The Physiological Society



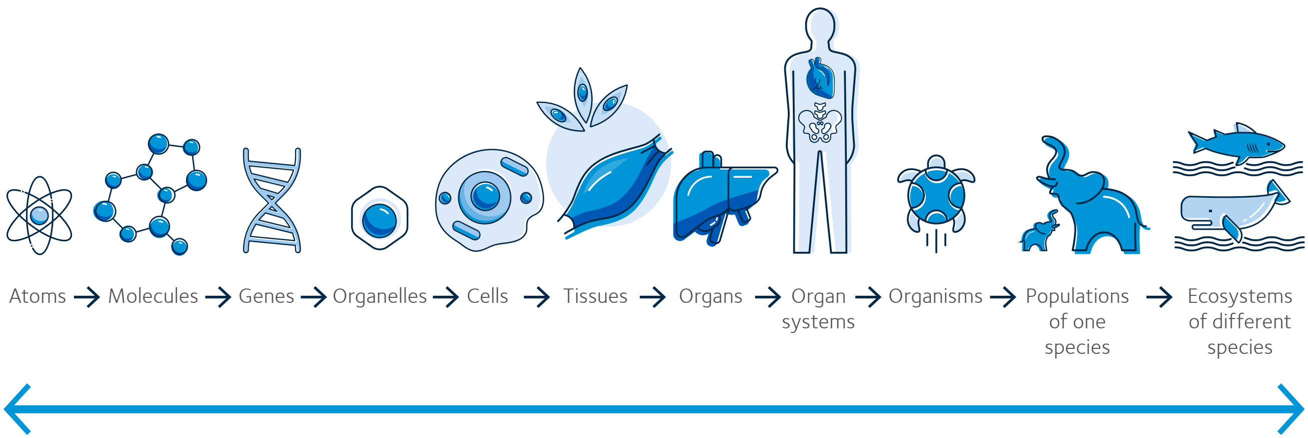


UNDERSTANDING LIFE | FOCUS ON PHYSIOLOGY



WHAT IS PHYSIOLOGY?

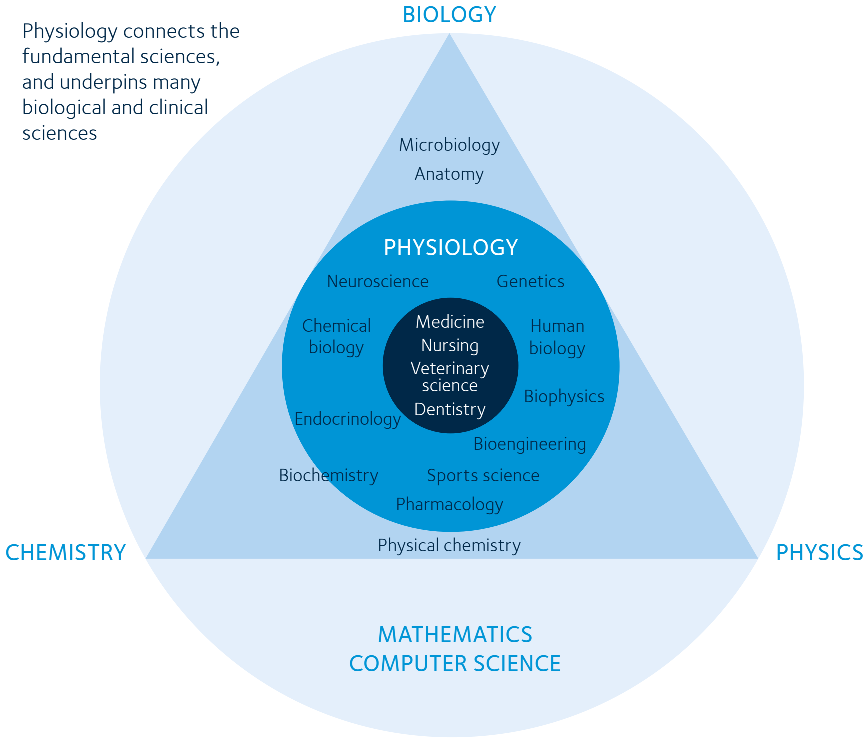
Physiology is the science of life. It is a broad science that aims to understand the mechanisms of living, from the atomic basis of cell function to the integrated behaviour of the whole body and the influence of the external environment. Research in physiology helps us to understand how the body works; it also helps us to determine what goes wrong in disease and even to identify new treatments for disease. The emphasis on integrating molecular, cellular, systems and whole-body function is what distinguishes physiology from the other life sciences.



