

## Oxygen The Molecule That Made World Nick Lane

The present theme concerns the forces of nature, and what investigations of these forces can tell us about the world we see about us. The story of these forces is long and complex, and contains many episodes that are not atypical of the bulk of scientific research, which could have achieved greater acclaim 'if only...'. The intention of this book is to introduce ideas of how the visible world, and those parts of it that we cannot observe, either because they are too small or too large for our scale of perception, can be understood by consideration of only a few fundamental forces. The subject in these pages will be the authority of the commonly termed, laws of physics, which arise from the forces of nature, and the corresponding constants of nature (for example, the speed of light,  $c$ , the charge of the electron,  $e$ , or the mass of the electron,  $m_e$ ).

The book starts with a theoretical understanding of electrocatalysis in the framework of density functional theory followed by a vivid review of oxygen reduction reactions. A special emphasis has been placed on electrocatalysts for a proton-exchange membrane-based fuel cell where graphene with noble metal dispersion plays a significant role in electron transfer at thermodynamically favourable conditions. The latter part of the book deals with two 2D materials with high economic viability and process ability and MoS<sub>2</sub> and WS<sub>2</sub> for their prospects in water-splitting from renewable energy.

Napoleon's Buttons is the fascinating account of seventeen groups of molecules that have greatly influenced the course of history. These molecules provided the impetus for early exploration, and made possible the voyages of discovery that ensued. The molecules resulted in grand feats of engineering and spurred advances in medicine and law; they determined what we now eat, drink, and wear. A change as small as the position of an atom can lead to enormous alterations in the properties of a substance-which, in turn, can result in great historical shifts. With lively prose and an eye for colorful and unusual details, Le Couteur and Burreson offer a novel way to understand the shaping of civilization and the workings of our contemporary world.

Oxygen takes the reader on an enthralling journey, as gripping as a thriller, as it unravels the unexpected ways in which oxygen spurred the evolution of life and death. The book explains far more than the size of ancient insects: it shows how oxygen underpins the origin of biological complexity, the birth of photosynthesis, the sudden evolution of animals, the need for two sexes, the accelerated ageing of cloned animals like Dolly the sheep, and the surprisingly long lives of bats and birds. Drawing on this grand evolutionary canvas, Oxygen offers fresh perspectives on our own lives and deaths, explaining modern killer diseases, why we age, and what we can do about it.

The Principles of Biology sequence (BI 211, 212 and 213) introduces biology as a scientific discipline for students planning to major in biology and other science disciplines. Laboratories and classroom activities introduce techniques used to study biological processes and provide opportunities for students to develop their ability to conduct research.

Explains how matter creates new substances through processes including explosion, oxidation, and digestion, and discusses the social significance and history of modern chemical industry.

Results from the National Research Council's (NRC) landmark study Diet and health are readily accessible to nonscientists in this friendly, easy-to-read guide. Readers will find the heart of the book in the first chapter: the Food and Nutrition Board's nine-point dietary plan to reduce the risk of diet-related chronic illness. The nine points are presented as sensible guidelines that are easy to follow on a daily basis, without complicated measuring or calculating--and without sacrificing favorite foods. Eat for Life gives practical recommendations on foods to eat and in a "how-to" section provides tips on shopping (how to read food labels), cooking (how to turn a high-fat dish into a low-fat one), and eating out (how to read a menu with nutrition in mind). The volume explains what protein, fiber, cholesterol, and fats are and what foods contain them, and tells readers how to reduce their risk of chronic disease by modifying the types of food they eat. Each chronic disease is clearly defined, with information provided on its prevalence in the United States. Written for everyone concerned about how they can influence their health by what they eat, Eat for Life offers potentially lifesaving information in an understandable and persuasive way. Alternative Selection, Quality Paperback Book Club

Educationalists are always wondering how to make science more interesting. I wonder if they might take a leaf out of this book and teach not science but the history of science.' Daily Mail

Nick Lane expertly reconstructs the history of life by describing the ten greatest inventions of evolution (including DNA, photosynthesis, sex, and sight), based on their historical impact, role in organisms today, and relevance to current controversies. Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which for many students is their only college-level science course. As such, this course represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives. For these reasons, Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand. We also strive to show the interconnectedness of topics within this extremely broad discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of Concepts of Biology is that instructors can customize the book, adapting it to the approach that works best in their classroom. Concepts of Biology also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts.

