

Part of the conference series  
**Breakthrough science and technologies**  
Transforming our future

# Trauma recovery: new science and technology for mental and physical health

Wednesday 4 March 2020



THE  
ROYAL  
SOCIETY

**INVICTUS  
GAMES**  
FOUNDATION





**Welcome to *Trauma recovery: new science and technology for mental and physical health*, a conference held by the Royal Society in collaboration with the Invictus Games Foundation.**

The plenary sessions will be held in the Wellcome Trust Lecture Hall. Our lunch, drinks reception and refreshment breaks take place in the City of London Rooms, adjacent to the Wellcome Trust Lecture Hall.

Toilets are located on the basement level and can be reached using the main (red) staircase past the main reception area or using the lifts.

There will be someone at the registration desk from which you collected your badge throughout the meeting; please do not hesitate to ask us any questions you might have.

Please note that there will be a photographer present on the day. If you would rather not be photographed, please inform someone at the registration desk.

We hope you enjoy your time with us.

*WiFi network: RS-Public*

*WiFi password: Newton+apple*



The Royal Society is committed to accessibility for our events. Our lecture hall is fitted with an induction loop for those who are hard of hearing.

If you hear the fire alarm at any time, it is not a test. Please calmly leave the lecture hall through your nearest fire exit.

## CONFERENCE BACKGROUND

This Transforming our Future meeting, held by the Royal Society in partnership with the Invictus Games Foundation, will bring together leading experts from industry, academia, government and the wider scientific community to discuss recent advances in technologies and treatments that have the real possibility of helping individuals recover from injury across the health spectrum.

The conference will focus upon two broad themes: Our increased understanding of the biology of human health after injury, and especially the impact of trauma on both mental and physical health and the application of innovative new technologies and treatments to help individuals adapt to life-changing injuries. Following the presentations, speakers will discuss what can be achieved in the short- and medium-term, and how such developments should be prioritised and driven forward based upon the experiences of those who have suffered injury.

This scientific meeting is part of the Royal Society's Transforming our Future conference series. The Transforming our Future meetings are unique, high-level events that address the scientific and technical challenges of the next decade. Each conference features cutting edge science from industry and academia and brings together leading experts from the scientific community, including regulatory, charity and funding bodies.

The Invictus Games Foundation is the charity behind the Invictus Games for wounded, injured or sick Servicemen and women, Serving or veteran, to use the power of sport in their recovery. People around the world have drawn inspiration from the international competitors and their stories of resilience and determination.

For more information, visit [royalsociety.org/industry](https://royalsociety.org/industry) or email [industry@royalsociety.org](mailto:industry@royalsociety.org).

## AGENDA:

**4 March 2020**

**9.00am Registration**

**9.30am Welcoming remarks**  
*Dame Sue Ion, The Royal Society*

### **Trauma Recovery: Group studies and personal perspectives**

*Chaired by Dame Sue Ion DBE FREng, FRS, The Royal Society*

**9.30am The ADVANCE Study: study of rational and preliminary cardiovascular results**  
*Dr Christopher Boos, Poole Hospital NHS Foundation Trust*

**10.00am The principles of (recovering from) war**  
*David Henson MBE, Imperial College London*

**10.30am Coffee break**

### **Innovations supporting physical and mental health (11.00am – 1.15pm)**

*Chaired by Professor Russell Foster CBE FRS, University of Oxford*

**11.00am Chair remarks**  
*Professor Russell Foster, University of Oxford*

**11.10am Better nights for better days – sleep science and mental health**  
*Dr Kirstie Anderson, Newcastle-upon-Tyne Hospitals NHS Foundation Trust*

**11.35am Innovations in the treatment of post-traumatic stress disorder**  
*Professor Barbara Rothbaum, Emory Healthcare Veterans Program*

**12.00pm Improving lives for people following traumatic brain injury**  
*Professor Melinda Fitzgerald, Curtin University and the Perron Institute for Neurological and Translational Science*