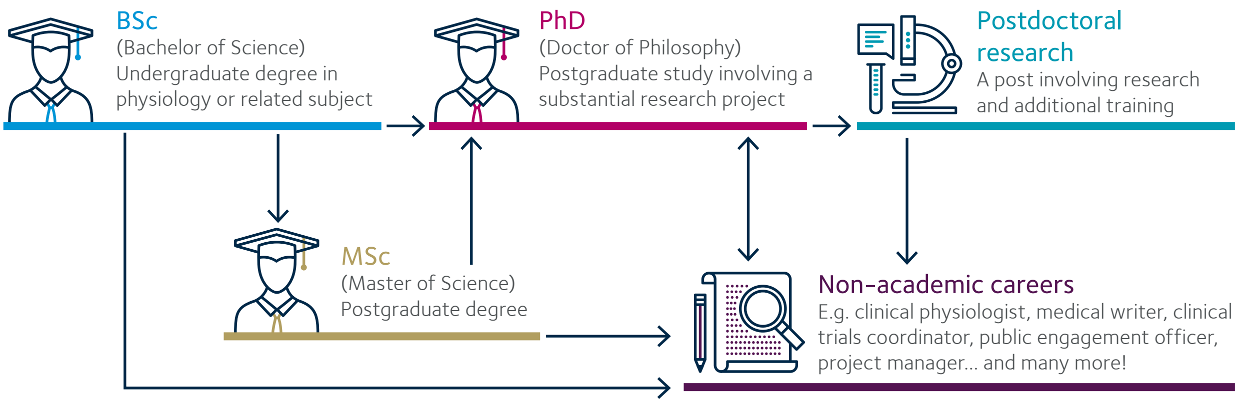
Physiology is the science of life

The Physiological Society is the largest network of physiologists in Europe and its Members have been at the heart of many advancements in physiology over the past 140 years. Some of their discoveries have even won the prestigious Nobel Prize in Physiology or Medicine for their contribution to advancing our understanding of physiology.

To ensure that physiology continues to flourish, we recognise it is important that future generations are aware of the discipline and its vital role in our everyday lives. With this in mind, we have developed this booklet to showcase some of the latest and most exciting areas of physiology, and hope it will help you choose your next career step, whatever stage you are at in your studies. Good luck!



Possible career steps after a physiology degree



WHAT DO PHYSIOLOGISTS DO?

All over the world, physiologists are working in universities, research institutions, biotechnology companies and the pharmaceutical industry to advance our understanding of how the body functions.

Physiologists study every aspect of the way human and other animal bodies work. Some physiologists investigate the behaviour of individual proteins in single cells. Others research the interaction of cells in tissues, organs and systems or study the integration of these systems to control the whole complex organism. This work provides the foundation for many biological and clinical sciences, including medicine and veterinary science. All over the world, physiologists are working in universities, research institutions, biotechnology companies and the pharmaceutical industry to advance our understanding of how the body functions.

Not all physiologists are found in research laboratories, though. As a physiologist, you might work with patients in hospital clinics, helping with the diagnosis and management of disease. Or you could work alongside elite athletes, helping to improve their performance and avoid injury. You might travel the world to conferences and meetings to report scientific developments for newspapers, journals and other media, or you might play an advisory role to Government or charitable organisations. Physiologists also use their skills in the legal arena, engaging in complex issues of patent law, or in education, inspiring and nurturing the next generation. Studying physiology opens doors to employment in all these areas and more; for more information about the range of careers and skills you can develop through a physiology degree, please visit **www.physoc.org**

How learned societies can help your career

Learned societies bring together people who are actively interested in a particular discipline, and so can provide invaluable opportunities for networking and professional development. Membership of The Physiological Society, for example, is free for Undergraduate and Masters students throughout their studies and offers them access to a range of career development activities, discounts for world-class scientific meetings, and grants for research and travel. If you're studying, or intend to study, a physiology-related degree, do consider joining us for these opportunities and to be part of a global community!

HEALTHY AGEING AND DEVELOPMENT

It is now widely acknowledged that the environment in which a fetus develops can permanently affect a person's physiology and lifelong health.

Healthy ageing may have its origins in the earliest stages of life. For the first time in human history, the current generation of children is predicted to have a shorter life-expectancy than their parents. This is attributable, in part, to the obesity epidemic and rising rates of type 2 diabetes mellitus, even in children. *Developmental programming* may play a role in this startling statistic. Whilst the importance of genetics in the "nature-nurture" debate can never be overlooked, it is now widely acknowledged that the nutritional, hormonal and microbial setting in which the fetus and neonate develops – combined with potential environmental insults from pollutants and endocrine disruptors – can influence gene expression during critical periods of organ growth and neurodevelopment to permanently affect an individual's physiology.

Maternal obesity is the single biggest obstetric risk factor and is also associated with conditions that lessen the long-term health of the child, such as obesity, type 2 diabetes and ultimately premature death from cardiovascular disease. Physiologists are beginning to understand how diet and nutrition in pregnancy can be modified to improve the future health of the child. Linked to this phenomenon is the emerging role of gut bacteria. This is now a hot topic, and physiologists are currently investigating the therapeutic potential of modifying mothers' gut bacteria during pregnancy to reduce obesity rates in children.

Rodent models have been invaluable in the study of life course sciences as the relatively quick life cycle of rodents means that generational effects can be studied within a meaningful time frame. Clinical trials then assess how translatable these findings are to humans and whether they are preventable through lifestyle interventions in pregnancy.

Physiologists therefore work closely alongside clinicians to understand why early life exposures, such as poor diet and complications in pregnancy, can impact on the lifelong health of an individual and the population in general. Interventions such as dietary supplements, probiotics and seeding of the infant gut bacteria may stem the growing tide of obesity and improve the health of future generations.