"Every pebble has many stories to tell. Its particular atoms, its crystals, its minerals, its grains, its textures, its strata, its tiny fossils bear evidence to a history that stretches back billions of years."--Book flap.

Overview of the THE CULLING (THE ALIEN APOCALYPSE: Book 1) Jet is a 19-year-old skag, one of the humans still living free on Earth following an invasion of creatures called the Nirreth. Squatting in the ruins of Vancouver, Jet and her family eke out an existence underground, hiding from culler ships and fighting off raiding humans. No one knows where the alien ships take the people they steal, but they never return. When a culler finds Jet, she may discover the truth the hard way...and end up living among the very creatures that have enslaved her. Praise for THE CULLING: "[A] detailed world with plenty of action, mystery, and a strong yet believable young female protagonist..." ~ Tamela Viglione, award-winning author "[A] fast-paced action thriller..." ~ Thomas Carpenter, author of YA series Gamers "SO looking forward to the rest of the series, you have me totally hooked and craving more..." ~ Shannon Meyer, bestselling author THE ALIEN APOCALYPSE SERIES is a dystopian new adult romance about a tough girl named Jet Tetsuo who grew up on Earth following an alien invasion. Forced into living among her conquerors, she must learn to navigate a treacherous world full of enemies who pose as friends, even as she becomes their most famous fighter in the Rings, their modern day version of the coliseum where she must fight just to survive.

In January of 2013 Max was diagnosed with an incurable chronic inflammatory degenerative autoimmune disease. Contrary to all medical prognosis that Max will need multiple surgeries and will suffer in pain for the rest of his life, taking powerful anti-

inflammatory and immune suppression drugs, Max completely recovered in 180 days. Dozen's of scientific research papers were published in the past five years and new diagnostic tools were developed revealing the real causes and factors for chronic inflammation, degeneration and premature aging of cells, tissues and organs. When your joints hurt so much that you cannot walk, when inflammation and pain takes over your body, when ulcers bleed inside your stomach cavity, when no medicine brings relief, when physicians tell you there is no medical cure - you don't give up hope. Suffering brings wisdom, strength and most important knowledge that can change everything. We were told so many times that there is no medical cure for this painful, inflammatory, degenerative, auto-immune disease, and they were absolutely right because the cure was at the farm and not at the pharmacy. Max's blood sedimentation rate was reduced 20 folds. From 61 mm/hr to 3 mm/hr in 180 days after changing his diet to real food. Max's calprotectin protein (inflammation marker) was reduced 28 folds. From 504 mcg/g to 18 mcg/g in 180 days after changing his diet to real food. Max's C-reactive protein (inflammation marker) was reduced 12 folds. From 6.2 mg/dl to 0.5 mg/dl in 180 days after changing his diet to real food. The book is short, simple, and straight forward. It is an effective tool in your hands to start your own search for the truth. The book is printed in full color and contains 27 pictures and over 90 references and links to relevant scientific research papers, medical research papers, books, videos, and news articles published worldwide in the last five years. Disclaimer: This book is a personal testimony by the author and the information presented here cannot be used as a medical advice, a medical diagnostic tool or alternative medical therapy. Please consult a licensed medical practitioner prior to making any changes to your therapy, diet or lifestyle. The information presented here is not intended to replace a one-on-one relationship with a qualified and licensed health care professional. It is intended as a passing on of knowledge and information from personal research and personal experience. The author encourages you to make your own health care decisions based upon your research and always in partnership with licensed, trained and qualified health care professional. Medical treatments and medical errors are physician and patient responsibility. The author cannot be hold responsible.

Seventy years ago, Erwin Schrödinger posed a profound question: 'What is life, and how did it emerge from non-life?' Scientists have puzzled over it ever since. Addy Pross uses insights from the new field of systems chemistry to show how chemistry can become biology, and that Darwinian evolution is the expression of a deeper physical principle.