**12.25pm Using virtual reality (VR) to deliver engaging, efficacious, and fast psychological intervention**  
*Professor Daniel Freeman, University of Oxford, UK*

**12.50pm Knowledge for the benefit of Blind Veterans and wider humanity**  
*Major General (Rtd) Nick Caplin, Blind Veterans UK*

**1.15pm Lunch**

**New technology to advance the recovery of physical health (2.00pm – 4.05pm)**

*Chaired by Professor Jackie Hunter CBE, BenevolentAI*

- 2.00pm**                    **RoboTrainer: making effective rehab training available to everyone**  
*Dr Anders Sørensen, University of Southern Denmark*
- 2.25pm**                    **The future of human wearable bionics from industry's point of view**  
*Dr Andreas Goppelt, Ottobock*
- 2.50pm**                    **Driving neural recovery following spinal cord injury**  
*Professor Jane Burridge, University of Southampton*
- 3.15pm**                    **Making direct neural interface therapies a clinical reality**  
*Dr Oliver Armitage, BIOS*
- 3.40pm**                    **Amputee biomechanics: it is not just about getting active**  
*Professor Anthony Bull, Imperial College London*
- 4.05pm**                    **Coffee break**

**Panel discussion: Where should scientists focus their efforts (4.30pm – 5.30pm)**

*Chaired by Sir Simon Wessely FMedSci, King's College London*

- 4.30pm**                    *Air Commodore Rich Withnall QHS, UK Defence Medical Services*  
*Professor Barbara Rothbaum, Emory Healthcare Veterans Program*  
*Wing Commander Marcus Stow, JHubMed*  
*Professor Jane Burridge, University of Southampton*  
*Miss Alexandra Crick, Salisbury NHS Trust*
- 5.30pm**                    **Closing Remarks**  
*Professor Russell Foster CBE FRS, University of Oxford*
- 5.35pm**                    **Close of main event**
- 5.30pm – 6.30pm**        **Networking reception**

## ORGANISER BIOGRAPHIES

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### ***Professor Russell Foster CBE FRS, University of Oxford***



Russell Foster is the Head of the Nuffield Laboratory of Ophthalmology, the founder and Director of the Sleep and Circadian Research Institute and is a Fellow of Brasenose College Oxford. His research addresses how circadian rhythms and sleep are generated and regulated and what happens when these systems fail as a result of societal pressures or disease. A key finding was the discovery and characterization of an unrecognized light-detecting system within the eye that regulates circadian rhythms and sleep, and most recently, the translation of this work to the clinic.

For his work, Russell was elected to the Fellowship of the Royal Society in 2008 and the Academy of Medical Sciences in 2013. In 2015 he received the Order of Commander of the British Empire (CBE) for services to Science. He is a member of the Governing Council of the Royal Society; he established and led for six years the Royal Society Public Engagement Committee, and is a Trustee of the Science Museum. Russell has published over 250 scientific papers and has received multiple national and international awards. He has also written four popular science books.

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### ***Professor Jackie Hunter CBE, BenevolentAI***



pharmaceutical sector.

BenevolentAI is a British held AI company which is using AI to augment the research capabilities of drug scientists, radically changing the way R&D is done. Uniquely, BenevolentAI has an end to end capability from early discovery to clinical development. Jackie joined the company with over thirty years of experience in the bioscience research sector, working across academia and industry including leading neurology and gastrointestinal drug discovery and early clinical development for GlaxoSmithKline. She has also been a champion of new business models such as open innovation in the

Jackie moved to BenevolentAI because she recognized the need for disruption in the industry and the need to apply novel advanced technologies to R&D to improve efficiency and increase the successful discovery of new medicines for patients. She was awarded a CBE in the Queen's Birthday Honours list for Services to the Pharmaceutical Industry and was recognized by Forbes Magazine as one of the top 20 Women Advancing AI Research. She is a member of the Biomedical Board for A\*Star in Singapore and the Science Advisory Board for the Data Science Institute at Imperial College. She is also a visiting Professor at Imperial College and at St George's Hospital Medical School.