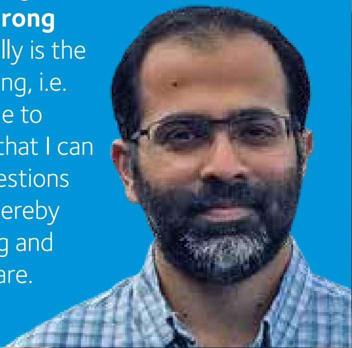
Nozomi Itani is a Research Associate in the Department of Women and Children's Health at King's College London

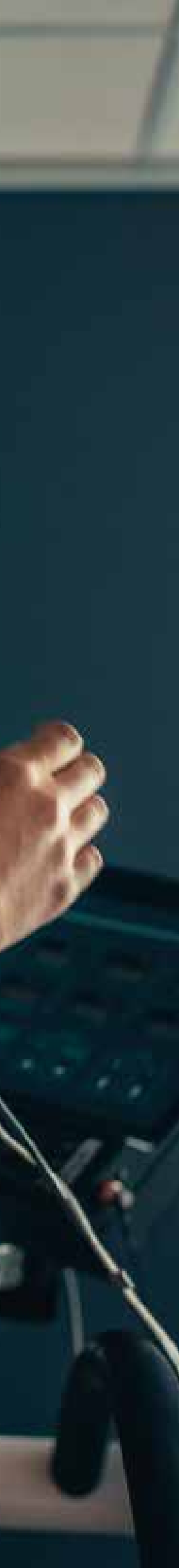
I specialised in reproductive biology as part of my BSc and MSc at the University of Edinburgh, as I was fascinated by the process of pregnancy and development. After completing a PhD in Fetal Cardiovascular Physiology at the University of Cambridge, I moved to King's College London, where I'm currently working as a postdoctoral researcher on the effects of obesity during pregnancy. **The best thing about physiology is that you get to study the whole body as one intact system**. My research is related to fetal development, the metabolic and cardiovascular system, and the reproductive system – they are all part of physiology. There is still so much to learn about how our body works, and I enjoy being part of this discovery.

Rehan Junejo is a Postdoctoral Research Fellow in the School of Sport, Exercise and Rehabilitation Sciences at the University of Birmingham

I completed a bachelor's degree in Medicine and Surgery (MBBS) followed by a MSc in Integrated Physiology. I then pursued a PhD in Cardiovascular Physiology, investigating the impact of healthy ageing on cardiovascular function – in particular, the oxygen dependency of vasodilator mechanisms that maintain perfusion. Currently, as a postdoc, I am investigating the impact of hypertension and atrial fibrillation on vascular health. I also help supervise undergrad, masters and PhD students.

If you are interested in living organisms, you can't go wrong studying physiology. It really is the biological science of everything, i.e. physical to chemical, organelle to organism. Personally, I value that I can formulate novel scientific questions and work to answer them, thereby helping our collective learning and ultimately improving healthcare.





EXERCISE PHYSIOLOGY

By helping us understand the way that the body responds to changes in activity, exercise physiology can inform the best practices for everyday human health.

Put simply, *exercise physiology* is the study of humans in motion. Exercise physiologists work in both the lab and in the field to gather a wide range of data on an individual's performance, e.g. their time, speed and power, as well as biochemical measurements such as oxygen uptake, blood, sweat and even urine. By helping us understand the way that the body, and indeed the mind, responds to changes in activity, exercise physiology can help to determine the best practices for everyday human health and elite performance.

Classically, exercise physiologists have helped athletes to determine the best ways to train and implement competition strategies that will give them the best chance of winning. For example, exercise physiology has helped to determine the best training programmes to perform well in hot environments, as well as the optimal nutritional regimes before and during competition. Exercise physiologists were a crucial part of the team for the famous "Breaking 2" project in 2017, which was a well-documented attempt to run a marathon in under 2 hours. To date, this milestone has still not been achieved: even with the help of pacers to keep up the pace, the shortest time recorded was 2:00:25, only four minutes less than the 2007 world record, a decade earlier. Exercise physiologists will continue to use their knowledge to narrow and eventually overcome this gap. Will you be the one to beat this challenge?

Another area of focus for exercise physiologists is in helping to determine physiological limits. These come in the form of internal and external factors such as temperature and altitude. As the popularity of ultra-endurance events increases, this field will require a new injection of investigative energy.

However, the sporting side of things is only part of the story. Exercise physiology has provided valuable insights into the benefits of regular exercise for everyone, at all stages of their life. In particular, it has shown us that maintaining high levels of physical activity into later life helps to prevent many problems that develop with age, such as the loss of muscle strength.

Exercise physiology can also be life-saving. Exercise physiologists provide valuable information for people working in physically or environmentally demanding jobs. Studies performed by exercise physiologists have been instrumental in guiding best practice guidelines for the fire and lifeguard services in particular.