An enchanting biography of the most resonant—and most necessary—chemical element on Earth. Carbon is everywhere: in the paper of this book and the blood of our bodies. It's with us from beginning to end, present in our baby clothes and coffin alike. We live on a carbon planet, and we are carbon life. No other element is so central to our well-being; yet, when missing or misaligned, carbon atoms can also bring about disease and even death. At once ubiquitous and mysterious, carbon holds the answers to some of humanity's biggest questions. Where did Earth come from? What will ultimately become of it—and of us? With poetic storytelling, earth scientist Robert M. Hazen explores the universe to discover the past, present, and future of life's most essential element. We're not only "made of star stuff," as Carl Sagan famously observed, but "Big Bang stuff," too. Hazen reveals that carbon's grand symphony began with a frenzied prelude shortly after the dawn of creation, bringing new attention to the tiny number of Big Bang-created carbon atoms that often get overlooked. In minutes, violently colliding protons and neutrons improbably formed the first carbon atoms, which can still be found within our bodies. His book then unfolds in four movements, building momentum as he explores carbon as the element of Earth, Air, Fire, and Water. He visits the famed volcanic crater Solfatara di Pozzuoli near Naples, where venting carbon dioxide and other noxious fumes condense into beautiful crystals. He climbs the cliffs of the Scottish Highlands and delves deep into the precious-metal mines of Namibia, journeying toward Earth's mysterious core in search of undocumented carbon structures. Hazen often asks us to pause and consider carbon's role in climate change and what we can do about it, for our lives and this element are inextricably intertwined. With prose that sparkles like a diamond, *Symphony in C* tells the story of carbon, in which we all have a part.

The authors have correlated many experimental observations and theoretical discussions from the scientific literature on water. Topics covered include the water molecule and forces between water molecules; the thermodynamic properties of steam; the structures of the ices; the thermodynamic, electrical, spectroscopic, and transport properties of the ices and of liquid water; hydrogen bonding in ice and water; and models for liquid water. The main emphasis of the book is on relating the properties of ice and water to their structures. Some background material in physical chemistry has been included in order to ensure that the material is accessible to readers in fields such as biology, biochemistry, and geology, as well as to chemists and physicists. Say "algae" and most people think of pond scum. What they don't know is that without algae, none of us would exist.

Winner of the 2010 Royal Society Prize for science books Powerful new research methods are providing fresh and vivid insights into the makeup of life. Comparing gene sequences, examining the atomic structure of proteins and looking into the geochemistry of rocks have all helped to explain creation and evolution in more detail than ever before. Nick Lane uses the full extent of this new knowledge to describe the ten greatest inventions of life, based on their historical impact, role in living organisms today and relevance to current controversies. DNA, sex, sight and consciousnesses are just four examples. Lane also explains how these findings have come about, and the extent to which they can be relied upon. The result is a gripping and lucid account of the ingenuity of nature, and a book which is essential reading for anyone who has ever questioned the science behind the glories of everyday life.

OxygenThe Molecule that Made the WorldOxford University Press, USA

The activities in this book explain elementary concepts in the study of chemistry, including matter, atoms, molecules, physical properties of matter, and changing states of matter. General background information, suggested activities, questions for discussion, and answers are included. Encourage students to keep completed pages in a folder or notebook for further reference and review.

Australopithecines, dinosaurs, trilobites--such fossils conjure up images of lost worlds filled with vanished organisms. But in the full history of life, ancient animals, even the trilobites, form only the half-billion-year tip of a nearly four-billion-year iceberg. Andrew Knoll explores the deep history of life from its origins on a young planet to the incredible Cambrian explosion, presenting a compelling new explanation for the emergence of biological novelty. The very latest discoveries in paleontology--many of them made by the author and his students--are integrated with emerging insights from molecular biology and earth system science to forge a broad understanding of how the biological diversity that surrounds us came to be. Moving from Siberia to Namibia to the Bahamas, Knoll shows how life and environment have evolved together through Earth's history. Innovations in biology have helped shape our air and oceans, and, just as surely, environmental change has influenced the course of evolution, repeatedly closing off opportunities for some species while opening avenues for others. Readers go into the field to confront fossils, enter the lab to discern the inner workings of cells, and alight on Mars to ask how our terrestrial experience can guide exploration for life beyond our planet. Along the way, Knoll brings us up-to-date on some of science's hottest questions, from the oldest fossils and claims of life beyond the Earth to the hypothesis of global glaciation and Knoll's own unifying concept of "permissive ecology." In laying bare Earth's deepest biological roots, *Life on a Young Planet* helps us understand our own place in the universe--and our responsibility

as stewards of a world four billion years in the making. In a new preface, Knoll describes how the field has broadened and deepened in the decade since the book's original publication.