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### ***Sir Simon Wessely FMedSci, King's College London***



Professor Sir Simon Wessely is Professor of Psychological Medicine and Regius Professor of Psychiatry at King's College London and a Consultant Liaison Psychiatrist at King's College and the Maudsley Hospitals.

Simon Wessely studied medicine and history of art at Trinity Hall, Cambridge, and finished his medical training at University College Oxford, graduating in 1981. He obtained his medical membership in Newcastle, before moving to London to train in psychiatry at the Maudsley. He has a Master's and Doctorate in epidemiology. He is a Foundation Senior Investigator of the National Institute for Health Research, past President of the Royal College of Psychiatrists, current President of the Royal Society of Medicine and is also chairing the Independent Review into the Mental Health Act.

He has over 750 original publications, with an emphasis on the boundaries of medicine and psychiatry, unexplained symptoms and syndromes, population reactions to adversity, military health, epidemiology and others. He founded the King's Centre for Military Health Research, which is now the main source of information on the health and well-being of the UK Armed Forces past and present and has been Civilian Consultant Advisor in Psychiatry to the British Army since 2001, He has co-authored books on chronic fatigue syndrome, randomised controlled trials and a history of military psychiatry, although sadly none of them are best sellers.

He is active in public engagement activities, speaking regularly on radio, TV and at literary and science festivals. He is a trustee of Combat Stress and his contributions to veterans' charities include cycling (slowly) eight times to Paris to raise funds for the Royal British Legion.

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## **SPEAKER BIOGRAPHIES AND ABSTRACTS**

### **Opening Remarks**



#### ***Dame Sue Ion, Chair of The Royal Society Science, Industry and Translation Committee***

Dame Sue Ion FRS is Hon President of the National Skills academy for Nuclear. She was previously Chairman of the UK Nuclear Innovation Research Advisory Board (NIRAB). She represents the UK on a number of international review and oversight committees for the nuclear sector including the Euratom Science and Technology Committee which she chaired until late 2018. She is the only non US member of the US Department of Energy's Nuclear Energy Advisory Committee on which she has served since 2005.

Sue spent 27 years with British Nuclear Fuels Ltd (BNFL) rising to the position of Chief Technology Officer in 1992, a post she held until 2006 when she assumed a number of mainly voluntary roles in Science and Engineering, including membership of the UK Council for Science and Technology and the Engineering and Physical Sciences Research Council (EPSRC). She was Vice President of the Royal Academy of Engineering 2002-2008 and currently chairs its MacRobert Committee. Sue was Deputy Chair of the Board of the University of Manchester until September 2018 and currently serves on the Board of the University of Central Lancashire.



Her core expertise is in materials science and engineering associated with the nuclear sector. Sue is a member of the Chief Scientific Advisor for Wales's Science and Innovation Advisory Council. She has been a Visiting Professor in the Department of Materials at Imperial College since 2006, holds an Honorary Professorship at the University of Manchester and is now Chair of the Royal Society Science, Industry and Translation Committee.

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## **Trauma Recovery: Group studies and personal perspectives**

***Chaired by Dame Sue Ion, FREng FRS, The Royal Society***

*See biography on page 6*

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### ***Dr Christopher Boos, Poole Hospital NHS Foundation Trust***



**Biography:** Dr Boos has been an NHS Consultant Cardiologist at Poole Hospital and the Royal Bournemouth Hospitals since 2008. He is dual accredited in General Internal Medicine. After qualification at St Mary's Hospital Medical School in 1994 he undertook Junior Doctor Training posts at St Mary's, the Royal London, the Royal Brompton and Portsmouth Hospitals. Thereafter, his specialist training in Cardiology was initially with Wessex (2001 - 2005) followed by the West Midlands Deanery (2005-2008) where he completed an MD in cardiac research and sub-specialty training in heart failure and complex device therapy.