MICROBIOME PHYSIOLOGY

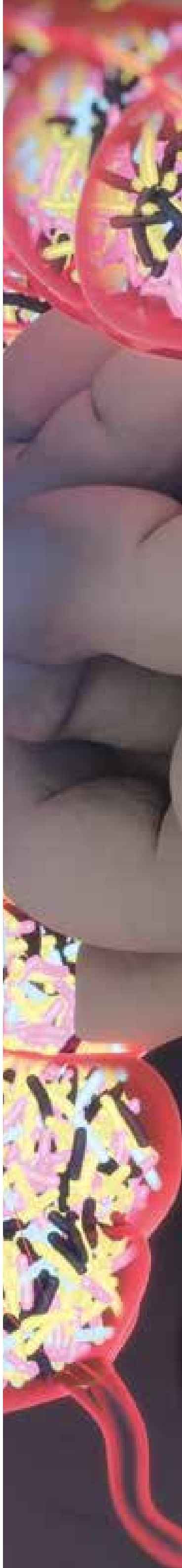
The composition of microbes in our gut, our "microbiome", can influence our physiology and help to maintain normal body processes such as gut motility.

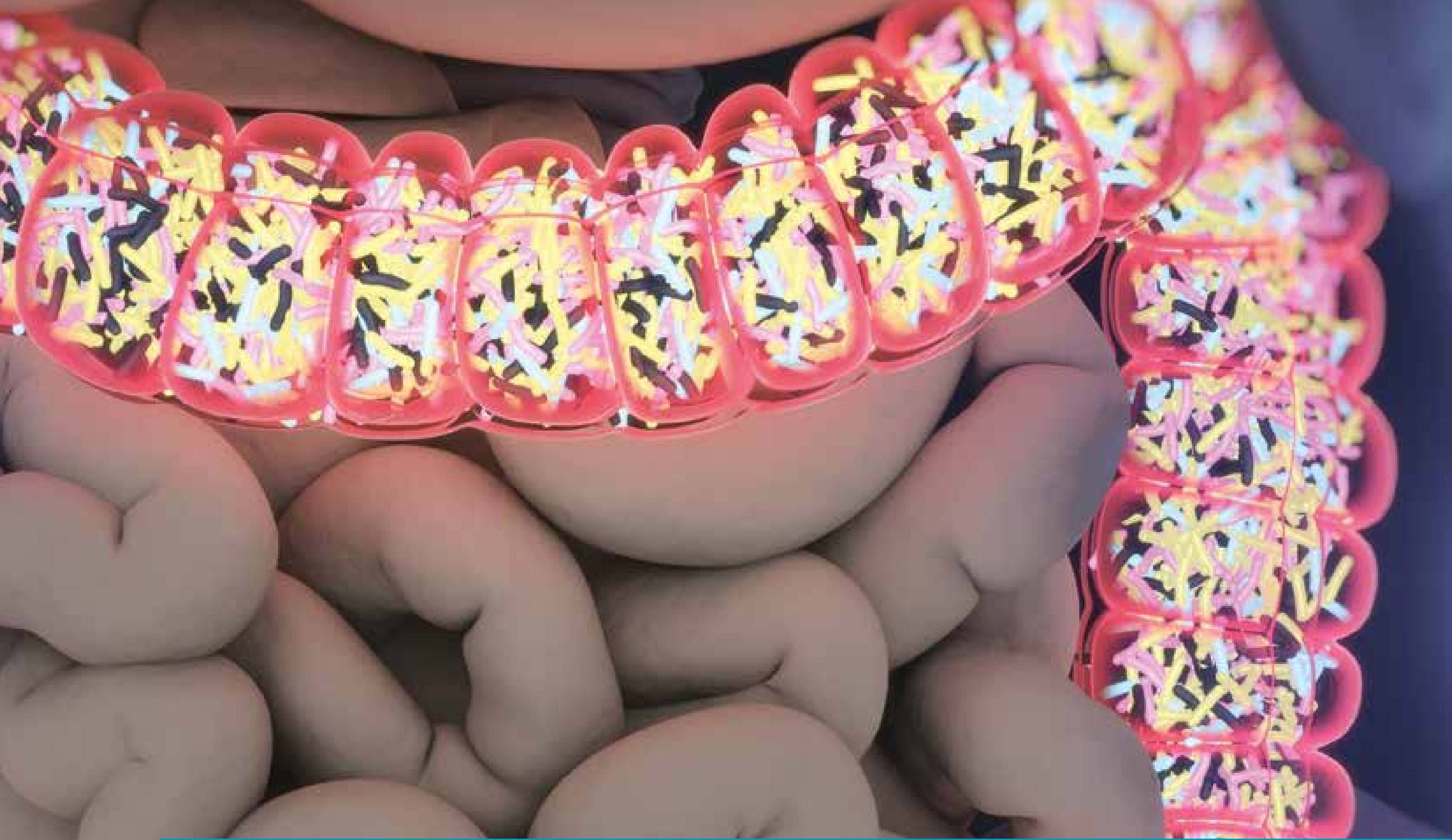
Our gastrointestinal tract is home to a vast array of different microbes. The composition of the microbial population can cause changes to our physiology through interactions with our nervous, endocrine and immunological systems. This microbial world in the gut is known as the "microbiome", and the pathway of communication between it and the brain is called the microbiota – gut – brain axis. In many instances, this bidirectional pathway benefits us, for example by helping to maintain normal gut function and keeping the immune system in check.

It is also now well established that the gut microbiota can influence other significant communication pathways that impact on our wellbeing, e.g. the hypothalamic – pituitary – adrenal axis or "stress axis", which suggests that the gut microbiota is biologically linked to our response to stress. This has stimulated a fevered interest amongst physiologists to try to unravel how the gut microbiome might interact with the brain to affect our mood and behaviour.