Oxygen has had extraordinary effects on life. Three hundred million years ago, in Carboniferous times, dragonflies grew as big as seagulls, with wingspans of nearly a metre. Researchers claim they could have flown only if the air had contained more oxygen than today - probably as much as 35 per cent. Giant spiders, tree-ferns, marine rock formations and fossil charcoals all tell the same story. High oxygen levels may also explain the global firestorm that contributed to the demise of the dinosaurs after the asteroid impact. The strange and profound effects that oxygen has had on the evolution of life pose a riddle, which this book sets out to answer. Oxygen is a toxic gas. Divers breathing pure oxygen at depth suffer from convulsions and lung injury. Fruit flies raised at twice normal atmospheric levels of oxygen live half as long as their siblings. Reactive forms of oxygen, known as free radicals, are thought to cause ageing in people. Yet if atmospheric oxygen reached 35 per cent in the Carboniferous, why did it promote exuberant growth, instead of rapid ageing and death? Oxygen takes the reader on an enthralling journey, as gripping as a thriller, as it unravels the unexpected ways in which oxygen spurred the evolution of life and death. The book explains far more than the size of ancient insects: it shows how oxygen underpins the origin of biological complexity, the birth of photosynthesis, the sudden evolution of animals, the need for two sexes, the accelerated ageing of cloned animals like Dolly the sheep, and the surprisingly long lives of bats and birds. Drawing on this grand evolutionary canvas, Oxygen offers fresh perspectives on our own lives and deaths, explaining modern killer diseases, why we age, and what we can do about it. Advancing revelatory new ideas, following chains of evidence, the book ranges through many disciplines, from environmental sciences to molecular medicine. The result is a captivating vision of contemporary science and a humane synthesis of our place in nature. This remarkable book will redefine the way we think about the world. The air we breathe is twenty-one percent oxygen, an amount higher than on any other known world. While we may take our air for granted, Earth was not always an oxygenated planet. How did it become this way? Donald Canfield—one of the world's leading authorities on geochemistry, earth history, and the early oceans—covers this vast history, emphasizing its relationship to the evolution of life and the evolving chemistry of the Earth. Canfield guides readers through the various lines of scientific evidence, considers some of the wrong turns and dead ends along the way, and highlights the scientists and researchers who have made key discoveries in the field. Showing how Earth's atmosphere developed over time, Oxygen takes readers on a remarkable journey through the history of the oxygenation of our planet.

See faster results through everyday feedback. The Feedback Imperative: How to Give Everyday Feedback to Speed Up Your Team's Success reveals the hidden reasons why giving feedback to employees can be so difficult and yet so urgently needed in today's workplace, and provides the definitive steps for overcoming feedback avoidance and taking great leaps forward with employee engagement, retention, and performance. Anna Carroll applies her extensive research and expertise in business consulting and psychology to illustrate how brain science, generational trends, our information economy, limiting beliefs, and organizational culture collide in the new workplace, creating a huge gap between the supply and demand of helpful professional feedback. In her "Seven Steps to Everyday Feedback" and sixteen tools for self-assessment and planning, Carroll provides detailed instructions for leaders to execute a feedback turnaround that will quench their team members' thirst for helpful feedback and build a culture in which employee-to-leader and peer-to-peer feedback are welcome as well. This monograph offers the reader a complete overview on both principles and applications of CE-MS. Starting with an introductory chapter on detection in CE, also related and more specialized techniques such as electrophoretic and chromatographic preconcentration are discussed. A special emphasis is put on CE-MS interfaces, which are described in detail. In a separate chapter, attention is paid to sheath-liquid interfacing. The developments and possibilities of microchip CE-MS are also described. Applications to all relevant areas are discussed in distinct chapters, each written by experts in the respective fields. Besides applications in pharmaceutical analysis and bioanalysis, recent implementations in food science, forensic analysis, analysis of intact proteins, metabolomics and proteomics are highlighted. MS is a perfectly appropriate detection system for CE, as efficient separation is coupled to sensitive and selection detection. Moreover, MS can provide structure information on the separated compounds. CE-MS has now been developed into a strong hyphenated system complementary to LC-MS. This monograph is a unique source of knowledge for everyone dealing with and interested in CE-MS.