Dr Boos has a strong academic interest and has published more than 130 papers in peer reviewed journals. He is a visiting Professor at Leeds Beckett University and a visiting research fellow at Bournemouth University and Kings College London. He leads the Cardiac trials unit at Poole Hospital. His main research interests are in the field of Sport and Exercise Medicine and Cardiovascular Risk. He is the lead for the heart failure, cardiac pacing and Cardiopulmonary Exercise Testing Services at Poole Hospital. His other clinical interests include patients with unexplained breathlessness and atrial fibrillation. Dr Boos is the current Civilian Consultant Advisor in Cardiology to the British Army.

### **Abstract – The ADVANCE Study: study of rational and preliminary cardiovascular results**

Historical and retrospective data have suggested an association between combat-related traumatic injury and an increased risk of cardiovascular disease. The ArmeD SerVices TrAuma Rehabilitation OutComE Study is the first prospective study to investigate the long-term physical and psycho-social outcomes of battlefield casualties related to recent armed conflict.

In this study 600 adult male UK Military Servicemen who have sustained significant combat-related injury following deployment to Afghanistan between 2002 and 2014 will be compared to 600 non exposed adults frequency-matched for deployment to Afghanistan, age, sex, service, rank and role. Professor Boos will be presenting a brief overview of ADVANCE and the preliminary cardiovascular results from the first 845 consecutive participants.

**David Henson MBE, Imperial College London**



**Biography:** Dave joined the British Army in 2008, commissioning into the Corps of Royal Engineers and deployed to Afghanistan in 2010 as a Royal Engineer Search Advisor. In February 2011 Dave lost both of his legs to an IED blast. Dave used sport as a catalyst for his recovery and has competed at the Warrior Games, Invictus Games, IPC World Championships and the Paralympic Games; winning medals in all competitions. Dave is currently completing his PhD in Amputee Biomechanics at Imperial College, London (submission January 2020). Dave is a trustee of the Invictus Games Foundation, the Explora Scholarship Fund, and the ADVANCE Study Charity. He is the Veterans' Advisor to the Centre for Blast Injury Studies and the co-chair and founding member of the CASEVAC Club. Dave is married to Hayley and has two daughters. He was awarded the MBE in 2014 for services to the military, and is an Honorary Fellow of the University of Hertfordshire.

**Abstract – The principles of (recovering from) war**

Recovering from the realities of traumatic injury is a long, complicated and often painful process. However, this process can, and should, be optimised. Using the context of the principles of war, this talk provides a personal perspective of the impact of traumatic injury of all aspects of health; the process for optimising the recovery pathway; and the role of new technology and treatments within this process.

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**Session 1**

**Chaired by Professor Russell Foster CBE FRS, University of Oxford**

See organiser biography on page 5

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**Dr Kirstie Anderson, Newcastle-upon-Tyne Hospitals NHS Foundation Trust**



**Biography:** Dr Kirstie Anderson is a neurologist and sleep specialist in the Regional Sleep Service in Newcastle and Newcastle University. Her sleep clinic and research focuses on the impact of poor sleep on mental health and the design of effective therapies for the sleepy and the sleepless. She has designed online insomnia therapy and sleep medicine training programmes and published and lectured on all aspects of sleep medicine. She was the insomnia lead on the Department of Health IAPT expert reference group and is current president of the Sleep Medicine section of the Royal Society of Medicine.

**Abstract - How to sleep well – understanding the causes and cures for a bad night after trauma**

Better nights for better days? Normal quantity and timing of sleep is vital for normal brain function. If sleep is interrupted for any reason it affects mood, memory and metabolism. Therefore, improving sleep after a physical or mental health problem should be thought of as a key tool for recovery. The talk will cover the different causes of sleep disturbance after trauma and the evidence for effective therapies. Our research and sleep clinic work focuses upon the impact of sleep upon mental health and the benefits and sometimes side effects of the therapies and in particular medications used during and after major trauma. Education of health professionals, patient and families about sleep and sleep disorders is needed for health after injury.