However, as with any biological system, there are complexities. In addition to the various communication pathways between the gut and the brain, physiologists are trying to understand how the microbes themselves elicit their effects, either locally in the gut or elsewhere in the body. This can involve the production of metabolites, in response to diet for example, which can subsequently exert effects locally on gut motility. Such metabolites may even enter the circulation and exert effects further from the gut itself, and potentially in the brain.

There is a mounting body of evidence gathered from human population studies and animal models of disease, such as those used to study anxiety, depression and obesity, demonstrating that the gut microbiome has been disturbed in these disorders. The microbiome therefore represents a useful target in managing a whole spectrum of disorders as it can be readily improved through dietary modifications, the introduction of pre- or pro-biotics ("beneficial bacteria") and even a transplantation of faecal microbiota from a healthy donor. If you are interested in the vital role that microbes play in our health, then a career in *microbiome physiology* could be for you!



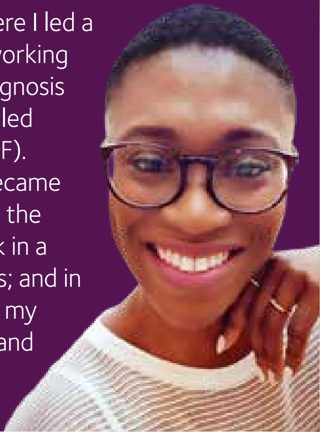


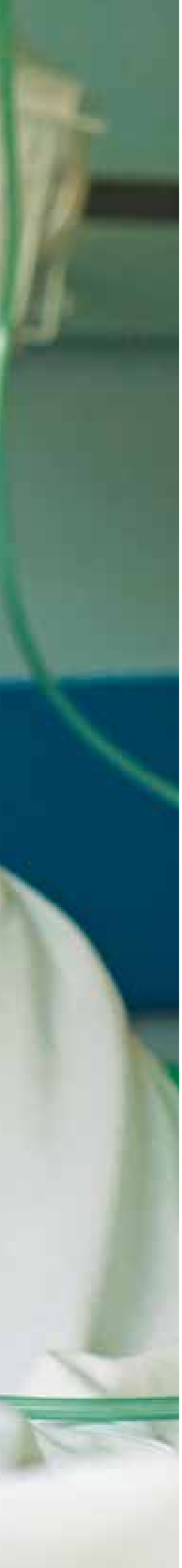
Valerie Ramirez is a Postdoctoral Researcher in the Department of Anatomy, Physiology and Cell Biology at the University of California Davis

During my Master's degree in Cellular and Molecular Biology at the Universidad de Chile, I developed a fascination for immunology and for neuroscience as well. I therefore decided to pursue a PhD in neuronal synapse development at the Catholic University of Chile. Now, as a postdoctoral researcher, I am mixing my three passions – neuroscience, immunology and cellular physiology – by working in neuroimmunophysiology with a focus on the brain – gut axis. **This field finally gives me the chance to explore several different aspects of physiology**. The understanding of how different systems interact with each other and how the bacteria in our gut are important in maintaining overall health encourages me to keep going in research and make new discoveries.

Kasope Wolffs is a Research Assistant at Cardiff University

Like most people, I didn't realise physiology was most of the biology we were taught in school – how plants and animals function. I have always been interested in helping people with breathing problems, but I also knew I didn't want to be a medic. During a gap year, I was reading a fictional book that mentioned a Clinical Respiratory Physiologist; I was intrigued, so I did some research and found out it was precisely what I wanted to do. I transferred courses to study physiology in Cardiff. It was the best decision I ever made! During my degree, I applied to do a placement year in a lung function clinic where I led a research project that involved working with patients to improve the diagnosis of a devastating lung disease called idiopathic pulmonary fibrosis (IPF). During my time at the clinic, I became passionate about understanding the disease process. I currently work in a lab that focuses on lung diseases; and in the next 2 years, I will complete my PhD, which aims to understand and highlight drug targets for IPF.





PATHOPHYSIOLOGY OF ASTHMA

Respiratory physiologists are studying how the airway smooth muscle interacts with inflammatory molecules to develop more targeted treatments for asthma.

Asthma is a common lifelong condition that affects both children and adults. The symptoms and episodic attacks result from a narrowing and blockage of the airway tubes that conduct inhaled air from the voice box (larynx) to the alveoli. This is caused by inflammation in the airways, which causes the airway smooth muscle to contract and become hyper-responsive, where even tiny amounts of irritant can trigger an asthma attack. Chemicals released during the inflammatory process can also activate airway sensory nerves, leading to wheezing, coughing and mucus secretion. While medications usually taken by inhalation are effective for most patients, this condition still affects people's daily lives and causes deaths that could be avoided.

Respiratory physiology plays an important role in understanding the factors that lead to asthma attacks. Asthmatics with allergies to pollen, pets or house dust mite faeces may experience increasing symptoms of asthma leading to attacks that may need urgent treatment, when there are increased levels of these allergens in the environment. Exposure to respiratory viruses, bacteria already present in the airways or, increasingly, environmental pollution from vehicle exhaust emissions can also lead to asthma attacks. These factors have also been implicated in causing the disease itself.