The stewards of Earth, these organisms transformed the chemistry of our planet to make it habitable for plants, animals, and us.

The Guardian's Best Science Book of 2017: the fascinating science and history of the air we breathe. It's invisible. It's ever-present. Without it, you would die in minutes. And it has an epic story to tell. In Caesar's Last Breath, New York Times bestselling author Sam Kean takes us on a journey through the periodic table, around the globe, and across time to tell the story of the air we breathe, which, it turns out, is also the story of earth and our existence on it. With every breath, you literally inhale the history of the world. On the ides of March, 44 BC, Julius Caesar died of stab wounds on the Senate floor, but the story of his last breath is still unfolding; in fact, you're probably inhaling some of it now. Of the sextillions of molecules entering or leaving your lungs at this moment, some might well bear traces of Cleopatra's perfumes, German mustard gas, particles exhaled by dinosaurs or emitted by atomic bombs, even remnants of stardust from the universe's creation. Tracing the origins and ingredients of our atmosphere, Kean reveals how the alchemy of air reshaped our continents, steered human progress, powered revolutions, and continues to influence everything we do. Along the way, we'll swim with radioactive pigs, witness the most important chemical reactions humans have discovered, and join the crowd at the Moulin Rouge for some of the crudest performance art of all time. Lively, witty, and filled with the astounding science of ordinary life, Caesar's Last Breath illuminates the science stories swirling around us every second.

SCIENCE IS A GREAT AREA TO TEACH, BECAUSE CHILDREN HAVE A NATURAL CURIOSITY ABOUT THE WORLD. THEY WANT TO KNOW WHY AND HOW THINGS WORK, WHAT THINGS ARE MADE OF, AND WHERE THEY CAME FROM.

Take the Easy Way to Lose Weight You've counted calories. You've gorged yourself on protein, then on carbohydrates. You've dieted on grapefruit, chocolate and bananas. You've run around the block for hours. You've attended weekly meetings. You've wasted money on expensive exercise machines. You've drunk gallons of shakes. You've gulped a thousand pills. You've eaten a thousand meal replacement bars. You've kept a weight loss journal or blog. You've bought tiny plates to make your food portions look big. You've spent thousands of dollars on special foods. You've stapled your ears. But you're still overweight. Maybe you lost some pounds, but regained that fat, and more. Now it's time to stop working so hard to lose weight and try it the easy way. Relax and Lose Weight It's the only one combining the latest in nutrition, self-image psychology, neuro-linguistic programming, and the health benefits of two "supplements" that are plentiful and free. No jogging for miles. No jumping around to a cardio DVD. No tedious diets. No special foods to buy. No calories to count. No fighting your cravings. Stop stressing out about your weight. Relax and let your thin self loose. 21,000 words. Therefore, scroll up and hit the Buy button now!

Today many school students are shielded from one of the most important concepts in modern science: evolution. In engaging and conversational style, Teaching About Evolution and the Nature of Science provides a well-structured framework for understanding and teaching evolution. Written for teachers, parents, and community officials as well as scientists and educators, this book describes how evolution reveals both the great diversity and similarity among the Earth's organisms; it explores how scientists approach the question of evolution; and it illustrates the nature of science as a way of knowing about the natural world. In addition, the book provides answers to frequently asked questions to help readers understand many of the issues and misconceptions about evolution. The book includes sample activities for teaching about evolution and the nature of science. For example, the book includes activities that investigate fossil footprints and population growth that teachers of science can use to introduce principles of evolution. Background information, materials, and step-by-step

presentations are provided for each activity. In addition, this volume: Presents the evidence for evolution, including how evolution can be observed today. Explains the nature of science through a variety of examples. Describes how science differs from other human endeavors and why evolution is one of the best avenues for helping students understand this distinction. Answers frequently asked questions about evolution. Teaching About Evolution and the Nature of Science builds on the 1996 National Science Education Standards released by the National Research Council--and offers detailed guidance on how to evaluate and choose instructional materials that support the standards. Comprehensive and practical, this book brings one of today's educational challenges into focus in a balanced and reasoned discussion. It will be of special interest to teachers of science, school administrators, and interested members of the community.

