

MASS EXTINCTIONS

A mass extinction is a sharp spike in the rate of extinction of species caused by a catastrophic event, or rapid environmental change. Scientists have been able to identify five mass extinctions in Earth's history, each of which led to a loss of more than 75 percent of animal species.

1. ORDOVICIAN-SILURIAN EXTINCTION 440 MILLION YEARS AGO (MA)

Scientists theorize that there were two main phases to this extinction: a glaciation event and a heating event. Abundant plant life removed carbon dioxide (CO₂) from the air, causing global cooling and glacier formation. This led to a drop in sea levels, reducing habitat. Later came global warming and sea level rising again. Creatures that had adapted to the cooler climate were unable to survive the increased temperature. Since most life was marine at the time, 80% of life was lost.

86% LOSS

2. LATE DEVONIAN EXTINCTION—365 MA

About 75% of life died off during this period. One theory suggests that land plants developed deep roots, releasing an abundance of nutrients into the oceans that led algae. Because of this, algae blooms consumed vast amounts of oxygen (O₂) in the oceans, suffocating many species. Another theory suggests that another global cooling took place, resulting in glaciation and a fall in sea level, leading to habitat loss.

75% LOSS

3. PERMIAN-TRIASSIC EXTINCTION—252 MA

The Permian-Triassic was the deadliest extinction in history: 90% of all life perished. Scientists believe that volcanic activity in Siberia put massive amounts of carbon dioxide, a greenhouse gas, into the atmosphere. Bacteria that thrive on CO₂ began producing methane, another greenhouse gas. Large quantities of both gases warmed the planet and combined with Earth's water, making the oceans and sea acids, creating a highly toxic environment for life.

96% LOSS

4. TRIASSIC-JURASSIC EXTINCTION—201.3 MA

Some scientists theorize that volcanic eruptions spewed tons of CO₂ into the atmosphere, which trapped heat and acidified the oceans, causing this mass extinction. Other scientists contend that an asteroid or comet impact triggered the extinction. About 80% of life was lost in this extinction, including most of the dinosaurs, making way for the dinosaur's extinction.

80% LOSS

5. CRETACEOUS-PALEOGENE EXTINCTION—66 MA

The Cretaceous-Paleogene extinction wiped out the dinosaurs, along with 60-70% of all life on Earth. A widely accepted theory is that an asteroid landed in the Yucatán Peninsula in Mexico and killed the dinosaurs. The impact would have ejected enormous amounts of debris into the atmosphere, causing global temperatures to drop. The impact may have also caused local fires, earthquakes, tsunamis, and acid rain.

60-70% LOSS

6. HOLOCENE EXTINCTION 11,700 YEARS AGO TO PRESENT

The next mass extinction may already be happening. The current extinction rate is at least a thousand times greater than the "normal" extinction rate. A "normal" or background extinction rate is the average rate of extinction based on the longevity of species through time without human influence, determined by the fossil record. Scientists believe that human impact on the environment is the leading cause of extinctions today.

NUMBER OF GENERA

40000
30000
20000
10000

Cambrian Ordovician Silurian Devonian Carboniferous Permian Triassic Jurassic Cretaceous Paleogene

GEOLOGIC TIME IN MILLIONS OF YEARS

Mass Extinctions Lab Manual

Edward Leamington Nichols



Mass Extinctions Lab Manual:

