arthropods (including insects and probably crustaceans) and cephalopods (including the octopus) meet many of the criteria for consciousness. The obvious and conventional wisdom-shattering implication is that consciousness evolved simultaneously but independently in the first vertebrates and possibly arthropods more than half a billion years ago. Combining evolutionary, neurobiological, and philosophical approaches allows Feinberg and Mallatt to offer an original solution to the “hard problem” of consciousness.

the cambrian explosion the construction of animal biodiversity: The Ecology of the Cambrian Radiation Robert Riding, 2001 The Cambrian radiation was the explosive evolution of marine life that started 550,000,000 years ago. It ranks as one of the most important episodes in Earth history. This key event in the history of life on our planet changed the marine biosphere and its sedimentary environment forever, requiring a complex interplay of wide-ranging biologic and nonbiologic processes. The Ecology of the Cambrian Radiation offers a comprehensive and surprising picture of the Earth at that ancient time. The book contains contributions from thirty-three authors hailing from ten countries and will be of interest to paleontologists, geologists, biologists, and other researchers interested in the global Earth-life system.

the cambrian explosion the construction of animal biodiversity: The Atlantic Forest Marcia C. M. Marques, Carlos E. V. Grelle, 2021-01-13 The Atlantic Forest is one of the 36 hotspots for biodiversity conservation worldwide. It is a unique, large biome (more than 3000 km in latitude; 2500 in longitude), marked by high biodiversity, high degree of endemic species and, at the same time, extremely threatened. Approximately 70% of the Brazilian population lives in the area of this biome, which makes the conflict between biodiversity conservation and the sustainability of the human population a relevant issue. This book aims to cover: 1) the historical characterization and geographic variation of the biome; 2) the distribution of the diversity of some relevant taxa; 3) the main threats to biodiversity, and 4) possible opportunities to ensure the biodiversity conservation, and the economic and social sustainability. Also, it is hoped that this book can be useful for those involved in the development of public policies aimed at the conservation of this important global biome.

the cambrian explosion the construction of animal biodiversity: *Applications of Non-Pollen Palynomorphs* F. Marret, J. O'Keefe, P. Osterloff, M. Pound, 2021-10-29 This long-awaited book about non-pollen palynomorphs (NPPs) aims to cover gaps in our knowledge of these abundant but understudied palynological remains. NPPs, such as fungal spores, testate amoebae, dinoflagellate cysts, acritarchs and animal remains, are routinely recovered from palynological preparations of marine or terrestrial material, from Proterozoic to recent geological times. This book gives the reader a comprehensive overview of the different types of NPPs, with examples from diverse time periods and environments. It provides guidance on sample preparation to maximize the recovery of these NPPs, detailed information on their diversity and ecological affinity, clarification on the nomenclature and demonstrates their value as environmental indicators. This volume will become the reference guide for any student, academic or practitioner interested in everything else in their palynological preparations.

the cambrian explosion the construction of animal biodiversity: *Biodiversity* John I. Spicer, 2009-01-15 Discusses the many different life forms that have existed on Earth, their importance, and how they have changed over time.

the cambrian explosion the construction of animal biodiversity: *Darwin's Ghost* Steve Jones, 2001-04-03 A modern geneticist revisits Darwin's classic work to offer contemporary examples and modern research that confirm the book's conclusions on evolution.

the cambrian explosion the construction of animal biodiversity: *Creative Conservation* P.J. Olney, G. Mace, A. Feistner, 2012-12-06 Past progress and future challenges R.J. Wheater Royal Zoological Society of Scotland, Edinburgh, UK. In the past two decades much has been achieved in the sphere of breeding endangered species, and we should be pleased that our co operative efforts have already borne so much fruit. However, on balance and despite the best efforts of conservationists, the position of wildlife in the wild places where they are best conserved has become worse, often dramatically worse. Before returning to the United Kingdom in 1972, I was in Uganda for 16 years, most of which time was spent as Chief Warden of Murchison Falls National Park. Our main problem was that an over-population of large mammals was having a devastating impact on the habitat. Devastation was being wrought on woodland areas by the arrival of large numbers of elephants into the sanctuary of the Park, following changes in land use in the areas outside the Park. These changes were in response to the requirements of an ever-expanding human population.

