



Life at the Extremes

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The debut of a female Steve Jones – likeable, literate, lucid and laconic. A sprightly, lavishly illustrated book on the science of human survival.

How do people survive extremes of heat, cold, depth, speed and altitude? This book explores the limits of human survival and the physiological adaptations which enable us to exist under extreme conditions. In man's battle for survival in the harshest of environments, the knowledge imparted by physiology, the 'logic of life', is crucial. What causes mountain sickness? Why is it possible to reach the top of Everest without supplementary oxygen, yet be killed if a plane depressurises suddenly at the same altitude. Why are astronauts unable to stand without fainting when they return to Earth? Why do human divers get the bends but sperm whales don't? Will men always be able to run faster than women? Why don't penguins get frostbite?

Life at the Extremes Details

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From Reader Review Life at the Extremes for online ebook

Todd says

I read this book after hearing it referenced by big wave surfer, Mark Healey, who is known for pushing his body to the limits. Frances Ashcroft writes about these experiences and human physiology, whether it is deep sea diving, mountain climbing, extreme temperatures, etc. The author does use a lot of scientific jargon, but as a lay reader, I felt that I was still able to make my way through the text. It is certainly worth the read to learn how the body reacts to varying situations and possibly how we can trick our bodies into overcoming them.

GlobeRunner says

Fascinating! Scientific findings are interspersed with interesting personal observations making it a fluid read despite being filled to the brim with information. However, although I enjoyed that parallels were drawn and scientific findings illustrated with examples from the author's personal experience, it was clear that unsubstantiated assumptions were being sometimes made. For examples, it was clear that the author only had observed schoolchildren in the UK when he states that "...Raynaud's syndrome (like chilblains) is less common in countries with relatively severe winters, like...Sweden, than in milder countries such as Britain and Italy, perhaps because the harsher climate ensures that people take better precautions. In Britain, for example, schoolchildren play outside in winter and are thus chronically exposed to cold." Although I'm certain that the first theory is correct (in terms of clothing), the deduction that British children play more outside in the winter than Swedish children would make anyone who has been to these countries laugh out loud. After having lived for at least 5 years in each of these three countries, I can confidently say that Swedish schoolchildren spend the most time playing outside in the winter (and Italian children the least). The Swedish saying that "there is no such thing as bad weather, only bad clothing" is known to all Swedish children old enough to go to school.

As could be expected considering that I bought this book more than ten years ago, some of the (sports) nutritional "advice" is somewhat outdated and newer findings and records are obviously not included. Still, I think that almost everyone interested in science will find that this provides an enjoyable, rewarding and fascinating read.

Marco says

As a Christmas present to myself, I decided to read Life at the Extremes: The Science of Survival by Frances Ashcroft, professor of physiology at the University of Oxford. And what a Christmas present it was! This book was a hidden gem in the library.

Life at the Extremes is all about the effects of the extreme environmental conditions on the human body, including heat and cold, height and depths, space, microgravity and, with regards to sport, pushing your body to the limit.

Highly accessible and filled with science, this book is perfect for anyone, but I would especially recommend this to A Level Biology students like me or those who want to do Biology or Medicine at university. The book covers so many aspects of physiology that we experience almost daily in our lives like how we regulate

heat and cold, the energy demands of speed and stamina, and aspects that we do not, such as living in microgravity and high altitude, etc.

The book is divided into 7 sections: Life at the Top, Life under Pressure, Life in the Hot Zone, Life in the Cold, Life in the Fast Lane, The Final Frontier and The Outer Limits.

Life at the Top talks about the high life - literally. It talks about altitude sickness and why it occurs. What I love most about this book, and especially this chapter, is that there is also some history of how these conditions were studied.

Altitude sickness is a condition that usually occurs when you're at a high altitude (usually above 8,000 feet), which occurs when you climb up too quickly without allowing your body to acclimatise to the conditions on top of the mountain.

This occurs because the air pressure at higher altitudes are lower than at sea level. As a result, the amount of oxygen we get into our blood is lowered and the body has to acclimatise. If this acclimatisation process does not occur, the condition can be fatal and there are unpleasant symptoms such as headaches, dizziness, exhaustion and nausea, which take their toll when you're climbing a snow-coated and dangerous mountain like the Everest.

In the chapter, Ashcroft discusses the lungs and the role of haemoglobin in our red blood cells and how this globular protein transports oxygen to our cells. The role of the hormone erythropoetin, the chemical that stimulates the production of red blood cells, is also discussed and it is interesting to note that some athletes used this hormone to improve their performance by using it to increase their red blood cell levels, and it is even more interesting to note that it is probably of little benefit!