In addition to understanding the factors that trigger an asthma attack, respiratory physiologists are keen to understand the asthmatic response itself: in particular, the physiology of inflammation and how it interacts with the airways in patients who suffer from asthma. Understanding this interaction could be crucial to developing new methods of diagnosis and treatment for the condition. To date, research has focused on the way that the airway smooth muscle contracts and why the contractile response can be so sensitive. Research is now focusing on how the airway smooth muscle interacts with inflammatory mediators, which has led to asthma treatments aimed at blocking inflammatory signals.

Respiratory physiologists will continue to investigate the pathophysiology of asthma and help develop more targeted treatments for the various types of asthma in the future. These treatments should be more effective and improve the lives of millions of people suffering from asthma worldwide.

SLEEP AND CIRCADIAN RHYTHMS

Our bodies have a 24-hour internal clock, also called a circadian rhythm, that controls when we should be awake and when we should be asleep.

If you ever feel sleepy after lunchtime, then you should blame your circadian rhythm for that. The circadian rhythm is a 24-hour internal clock that synchronises our brain and controls when we should be awake and when we should be asleep. This clock is controlled by the clock gene, which controls the daily ups and downs of biological patterns, including body temperature, blood pressure and the release of hormones. These fluctuations are vital in making us both ready for the day and ready for sleep. However, when this rhythm is disrupted, it can have profound consequences on the body, brain and memory. This disruption can arise through sleep deprivation, not getting enough sunlight during the day or, paradoxically, being exposed to blue light at night.

The ideal amount of sleep for adults is 7 – 9 hours, yet in the UK, it is estimated that two out of five people are not getting this. One out of five people sleep poorly most nights, and this is mainly due to modern lifestyles. People now typically spend approximately 88% of their time in enclosed buildings, away from direct sunlight, which is the natural source of vitamin D. A deficiency of vitamin D has a direct influence on the clock gene, resulting in changes to the circadian rhythm and sleep patterns. Night-shift workers are exposed to even less sunlight and are at particular risk of this. The use of electronic devices at bedtime is another significant factor as these devices expose the eyes to blue and intense light, which is known to suppress melatonin production and impair alertness the next morning. This results in delayed sleep time, poor quality sleep and less sleep overall. Long distance travel can also induce these effects, known as jet lag, as the internal body clock becomes suddenly out-of-sync with the external environment.

Long-term sleep deprivation is the second most common health complaint in the UK, after pain, and has been associated with several diseases such as high blood pressure, coronary heart disease and stroke. More recently, some evidence has shown that sleep deprivation can significantly impair learning and cognitive abilities. *Sleep physiology* plays an important role in developing our understanding of the physiology behind sleep deprivation. It is hoped this understanding will inform new treatments that will correct circadian rhythms and ultimately improve quality of life.

Yousef Alqurashi is a Respiratory Therapist and PhD student at Imperial College London

When I completed a BSc in Respiratory Care, I found out that sleep and breathing are the best fit for me. As part of my PhD at Imperial College London, I'm investigating novel methods for assessing sleep and sleepiness in patients with sleep apnoea. **I enjoy studying the physiology of sleep and the opportunity to observe physiological changes in real time during overnight sleep studies with my participants**. I also advise people on how to get a good night's sleep, and I find it particularly rewarding when they come to me the next day and say my advice was helpful to them. Sleep takes up one-third of our lives, and if we can treat sleep problems, it will really improve people's quality of life.

Jo Corbett is an Associate Head in the Department of Sport and Exercise Science at the University of Portsmouth

I chose to combine my two passions (science and sport) into my career. After completing my PhD in Exercise Physiology, I secured an academic position at the University of Portsmouth, where I balance my teaching and administrative duties with my research in the Extreme Environments Laboratory. **The variety of activities that I am involved in means that my job is never dull**. The people that I work with in my research range from Olympic athletes to workers required to perform in arduous conditions and individuals with clinical conditions such as type 2 diabetes. I have been privileged to work in a unique facility and learn from the best in the field.

LIFE AT THE LIMITS

In studying the physiological responses of humans and other animals to extreme environments, we can gain invaluable insights into the challenge that such environments present.

Humans are tropical, low-altitude, air-breathing mammals, so with only 15% of our planet not occupied by water, desert, ice or mountain, the majority of Earth presents a hostile place for us. Given this, how do humans manage to summit the highest mountains, dive into the high-pressure underwater world, run marathons in the desert, visit the frozen poles and swim in Arctic waters? How do fish, penguins, frogs and polar bears endure extreme cold? How do whales dive under cold water for 90 minutes, geese fly over the summit of Everest and camels, lizards and rats live in extreme heat without water? The answer to these questions lies in understanding physiology.

In studying the physiological responses of humans and other animals to extreme environments, we can gain invaluable insights into the challenge that such environments present, as well as the physiological and pathophysiological responses to these challenges. This field of research is known as *extreme environmental physiology* and underpins many of the interventions that allow us to thrive across the whole of our planet. This research also helps athletes to win Olympic medals and makes sure that groups such as firefighters and military personnel are protected and able to work in hostile natural environments.