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## **Professor Barbara Rothbaum, Emory Healthcare Veterans Program**



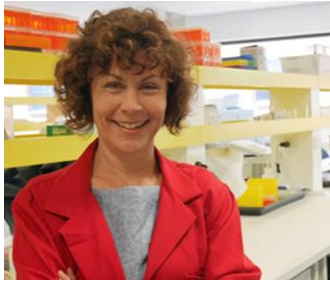
**Biography:** Barbara O. Rothbaum, PhD is Executive Director of the Emory Healthcare Veterans Program. She is a Professor and Associate Vice Chair of Clinical Research at Emory School of Medicine in the Department of Psychiatry and Behavioral Sciences and Director of the Trauma and Anxiety Recovery Program and holds the Paul A. Janssen Chair in Neuropsychopharmacology. Dr Rothbaum specializes in research on the treatment of anxiety disorders, particularly PTSD. She was a member of the Institute of Medicine's (IOM) Study on Assessment of Ongoing Efforts in the Treatment of PTSD, and briefed the DOD, VA, House and Senate Committees on Veterans Affairs and Armed Services Committees on the IOM report results (June 17-18, 2014).

Dr Rothbaum has been studying PTSD treatments since 1986 and has developed, tested, and disseminated some of the most innovative and effective treatments available for PTSD. She is an inventor of virtual reality exposure therapy. She was a pioneer in applying it in the treatment of PTSD in combat veterans. She has authored over 350 scientific papers and chapters, has published 11 books on the treatment of PTSD and edited 4 others on anxiety, and received the Diplomate in Behavioral Psychology from the American Board of Professional Psychology. She is a past president of the International Society of Traumatic Stress Studies (ISTSS), is currently on the Scientific Advisory Boards for the Anxiety Disorders Association of America (ADAA), National Center for PTSD (NC-PTSD), and the executive committee of the Warrior Care Network. She is a fellow of the ACNP (American College of Neuropsychopharmacology), the National Academy of Inventors (NAI), the Association for Behavioral and Cognitive Therapies (ABCT), and American Psychological Association's Division 56 (Division of Trauma Psychology) and was awarded the 2010 "Award for Outstanding Contributions to the Practice of Trauma Psychology" for APA Division 56 and the Robert S. Laufer Award for Outstanding Scientific Achievement from the International Society for Traumatic Stress Studies (ISTSS). Her outreach efforts include training community clinicians in evidenced based treatment for PTSD.

### **Abstract – Creating medicines that eliminate senescent cells for the treatment of diseases of ageing**

The pharmacotherapy and psychotherapy literatures for post-traumatic stress disorder (PTSD) will be succinctly reviewed and discussed, focusing on cognitive behavioral treatments (CBT) and specifically exposure therapies. Innovations in the treatment of PTSD will be broadly divided into 1) Medium of Delivery of Exposure Therapy; 2) Enhancing Exposure Therapy with Pharmacological Agents; 3) Timing of Exposure Therapy, and 4) Treatment Delivery Schedules. The medium of delivery of exposure therapy will focus on Virtual Reality Exposure Therapy (VRE). Some of the pharmacological enhancing agents will include cognitive enhancers such as D-Cycloserine and psychedelics such as 3,4-methylenedioxymethamphetamine (MDMA). The timing of exposure therapy will discuss early interventions administered within hours of trauma exposure. Finally, massed prolonged exposure (PE) treatment delivery will be presented using the example of the Emory Healthcare Veterans Program intensive outpatient treatment model and pilot data will be presented.

**Professor Melinda Fitzgerald, Curtin University and the Perron Institute for Neurological and Translational Science**



**Biography:** Melinda Fitzgerald is Professor of Neurotrauma and Deputy Director of the Curtin Health Innovation Research Institute, Curtin University, jointly appointed by the Perron Institute for Neurological and Translational Science. Professor Fitzgerald's research goal is to improve outcomes for patients who have experienced traumatic injury to their central nervous system. She leads her pre-clinical research team in studies to understand how damage spreads following neurotrauma, and uses findings from these fundamental studies to design and test

treatment strategies. She is working with her collaborators and clinical research team to facilitate translation of her pre-clinical findings, focusing on prediction of persisting post-concussion symptoms, in order to identify suitable patients for treatment.