The next chapter, Life under Pressure, is about how humans cope in the depths of the oceans. There is definitely a lot more science in this chapter, especially the physics of pressure, which can sometimes be difficult to keep up with, however, all is explained clearly. History about the development of the diving suit is recounted and how the first cases of the bends came about.

The bends, or decompression sickness, occurs when a diver who has been at depths of over 10m under water for a long period of time rises quickly. This happens because a lot of nitrogen dissolves into the blood under pressure. When the diver rises quickly, the pressure is suddenly lowered and so the nitrogen can no longer stay dissolved into the blood and so it comes out of the solution to form gas bubbles inside your body and blocks the flow of blood in small blood vessels, resulting in joint pain and paralysis, especially when the blood vessels to the brain are blocked. The phenomenon is similar to the fizzing of a fizzy drink like coca-cola when you open a can. Carbon dioxide dissolved under high pressure suddenly comes out of the solution as the pressure drops. The condition can be fatal due to the lack of oxygen and nutrients provided to the cells and tissues when blood vessels are blocked.

The biology in the chapter is incredible fascinating. Ashcroft also explains that whales don't get the bends because they limit the gas dissolving into their blood by breathing out before a dive, and limiting blood flow to the lungs.

Chapter three, Life in the Hot Zone, discusses how heat affects the human body and how we sense heat. There is also plentiful history about the development of the thermometer. Ashcroft talks about how and why we regulate our bodies: homeostasis, the processes that occur in the body to keep our body functioning normally.. Homeostasis is important to keep our body functioning properly, and this involves regulating the temperature so that the core body temperature reaches the "just right" temperature, which is important as our metabolism depends on enzymes which work best at the "just right," optimum temperature. This is why when it's too cold or too hot, we can die from hypothermia or hyperthermia, because cellular activity is

affected hugely.

There is also a lot about physiology in this chapter, especially about the thermoregulatory system and how the skin disperses body heat into the atmosphere, but the chapter reads well because it is in the form of stories and analogies so it doesn't sound like a textbook. As a result, it is so easy to become engrossed in this book.

Life in the Cold is about... life in the cold! Frostbite, hypothermia and related conditions are explained in this chapter. Other animals are also discussed, indeed a large part of this section talks about how different animals are adapted to coldness, penguins especially.

I think it is amazing how Emperor penguins can coordinate themselves to be in a large group to conserve heat and huddle for warmth, facing continuous darkness and temperatures below -70 degrees Celsius. Incredible! It is also amazing that babies are born with "brown fat," or brown adipose tissue, which have a greater number of ATP-producing, energy-providing mitochondria. Mitochondria produce ATP which can provide energy to burn the fat and act as a heater for babies so that they do not suffer from hypothermia. Babies have this brown fat because of their larger surface area to volume ratio, which means that their rate of heat loss is much quicker than in adults.

ATP is discussed in more detail in Life in the Fast Lane, the chapter about pushing the human body to the limits of speed, strength and stamina. So much information is provided but it is beneficial most especially for A Level Biology students!

I think this is the most interesting section of the book. Ashcroft describes how muscle contraction occurs, from the triggering by calcium ions, to how glycogen stores are depleting, turning them into glucose, which is used to make ATP, to the protein filaments interlocking and breaking bonds and reforming them. Incredible.

The chapter also discusses the difference between men and women's physique, and how it contributes to being better in a certain sport. For example, women tend to have a greater fat percentage than men do, so women are often better in long distance swimming where buoyancy is important, and men are better in sprinting where as little a ratio of fat to muscle mass is required. The chapter ends with the thought that although moderate exercise can slow bone loss in older women.

The next chapter, The Final Frontier, truly appealed to my inner space nerd. It is so enthralling to hear about astronauts in outer space taking that giant leap for mankind, but it is even more engrossing to hear the stories in relation to the effects of microgravity in space. Space is the ultimate frontier - the ultimate extreme. It is a vacuum. It is freezing but the ultraviolet rays from the sun would burn your skin. To get there, you must be accelerated to over 25,056 miles per hour, subjecting you to extreme g-forces and when you're there, you exist in microgravity. As a result, many physiological changes occur such as a shift in body fluids.

Usually, fluid accumulated in the lower half of the body due to gravity; in microgravity, body fluids migrate to the chest and head and redistribute again, causing the moon-face appearance of some astronauts. The heart does not pump as hard due to not having to pump against gravity.