Meeting the desire for a comprehensive book that collects and curates the vast amount of knowledge gained in the field of singlet oxygen, this title covers the physical, chemical and biological properties of this reactive oxygen species and also its increasingly important applications across chemical, environmental and biomedical areas. The editors have a long and distinguished background in the field of singlet oxygen chemistry and biomedical applications, giving them a unique insight and ensuring the contributions attain the highest scientific level. The book provides an up to date reference resource for both the beginner and experienced researcher and crucially for those working across disciplines such as photochemistry, photobiology and photomedicine.

Describes the properties and functions of the various groups of chemical elements.

Describes how physical changes occur in matter and molecules.

Competition Science Vision (monthly magazine) is published by Pratiyogita Darpan Group in India and is one of the best Science monthly magazines available for medical entrance examination students in India. Well-qualified professionals of Physics, Chemistry, Zoology and Botany make contributions to this magazine and craft it with focus on providing complete and to-the-point study material for aspiring candidates. The magazine covers General Knowledge, Science and Technology news, Interviews of toppers of examinations, study material of Physics, Chemistry, Zoology and Botany with model papers, reasoning test questions, facts, quiz contest, general awareness and mental ability test in every monthly issue.

This presentation describes various aspects of the regulation of tissue oxygenation, including the roles of the circulatory system, respiratory system, and blood, the carrier of oxygen within these components of the cardiorespiratory system.

The respiratory system takes oxygen from the atmosphere and transports it by diffusion from the air in the alveoli to the blood flowing through the pulmonary capillaries. The cardiovascular system then moves the oxygenated blood from the heart to the microcirculation of the various organs by convection, where oxygen is released from hemoglobin in the red blood cells and moves to the parenchymal cells of each tissue by diffusion. Oxygen that has diffused into cells is then utilized in the mitochondria to produce adenosine triphosphate (ATP), the energy currency of all cells. The mitochondria are able to produce ATP until the oxygen tension or  $PO_2$  on the cell surface falls to a critical level of about 4–5 mm Hg. Thus, in order to meet the energetic needs of cells, it is important to maintain a continuous supply of oxygen to the mitochondria at or above the critical  $PO_2$ . In order to accomplish this desired outcome, the cardiorespiratory system, including the blood, must be capable of regulation to ensure survival of all tissues under a wide range of circumstances. The purpose of this presentation is to provide basic information about the operation and regulation of the cardiovascular and respiratory systems, as well as the properties of the blood and parenchymal cells, so that a fundamental understanding of the regulation of tissue oxygenation is achieved.

Mitochondria are tiny structures located inside our cells that carry out the essential task of producing energy for the cell. They are found in all complex living things, and in that sense, they are fundamental for driving complex life on the planet. But there is much more to them than that. Mitochondria have their own DNA, with their own small collection of genes, separate from those in the cell nucleus. It is thought that they were once bacteria living independent lives. Their enslavement within the larger cell was a turning point in the evolution of life, enabling the development of complex organisms and, closely related, the origin of two sexes. Unlike the DNA in the nucleus, mitochondrial DNA is passed down exclusively (or almost exclusively) via the female line. That's why it has been used by some researchers to trace human ancestry daughter-to-mother, to 'Mitochondrial Eve'. Mitochondria give us important information about our evolutionary history. And that's not all. Mitochondrial genes mutate much faster than those in the nucleus because of the free radicals produced in their energy-generating role. This high mutation rate lies behind our ageing and certain congenital diseases. The latest research suggests that mitochondria play a key role in degenerative diseases such as cancer, through their involvement in precipitating cell suicide. Mitochondria, then, are pivotal in power, sex, and suicide. In this fascinating and thought-provoking book, Nick Lane brings together the latest research findings in this exciting field to show how our growing understanding of mitochondria is shedding light on how complex life evolved, why sex arose (why don't we just bud?), and why we age and die. This understanding is of fundamental importance, both in understanding how we and all other complex life came to be, but also in order to be able to control our own illnesses, and delay our degeneration and death. Oxford Landmark Science books are 'must-read' classics of modern science writing which have crystallized big ideas, and shaped the way we think.

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