Biology Laboratory Manual Sylvia S. Mader, 2000-07 Mader includes revised coverage of animal behaviour and ecology as well as a wealth of new focus boxes which highlight topics of high interest and relate biology to everyday life This text is linked to a web site offering extended chapter outlines Laboratory Manual Inquiry into Life Sylvia S. Mader, *The Sciences, Laboratory Manual* James Trefil, Robert M. Hazen, 1998-05-12 Within this text the authors explore the main aspects of physical and life sciences and will show how to integrate these scientific principles into everyday life and events The reader student will examine such issues as human health technology environmental concerns and more A Laboratory Manual of Dynamic and Structural Geology Kirtley Fletcher Mather, Ralph Gordon Lusk, 1929 A Laboratory Manual of Physics and Applied Electricity Edward Leamington Nichols, 1894 *Instructor's Manual to Accompany Biology Laboratory* Carolyn Eberhard, 1987 **Structural Human Ecology** Nadine Bratchatzek, Paul Ehrlich, Sylvia Hiller, Roger E. Kasperson, Sandra T. Marquart-Pyatt, Allan Mazur, Ortwin Renn, Dirk Scheer, 2021-09-24 The desire to understand people's influence on ecosystems has inspired scientific studies and analyses of the stress individuals and communities place on the environment human well being and the tradeoffs between them As an emerging discipline Structural Human Ecology is devoted to unlocking the dynamic links between population environment social organization and technology The new field offers cutting edge research in risk analysis that can be used to evaluate environmental policies and thus help citizens and societies worldwide learn how to most effectively mitigate human impacts on the biosphere The essays in this volume were presented by leading international scholars at a 2011 symposium honoring the late Dr Eugene Rosa then Boeing Distinguished Professor of Environmental Sociology at WSU *Discovery-Based Learning in the Life Sciences* Kathleen M. Susman, 2015-06-29 For nearly a decade scientists educators and policy makers have issued a call to college biology professors to transform undergraduate life sciences education As a gateway science for many undergraduate students biology courses are crucial to addressing many of the challenges we face such as climate change sustainable food supply and fresh water and emerging public health issues While canned laboratories and cook book approaches to college science education do teach students to operate equipment make accurate measurements and work well with numbers they do not teach students how to take a scientific approach to an area of interest about the natural world Science is more than just techniques measurements and facts science is critical thinking and interpretation which are essential to scientific research *Discovery Based Learning in the Life Sciences* presents a different way of organizing and developing biology teaching laboratories to promote both deep learning and understanding of core concepts while still teaching the creative process of science In eight chapters the text guides undergraduate instructors in creating their own discovery based experiments The first chapter introduces the text delving into the necessity of science education reform The chapters that follow address pedagogical goals and desired outcomes incorporating discovery based laboratory experiences realistic constraints on such

lab experiments model scenarios and alternate ways to enhance student understanding The book concludes with a reflection on four imperatives in life science research climate food energy and health and how we can use these laboratory experiments to address them Discovery Based Learning in the Life Sciences is an invaluable guide for undergraduate instructors in the life sciences aiming to revamp their curriculum inspire their students and prepare them for careers as educated global citizens

Sacred, Symbolic, and Contested Gregory S. Szarycz, 2025-09-04 Sacred Symbolic and Contested explores how animals are revered represented and disputed across global cultures Through vivid case studies from sacred cows in India to ritual slaughter in Judaism and animal commodification in industrial societies this book reveals how human animal relationships express deep ethical religious and political tensions You ll encounter surprising contradictions animals celebrated in myth yet mistreated in practice or protected in law yet consumed in daily life Drawing on sociology religious studies and critical animal studies this timely work invites you to rethink the role of animals in shaping human identity culture and moral responsibility

Lunar Settlements Haym Benaroya, 2010-02-12 Bringing together some of the most recognized and influential researchers and scientists in various space related disciplines Lunar Settlements addresses the many issues that surround the permanent human return to the Moon Numerous international contributors offer their insights into how certain technological physiological and psychological challenges must be met to make permanent lunar settlements possible The book first looks to the past covering the Apollo and Saturn legacies In addition former astronaut and U S Senator Harrison H Schmitt discusses how to maintain deep space exploration and settlement The book then discusses economic aspects such as funding for lunar commerce managing human resources and commercial transportation logistics After examining how cultural elements will fit into habitat design the text explores the physiological psychological and ethical impact of living on a lunar settlement It also describes the planning technical requirements of lunar habitation the design of both manned and modular lunar bases and the protection of lunar habitats against meteoroids Focusing on lunar soil mechanics the book concludes with discussions on lunar concrete terraforming and using greenhouses for agricultural purposes Drawing from the lunar experiences of the six Apollo landing missions to the many American and Soviet robotic missions to current space activities and research this volume summarizes the problems prospects and practicality of enduring lunar settlements It reflects the key disciplines including engineering physics architecture psychology biology and anthropology that will play significant roles in establishing these settlements

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