Furthermore, the understanding gained from studying the physiological responses to extreme environments, and the adaptations to these environments, is assisting with a wide range of common life-threatening and debilitating conditions. Studies in cold water have helped us understand the pathophysiology of drowning and sudden cardiac death. Work in cold air is helping us understand peripheral vascular pathologies associated with cold injury, Raynaud's disease and diabetes. Studies in the heat are providing insights into brain, kidney and gut dysfunction and inflammatory responses. Our knowledge of what happens to humans at altitude is helping our understanding of the variable outcomes for patients in intensive care.

Extreme environmental physiology therefore offers an exciting array of opportunities and a rewarding career making discoveries with a range of applications. We still have much to learn!

SPACE PHYSIOLOGY

Space physiology plays a vital role in addressing the significant challenges of space travel by investigating the effects of space on the body. This work provides useful parallels with medical conditions on Earth.

Space is a hostile environment for humans; yet we still want to travel there and explore new worlds. *Space physiology* plays a vital role in addressing the significant challenges presented by space travel. It investigates the effects of space on the human body to inform what support astronauts will need to survive and perform well in space. This work also provides useful parallels with the physiology of medical conditions in people living on Earth.

One characteristic of life in space that has a profound influence on human physiology is microgravity. The most problematic aspect of microgravity environments is the absence of mechanical forces on the body; these forces play a fundamental role in regulating the health and function of physiological systems. Under the influence of Earth's gravity, blood accumulates in our lower limbs and the heart has to work to make sure the brain receives enough blood. Within the first 48 hours of entrance into microgravity, blood is displaced from the lower body and starts to accumulate in the chest. As a consequence, the heart does not need to pump as strongly. The mechanisms that normally control and regulate blood supply to the head are impaired, and upon returning to Earth it can be challenging to remain upright without fainting! This profound effect on cardiac performance can also be seen in patients after significant periods of bed rest or with certain clinical conditions when the blood pressure falls with a change in posture.

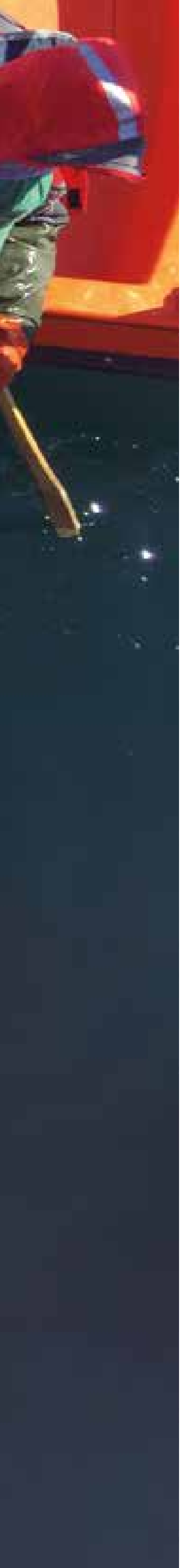
The musculoskeletal system is also affected by microgravity, and the loss of loading forces is particularly evident in those muscles and bones that keep us upright. Loss of muscle size (and strength) from spaceflight studies show decreases in calf muscles of up to 24% after more than 100 days. Thigh bones have been shown to lose around 1.5% of their mineral content per month. Such bone loss can increase the risk of fracture and kidney stones as well. Similarly, individuals on Earth who have sustained injuries resulting in reduced movement or bed rest can also suffer from these musculoskeletal losses. As such, countermeasures employed to tackle these issues during spaceflight can be relevant for treating these medical conditions on Earth. For example, physiologists are helping to design exercise strategies to minimise these changes in microgravity.

Julia Attias is a Research Student in the Centre of Human and Aerospace Physiological Sciences at King's College London

From an early age, I realised that understanding physiology was one of the best chances at a healthy life for myself. During my Sport Science degree, I became fascinated by how our body functions in extreme environments and how this could further our understanding of how the body should work in its normal habitat. I pursued a MSc in Space Physiology and Health, and am now a PhD student at King's College London researching into ways that will help to protect astronauts' bodies in space, e.g. a "SkinSuit" designed to recreate the effects of gravity. I love being part of a team of people that will better understand how to safely get humans back to the moon and to Mars for the first time!

William Twardek is a Salmon Biologist at the Canadian Wildlife Federation

I completed a MSc degree in Biology with a focus on fish and fisheries. My degree provided me with an applied knowledge of physiology and taught me how physiological tools can be used to evaluate human impacts on the natural world. Following my degree, I began working as a biologist for the Canadian Wildlife Federation, where I currently use tools in physiology and ecology to monitor salmon spawning migrations and the impacts of hydroelectric facilities on their movement. The most enjoyable aspect of my work is combining techniques from different branches of biology to answer applied research questions that can benefit fish populations and the communities that depend on them. **I believe that a strong background in physiology will benefit anyone interested in a natural resources career!**



CONSERVATION PHYSIOLOGY

Conservation physiology uses physiological knowledge to build a better understanding of species to aid conservation and management.

Physiology is vital for understanding how life works and how life interacts with its surroundings. For non-human species, this understanding can be integrated into ecosystem management to solve complex conservation problems. Known as *conservation physiology*, this growing field involves physiologists from across the discipline who use physiological knowledge to build a better understanding of species to aid conservation and management. This research can also offer some useful comparisons with human physiology to inform treatments for medical conditions.