The work is part of a broader national initiative to improve outcomes following traumatic brain injury of all severities, which has led to the establishment of a federally funded Mission for Traumatic Brain Injury, for which she is the provisional Chair of the Expert Advisory Panel. She has published over 85 scientific papers, including in discipline leading journals such as J Neuroscience, Nature Nano, ACS Nano, and Biomaterials. She is a Handling Editor for the Journal of Neurochemistry, the Australian representative for the Asia Pacific Regional Committee for IBRO and serves on NHMRC and MS Australia grant review panels as well as a range of scientific advisory committees and steering groups.

**Abstract – Improving lives for people following traumatic brain injury**

Traumatic brain injury (TBI) arises as a result of a physical injury to the brain and dramatically impacts the lives of both the patient involved and the people around them. There is a desperate need for new options to improve lives following TBI and give patients and their families hope for the future. TBI arises from a range of circumstances, such as concussion from playing sport, an elderly person having a fall or severe injury arising following a road accident. The resulting injuries vary in severity, ranging from mild to moderate or severe trauma to the brain. Symptoms also span a spectrum of severity, such as deficits in cognition through to vegetative states, varying degrees of lack of emotional control, poor mental health, disrupted balance and sleep disturbances. These can lead to dramatic, often long-lasting, impacts on patients and their families and a substantial financial drain on society.

The Australian Mission for TBI is a large scale federally funded initiative in Australia, providing 10 million AUD over 10 years. The Expert Advisory Panel for the Mission will define priorities for research funding that will improve outcomes for people following TBI of all severity, from concussion through to severe injuries. It is likely that the approach will include a large scale research registry that will enable the prediction of outcomes following injury. In addition, nationwide clinical trials of promising treatments will be conducted. The research of the Australian Mission for TBI has the potential to be transformative and lead to substantially improved outcomes for people who have experienced a TBI.



**Professor Daniel Freeman, University of Oxford, UK**



**Biography:** Daniel Freeman is an NIHR Research Professor, Professor of Clinical Psychology in the Department of Psychiatry, University of Oxford, a consultant clinical psychologist in Oxford Health NHS Foundation Trust, a fellow of University College Oxford, and leads the Oxford Cognitive Approaches to Psychosis (O-CAP) research group at the University of Oxford. Daniel has been working with virtual reality (VR) since 2001 and is a co-founder and Chief Clinical Officer of Oxford VR, a University of Oxford spinout company.

**Abstract - Using virtual reality (VR) to deliver engaging, efficacious, and fast psychological intervention**

Mental health disorders are very common, but far too few people receive the best treatments. Much greater access to the best psychological treatments may be achieved using automated delivery in virtual reality (VR). With virtual reality simulations, individuals can repeatedly experience problematic situations and be taught, via evidence-based psychological treatments, how to overcome difficulties. A key advantage of VR is that individuals know that a computer environment is not real but their minds and bodies behave as if it is real; hence, people will much more easily face difficult situations in VR than in real life and be able to try out new therapeutic strategies. VR treatments can also be made much more engaging and appealing for patients than traditional therapies. A systematic programme of work developing and testing automated VR psychological treatments will be described, with a particular focus on the gameChange ([www.gameChangeVR.com](http://www.gameChangeVR.com)) project for schizophrenia.

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**Major General (Rtd) Nick Caplin, Blind Veterans UK**



**Biography:** Commissioned into the Army Air Corps Nick saw operational service flying helicopters in Northern Ireland and Bosnia. He has extensive experience of training troops in UK, Germany, Canada, Belize and Kenya. Promoted to Major General in 2008, Nick had top level posts in Kosovo and Germany. He completed his 34-year Army career as the Senior Army Directing Staff at the Royal College of Defence Studies in Seafood House, London. He became CEO of Blind Veterans UK in October 2014. He is a Director of the Confederation of Service Charities (Cobseo) and a Director of

Action Against Age-related Macular Degeneration (AAAMD).