the cambrian explosion the construction of animal biodiversity: *Chordate Origins and Evolution* Noriyuki Satoh, 2016-07-14 Chordate Origins and Evolution: The Molecular Evolutionary Road to Vertebrates focuses on echinoderms (starfish, sea urchins, and others), hemichordates (acorn worms, etc.), cephalochordates (lancelets), urochordates or tunicates (ascidians, larvaceans and others), and vertebrates. In general, evolution of these groups is discussed independently, on a larger scale: ambulacrarians (echi+hemi) and chordates (cephlo+uro+vert). Until now, discussion of these topics has been somewhat fragmented, and this work provides a unified presentation of the essential information. In the more than 150 years since Charles Darwin proposed the concept of the origin of species by means of natural selection, which has profoundly affected all fields of biology and medicine, the evolution of animals (metazoans) has been studied, discussed, and debated extensively. Following many decades of classical comparative morphology and embryology, the 1980s marked a turning point in studies of animal evolution, when molecular biological approaches, including molecular phylogeny (MP), molecular evolutionary developmental biology (evo-devo), and comparative genomics (CG), began to be employed. There are at least five key events in metazoan evolution, which include the origins of 1) diploblastic animals, such as cnidarians; 2) triploblastic animals or bilaterians; 3) protostomes and deuterostomes; 4) chordates, among deuterostomes; and 5) vertebrates, among chordates. The last two have received special attention in relation to evolution of human beings. During the past two decades, great advances have been made in this field, especially in regard to molecular and developmental mechanisms involved in the evolution of chordates. For example, the interpretation of phylogenetic relationships among deuterostomes has

drastically changed. In addition, we have now obtained a large quantity of MP, evo-devo, and CG information on the origin and evolution of chordates. - Covers the most significant advances in this field to give readers an understanding of the interesting biological issues involved - Provides a unified presentation of essential information regarding each phylum and an integrative understanding of molecular mechanisms involved in the origin and evolution of chordates - Discusses the evolutionary scenario of chordates based on two major characteristic features of animals—namely modes of feeding (energy sources) and reproduction—as the two main forces driving animal evolution and benefiting dialogue for future studies of animal evolution

the cambrian explosion the construction of animal biodiversity: Darwin's Lost World Martin Brasier, 2010-03-11 Darwin made a powerful argument for evolution in the Origin of Species, based on all the evidence available to him. But a few things puzzled him. One was how inheritance works - he did not know about genes. This book concerns another of Darwin's Dilemmas, and the efforts of modern palaeontologists to solve it. What puzzled Darwin is that the most very ancient rocks, before the Cambrian, seemed to be barren, when he would expect them to be teeming with life. Darwin speculated that this was probably because the fossils had not been found yet. Decades of work by modern palaeontologists have indeed brought us amazing fossils from far beyond the Cambrian, from the depths of the Precambrian, so life was certainly around. Yet the fossils are enigmatic, and something does seem to happen around the Cambrian to speed up evolution drastically and produce many of the early forms of animals we know today. In this book, Martin Brasier, a leading palaeontologist working on early life, takes us into the deep, dark ages of the Precambrian to explore Darwin's Lost World. Decoding the evidence in these ancient rocks, piecing together the puzzle of what happened over 540 million years ago to drive what is known as the Cambrian Explosion, is very difficult. The world was vastly different then from the one we know now, and we are in terrain with few familiar landmarks. Brasier is a master storyteller, and combines the account of what we now know of the strange creatures of these ancient times with engaging and amusing anecdotes from his expeditions to Siberia, Outer Mongolia, Barbuda, and other places, giving a vivid impression of the people, places, and challenges involved in such work. He ends by presenting his own take on the Cambrian Explosion, based on the picture emerging from this very active field of research. A vital clue involves worms - burrowing worms are one of the key signs of the start of the Cambrian. This is fitting: Darwin was inordinately fond of worms.