A few years ago, scientists discovered the extreme life span of the Greenland shark (*Somniosus microcephalus*), which may be as long as 500 years. It was this remarkable longevity that inspired a team of physiologists from different research labs across the world to travel to the ocean off the coast of Greenland to find out more about the shark's physiology. They spent several weeks on a ship collecting a huge variety of data on the shark's growth, movement and reproduction.

These researchers then went back to their respective labs to further analyse their findings in order to develop an understanding of the shark's responsiveness to stress and its ability to endure changing environmental conditions. This work is ongoing and could aid effective management and conservation of the species. For example, one lab is focusing on cardiac physiology and how heart function is maintained in a changing world. Understanding how the shark heart beats for nearly half a millennium without developing heart disease may also reveal new pathways that could inform our understanding of the ageing process in humans. Many symptoms of ageing in humans are associated with cardiovascular dysfunction. The same methods used to measure heart function in humans are applied to sharks, although adapted slightly for an animal that is 4 meters long. Part of this work is also looking at the regenerative potential of the shark's heart, because if you are able to regenerate, do you really age?

Conservation physiology is a fascinating field. If you are keen to learn about how animals (including humans) survive in different environments and respond to environmental changes, then conservation physiology could be for you!

CURRENT TECHNIQUES IN PHYSIOLOGY RESEARCH

Simple techniques like activity monitoring are now becoming increasingly popular as large data-sets from the whole population are becoming available.

Physiologists use a very wide range of experimental techniques, partly because they study complex functional systems but also because these systems involve interactions from the atomic level through to connections between organ systems. They need to be able to probe and investigate complicated sequences of connections, from the binding and movement of individual atoms all the way up to the network effects of millions of synapses. Physiologists have to be inventive to make progress and are often early adopters of new techniques.

At the atomic level, physiologists use atomic force microscopy to probe how nerve cells migrate. At the molecular level, gene sequencing, gene chip arrays and gene editing with CRISPR are all commonly used. Individual cells can be “patch-clamped”, recorded and controlled electrically; they can also be stained with specific antibodies and imaged using fluorescence and electron microscopy.

At the tissue level, functional assays such as oxygen consumption and metabolite concentrations are widely used. Some tissues are studied once removed from an animal, allowing physiologists to make precise measurements. It is also possible to record biological signals from single neurones in live animals and even alter neuronal pathways using genetically added light-sensitive proteins (optogenetics).

At the whole-animal level, physiological pathways can be studied with non-invasive imaging techniques (such as X-ray, ultrasound, CAT, PET and NMR imaging). Physiological measurements can also be taken from the skin with electrodes (ECG, EEG); gas exchange can be recorded with respiratory equipment; and skin temperature can be inferred from infra-red imaging.

Indeed, simple techniques like activity monitoring are now becoming increasingly popular as large data-sets from the whole population are becoming available. This is fuelling the growth in a new form of computer modelling using neural networks. Such “big data” is still in its infancy and has the potential to enable us to understand the wide variation that exists within the population.

PHYSIOLOGY IN THE FUTURE

Understanding how the brain develops and then functions to control so many physiological systems remains one of the major goals of physiology. With better knowledge of how memories are stored and information is processed, many other things become possible: from controlling artificial limbs to designing more powerful computer systems. However, even understanding the simple systems will yield game-changing results. There are hundreds of examples of such systems that we currently do not understand, but perhaps the most important are related to cancer and obesity. Both of these conditions result partly from the failure of normal physiological control systems – and preventing this failure will save millions of lives.

The Physiological Society is a learned society, founded in 1876, which brings together people from all over the world who share a passion for physiology. It is, after all, the science of life and therefore vital to the health of future generations. To ensure that physiology continues to thrive, The Society offers a community for researchers in the field to share new insights as well as a range of services to support their professional development. The Society is also committed to communicating the importance of physiology to the wider public, policymakers and the next generation of physiologists.

Understanding Life has been developed by The Society to introduce the ever-evolving subject of physiology and why we study it, particularly for people considering a career in the field. By developing our understanding of normal processes in the body, physiology can provide useful insights into how we, and other species, can maintain our health, e.g. through diet and exercise. The booklet also describes the central role of physiology in the clinical sciences and explains how physiologists are involved in the detection, prevention and treatment of disease and disability.

If you are interested in learning more about The Society and the wide range of careers that studying physiology can open up to you, please visit our website **www.physoc.org**

Understanding Life was compiled and edited by Dr Clare Ray, University of Birmingham; Dr Sarah Hall, Cardiff University; Dr Christopher Torrens, University of Southampton; and Angela Breslin, The Physiological Society – with contributions from the following individuals: Yousef Alqurashi, Imperial College London; Julia Attias, King's College London; Dr Daniel Brayson, King's College London; Professor Fan Chung, Imperial College London; Dr Niall Hyland, University College Cork; Dr Thomas Smith, King's College London; Dr Christof Schwiening, University of Cambridge; Dr Holly Shiels, University of Manchester; Dr Paul Taylor, King's College London; and Professor Mike Tipton, University of Portsmouth.

Requests for reprints or questions relating to this booklet should be emailed to **education@physoc.org**

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