Equilibrioception (the sense of balance) can also be damaged. Dizziness can occur due to Space Adaptation Syndrome, a condition suffered by astronauts in orbit when the state of weightlessness stops their vestibular system from working properly. Reduced production of red blood cells, bone loss, muscle wasting - these are all trials and tribulations that greet the brave astronaut in space.

The last chapter, The Outer Limits, although not about human physiology, is also very fascinating. How some microorganisms can grow at 113 degrees Celsius, and others can grow at a pH of 2 is incredible. And

even life without oxygen is possible! For certain microorganisms, that is. It seems so bizarre that oxygen, something that we is vital to our survival, is toxic to other organisms.

Ashcroft truly amazes the reader in this chapter. It is very well-researched and has prompted me to do some research myself - it turns out that there are microorganisms that have even adapted to build their DNA using arsenic, which is toxic to humans! Wow. Such is the incredible diversity of life.

I cannot recommend this book enough! It is a delightful read and it bears witness to the human tenacity. Part-survival guide, part-scientific textbook, Life at the Extremes should be in the shelves of every armchair adventurer, explorer, science enthusiast and Biology students.

Melanie Windridge says

Informative.

Mared Owen says

I genuinely feel like I've learnt SO MUCH from reading this book! It reminds me of some of my all-time favourite books that I read as a child - not Malory Towers, but books like 100 Most Dangerous Things on the Planet, Deadly Peril and anything to do with catastrophes. It was a real joy to read Life At The Extremes, just as those aforementioned books were enjoyable, because there were new facts and ideas lurking on every page, and I couldn't help but share my newly discovered information with anyone around me, probably to their dismay.

D?nmis says

I noticed that people complain about abundance of facts in the book, which otherwise could be easily fetched to you by Google. Yes there are facts, numbers and statistics. And for good reason.

However, these digits and stories of history's firsts don't constitute the bulk of the book, or at least the most interesting and practical part of it. IMHO readers benefit most from detailed explanation of how your body (and those of some other living creatures) reacts to exposure to most extreme conditions at different levels. It is extremely curious and enlightening. A lot of these facts (especially regarding helping the injured) run against the grain of conventional wisdom.

Ksenya Netreba says

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Alper Koyuncu says

Kitap çok ekstrem ko?ullar? harika bir ?ekilde özetlemi?. Ayn? zamanda da?c?l?k, dalg?çl?k gibi konularda detayl? bir ?ekilde hangi durumlarda neler yap?lmal? ve nas?l yap?lmal? olarak ele alm??. Çok sade ve yal?n bir dili oldu?u için hiç s?k?lmadan okunabilecek bir kitap.

Dion Garman says

A good angle to understand physiology from.

Arian says

I just wrote a long review for this book and then it got erased so screw it.

This book is about a bunch of crazy people who did things before warning labels were invented sometimes in the name of science sometimes just in the spirit of extremism. If you want to learn a lot about physiological limits how people have pushed them over the years (temperature, pressure, oxygen, physical feats, etc) give it a look. The chapters are pretty independant of one another too which is nice because you can just skip to what interests you.

Okay now where is that f-ing save button.

Jacob says

I very much enjoyed the various topics covered in this book and the way in which they were covered. I wish I would have had a copy when I was a boy since it presents so many interesting ways of dissecting the world around us and beyond. The details may change or be corrected over time, but the thinking framework presented by Ashcroft offers a recipe for lifelong curiosity.

Kerem says

Bazen insana ansiklopedi okuyormus hissi verse de asiri kosullarda insanin sinirlarini detaylica ve kimi zaman hikayelerle bezeyerek anlatan cok degisik bilimsel bir kitap. Ozellikle asiri durumlara ilgi duyanlara guzel bir okuma olur.

Allan Harle says

I thoroughly enjoyed reading this book. Filled with lots of interesting facts, it did get a bit technical at times, but well worth the effort to read it.

Evket Selçuk says

İnsanların sınırlarını tanımak için çok güzel ve akıcı bir kitap

Gerda Mickute says

Each chapter of the book is on a different environmental extreme (heat, cold, low/high pressures and etc.) and how it affects human functioning. The book can be read either from cover to cover or in bits, although reading it whole would definitely give a broader understanding of some common issues that different environmental extremes impose upon the physiology. Would recommend for those interested in science as well as those undertaking extreme sports (or considering undertaking them).