the cambrian explosion the construction of animal biodiversity: Conservation Biology for All Navjot S. Sodhi, Paul R. Ehrlich, 2010-01-08 Conservation Biology for All provides cutting-edge but basic conservation science to a global readership. A series of authoritative chapters have been written by the top names in conservation biology with the principal aim of disseminating cutting-edge conservation knowledge as widely as possible. Important topics such as balancing conservation and human needs, climate change, conservation planning, designing and analyzing conservation research, ecosystem services, endangered species management, extinctions, fire, habitat loss, and invasive species are covered. Numerous textboxes describing additional relevant material or case studies are also included. The global biodiversity crisis is now unstoppable; what can be saved in the developing world will require an educated constituency in both the developing and developed world. Habitat loss is particularly acute in developing countries, which is of special concern because it tends to be these locations where the greatest species diversity and richest centres of endemism are to be found. Sadly, developing world conservation scientists have found it difficult to access an authoritative textbook, which is particularly ironic since it is these countries where the potential benefits of knowledge application are greatest. There is now an urgent need to educate the next generation of scientists in developing countries, so that they are in a better position to protect their natural resources.

the cambrian explosion the construction of animal biodiversity: Superplumes: Beyond Plate Tectonics David A. Yuen, Shigenori Maruyama, Shun-ichiro Karato, Brian F. Windley, 2007-06-29 This abundantly illustrated book provides a concise overview of our understanding of the entire mantle, its evolution since early differentiation and the consequences of superplumes for

earth surface processes. The book's balanced authorship has produced a state-of-the-science report on the emerging concept of superplumes. This presents a new concept to explain catastrophic events on Earth through geologic time.

the cambrian explosion the construction of animal biodiversity: Biodiversity and Traditional Knowledge Sarah A. Laird, 2010-09-23 Biodiversity research and prospecting are long-standing activities taking place in a new legal and ethical environment. Following entry into force of the Convention on Biological Diversity in 1993, and other recent policy developments, expectations and obligations for research and prospecting partnerships have changed. However, to date there are few guides to integrating these concepts with practice. This book offers practical guidance on how to arrive at equitable biodiversity research and prospecting partnerships. Drawing on experience and lessons learned from around the world, it provides case studies, analysis and recommendations in a range of areas that together form a new framework for creating equity in these partnerships. They include researcher codes of ethics, institutional policies, community research agreements, the design of more effective commercial partnerships and biodiversity prospecting contracts, the drafting and implementation of national 'access and benefit-sharing' laws, and institutional tools for the distribution of financial benefits. As part of the People and Plants initiative to enhance the role of communities in efforts to conserve biodiversity and use natural resources sustainably, Biodiversity and Traditional Knowledge will be invaluable to students, researchers and local communities, academic institutions, international agencies, government bodies and companies involved in biodiversity research, prospecting and conservation.

the cambrian explosion the construction of animal biodiversity: *Animal Evolution* NATURAL SCIENCES and MATHEMATICS (500), ZOOLOGICAL SCIENCES (590), 2009-08-13 Animal life, now and over the past half billion years, is incredibly diverse. Describing and understanding the evolution of this diversity of body plans - from vertebrates such as humans and fish to the numerous invertebrate groups including sponges, insects, molluscs, and the many groups of worms - is a major goal of evolutionary biology. In this book, a group of leading researchers adopt a modern, integrated approach to describe how current molecular genetic techniques and disciplines as diverse as palaeontology, embryology, and genomics have been combined, resulting in a dramatic renaissance in the study of animal evolution. The last decade has seen growing interest in evolutionary biology fuelled by a wealth of data from molecular biology. Modern phylogenies integrating evidence from molecules, embryological data, and morphology of living and fossil taxa provide a wide consensus of the major branching patterns of the tree of life; moreover, the links between phenotype and genotype are increasingly well understood. This has resulted in a reliable tree of relationships that has been widely accepted and has spawned numerous new and exciting questions that require a reassessment of the origins and radiation of animal life. The focus of this volume is at the level of major animal groups, the morphological innovations that define them, and the mechanisms of change to their embryology that have resulted in their evolution. Current research themes and future prospects are highlighted including phylogeny reconstruction, comparative developmental biology, the value of different sources of data and the importance of fossils, homology assessment, character evolution, phylogeny of major groups of animals, and genome evolution. These topics are integrated in the light of a 'new animal phylogeny', to provide fresh insights into the patterns and processes of animal evolution. *Animal Evolution* provides a timely and comprehensive statement of progress in the field for academic researchers requiring an authoritative, balanced and up-to-date overview of the topic. It is also intended for both upper level undergraduate and graduate students taking courses in animal evolution, molecular phylogenetics, evo-devo, comparative genomics and associated disciplines.

the cambrian explosion the construction of animal biodiversity: *Scientific Creationism* Institute for Creation Research, 1985 This book deals with all the important aspects of the creation-evolution question from a strictly scientific point of view, attempting to evaluate the physical evidence from the relevant scientific fields without reference to the Bible or other religious literature. It demonstrates that the real evidences dealing with origins and ancient history support

creationism rather than evolutionism. This General Edition (rather than the Public School Edition) includes a chapter, Creation According to Scripture, which places the scientific evidence in its proper Biblical and theological context.

the cambrian explosion the construction of animal biodiversity: *Introduction to Paleobiology and the Fossil Record* Michael J. Benton, David A. T. Harper, 2013-04-25 This book presents a comprehensive overview of the science of the history of life. Paleobiologists bring many analytical tools to bear in interpreting the fossil record and the book introduces the latest techniques, from multivariate investigations of biogeography and biostratigraphy to engineering analysis of dinosaur skulls, and from homeobox genes to cladistics. All the well-known fossil groups are included, including microfossils and invertebrates, but an important feature is the thorough coverage of plants, vertebrates and trace fossils together with discussion of the origins of both life and the metazoans. All key related subjects are introduced, such as systematics, ecology, evolution and development, stratigraphy and their roles in understanding where life came from and how it evolved and diversified. Unique features of the book are the numerous case studies from current research that lead students to the primary literature, analytical and mathematical explanations and tools, together with associated problem sets and practical schedules for instructors and students. “..any serious student of geology who does not pick this book off the shelf will be putting themselves at a huge disadvantage. The material may be complex, but the text is extremely accessible and well organized, and the book ought to be essential reading for palaeontologists at undergraduate, postgraduate and more advanced levels—both in Britain as well as in North America.” Falcon-Lang, H., Proc. Geol. Assoc. 2010 “...this is an excellent introduction to palaeontology in general. It is well structured, accessibly written and pleasantly informativeI would recommend this as a standard reference text to all my students without hesitation.” David Norman Geol Mag 2010 Companion website This book includes a companion website at: www.blackwellpublishing.com/paleobiology The website includes: · An ongoing database of additional Practical’s prepared by the authors · Figures from the text for downloading · Useful links for each chapter · Updates from the authors

the cambrian explosion the construction of animal biodiversity: Global Re-introduction Perspectives Pritpal S. Soorae, 2010 This is the second issue in the Global Re-introduction Perspectives series and has been produced in the same standardized format as the previous one. The case-studies are arranged in the following order: Introduction, Goals, Success Indicators, Project Summary, Major Difficulties Faced, Major Lessons Learned, Success of Project with reasons for success or failure. For this second issue we received a total of 72 case-studies compared to 62 in the last issue. These case studies cover the following taxa as follows: invertebrates (9), fish (6), amphibians (5), reptiles (7), birds (13), mammals (20) and plants (12) ... We hope the information presented in this book will provide a broad global perspective on challenges facing re-introduction projects trying to restore biodiversity.--Pritpal S. Soorae.

the cambrian explosion the construction of animal biodiversity: *Ecocide* Franz J Brosch, 2002

the cambrian explosion the construction of animal biodiversity: The Emergence of Animals Mark A. McMenamin, Dianna L. Schulte McMenamin, 1990 The authors explore the late Precambrian and earliest Cambrian fossil record to explain the Cambrian phenomenon and discuss the possibility of a major turnover in marine ecology at the beginning of the Cambrian period or whether a new, improved type of animal appeared at this time. They support their often controversial conclusions with photos and illustrations of fossils, some never before published.

the cambrian explosion the construction of animal biodiversity: *The Invertebrates* R. S. K. Barnes, Peter P. Calow, P. J. W. Olive, D. W. Golding, J. I. Spicer, 2009-04-13 The majority of undergraduate texts in invertebrate zoology (of which there are many) fall into one of two categories. They either offer a systematic treatment of groups of animals phylum by phylum, or adopt a functional approach to the various anatomical and physiological systems of the better known species. The Invertebrates is the first and only textbook to integrate both approaches and thus meet the modern teaching needs of the subject. This is the only invertebrate textbook to integrate

systematics and functional approaches. The molecular systematics sections have been completely updated for the new edition. Strong evolutionary theme which reflects the importance of molecular techniques throughout. Distills the essential characteristics of each invertebrate group and lists diagnostic features to allow comparisons between phyla. New phyla have been added for the new edition. Stresses comparisons in physiology, reproduction and development. Improved layout and illustration quality. Second edition has sold 14000 copies. Nature of the first edition: 'Students will like this book. It deserves to succeed.'

the cambrian explosion the construction of animal biodiversity: Biosphere Origin and Evolution Nikolay Dobretsov, Nikolay Kolchanov, Alexey Rozanov, Georgy Zavarzin, 2007-12-03 This monograph contains articles based on the oral presentations given at the International Workshop on the Biosphere Origin and Evolution (BOE 2005) held in Novosibirsk, Russia, June 26-29, 2005. The organizers of the event were the Scientific Programme of the Presidium of the Russian Academy of Sciences, which involves 50 institutes of the Russian Academy of Sciences.

the cambrian explosion the construction of animal biodiversity: The Great Ordovician Biodiversification Event Barry D. Webby, Florentin Paris, Mary L. Droser, Ian G. Percival, 2004-04-14 Two of the greatest evolutionary events in the history of life on Earth occurred during Early Paleozoic time. The first was the Cambrian explosion of skeletonized marine animals about 540 million years ago. The second was the Great Ordovician Biodiversification Event, which is the focus of this book. During the 46-million-year Ordovician Period (489-443 m.y.), a bewildering array of adaptive radiations of Paleozoic- and Modern-type biotas appeared in marine habitats, the first animals (arthropods) walked on land, and the first non-vascular bryophyte-like plants (based on their cryptospore record) colonized terrestrial areas with damp environments. This book represents a compilation by a large team of Ordovician specialists from around the world, who have enthusiastically cooperated to produce this first globally orientated, internationally sponsored IGCP (International Geological Correlation Program) project on Ordovician biotas. The major part is an assembly of genus- and species-level diversity data for the many Ordovician fossil groups. The book also presents an evaluation of how each group diversified through Ordovician time, with assessments of patterns of change and rates of origination and extinction. As such, it will become the standard work and data source for biotic studies on the Ordovician Period.

the cambrian explosion the construction of animal biodiversity: Evolution Donald R. Prothero, 2017-08-22 Donald R. Prothero's *Evolution* is an entertaining and rigorous history of the transitional forms and series found in the fossil record. Its engaging narrative of scientific discovery and well-grounded analysis has led to the book's widespread adoption in courses that teach the nature and value of fossil evidence for evolution. *Evolution* tackles systematics and cladistics, rock dating, neo-Darwinism, and macroevolution. It includes extensive coverage of the primordial soup, invertebrate transitions, the development of the backbone, the reign of the dinosaurs, and the transformation from early hominid to modern human. The book also details the many alleged "missing links" in the fossil record, including some of the most recent discoveries that flesh out the fossil timeline and the evolutionary process. In this second edition, Prothero describes new transitional fossils from various periods, vividly depicting such bizarre creatures as the *Odontochelys*, or the "turtle on the half shell"; fossil snakes with legs; and the "Frogamander," a new example of amphibian transition. Prothero's discussion of intelligent design arguments includes more historical examples and careful examination of the "experiments" and observations that are exploited by creationists seeking to undermine sound science education. With new perspectives, Prothero reframes creationism as a case study in denialism and pseudoscience rather than a field with its own intellectual dynamism. The first edition was hailed as an exemplary exploration of the fossil evidence for evolution, and this second edition will be welcome in the libraries of scholars, teachers, and general readers who stand up for sound science in this post-truth era.

the cambrian explosion the construction of animal biodiversity: The Dawn of Animal Life Martin F. Glaessner, 1984 This 1985 book examines the origin of the present diversity of marine invertebrate animals. A brief review of the early stages in the history of life discusses the time-scale

of the relevant geological periods alongside corresponding events in the evolutionary sequence. These views of the early history of life are then matched against the fossil record and conjectures drawn from the living fauna, enabling the author to attempt an overview of the early diversification of marine animal life. Transitions to the succeeding assemblages of shellbearing fossils in Palaeozoic rocks are discussed and a number of stratigraphic adjustments are suggested for the period in which evolutionary events had their greatest impact on oceans and marine rock strata. The need for an interdisciplinary approach to early evolution is emphasized.

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