Nick has been awarded the Queen's Commendation for Valuable Service and has been appointed a Companion of the Most Honourable Order of the Bath.

**Abstract – Knowledge for the benefit of Blind Veterans and wider humanity**

Losing your sight is devastating. It is both physically and mentally challenging and leads to a plethora of difficulties at different stages of life. What do we know about our Blind Veterans? We research factors to enable beneficiaries to maintain and improve the quality of their health and well-being, and their level of social inclusion and satisfaction with life. We accelerate innovation by stimulating the rapid development of technologies such as autonomous vehicles for disabled individuals.

Our detailed research of Blind Veterans' state of health allows for a personalised approach, whilst gathering valuable longitudinal data. With an international approach to all that we study, our research

cohort includes both UK Blind Veterans and the Blinded Veterans of America. Can we predict sight loss? Can we prevent avoidable sight loss? Whilst focussed on blind veterans, our research has relevance and applicability beyond this population, with implications for both wider veteran and visually impaired communities throughout the world.

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## **Session 2**

**Chaired by Professor Jackie Hunter CBE, BenevolentAI**

*See organiser biography on page 5*

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### **Dr Anders Sørensen, University of Southern Denmark**



**Biography:** Dr Anders Stengaard Sørensen is an electronics and robotics engineer, employed as Associate professor with University of Southern Denmark's department for Health Technology. As head of the Training Technology Lab, he is working closely with health professionals, training experts and humanistic researchers, to create real-world technology for better training. Using robotic devices and components to create bodily interaction with users play a major role in the development of new training methods, but are also employed in improving existing ones. Dr Sørensen and his lab are thus collaborating with Danish patient, elite sports and aerospace organizations to improve and renew training in general. From patients to athletes and even astronauts.

### **Abstract: RoboTrainer: making effective rehab training available to everyone**

A large amount of trauma victims suffer neurological damage to motor function, that severely inhibit rehabilitative training. Overcome by gravity, they are locked in a viscous circle, risking atrophy, circulatory disease and other physical complications, while depression may further undermine their quality of life. Underwater training, exoskeletons and advanced training machines may break the circle, but their high operational cost is in stark contrast to the high amounts of training needed to make a difference. In the RoboTrainer projects, we explore the design and impact of training robots optimized for simplicity and low cost. Our initial studies show that such devices can easily be operated by physical therapists in simple clinics, and potentially also by patients and their helpers at home. Case tests on the long term robot training made feasible by RoboTrainer show promising results in terms of strength and functional improvement in chronic (abandoned) patients with neurological damage.

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### **Dr Andreas Goppelt, Ottobock**



**Biography:** As Chief Technology Officer (CTO), Dr Andreas Goppelt has been in charge of Research and Development at Ottobock since September 2017. Goppelt was previously managing director of Otto Bock Mobility Solutions GmbH, the company's wheelchair business. He joined the Ottobock Group in 2015 as managing director of nstim NeuroBionics GmbH.

Goppelt was a consultant for biopharmaceuticals and medical technology between 2013 and 2015. From 2005 to 2013, he served as head of R&D for the BioSurgery and Regenerative Medicine business unit at Baxter. Goppelt began his career in business in 1997 as co-founder and chief scientific officer of biotech company Switch Biotech AG, which specialises in curing wound healing disorders and skin diseases.

A native of Erlangen, he studied chemistry at Ludwig Maximilian University (LMU) in Munich and earned his doctorate in biochemistry. After earning his doctorate, Goppelt worked as a postdoc at the LMU's gene centre and the Max-Planck Institute for Biochemistry in Martinsried, Germany.

### **Abstract – The future of human wearable bionics from industry's point of view**

In its 100 years' history, Ottobock has been a leader in human mobility: The introduction of C-leg®, the world's first microprocessor controlled knee (MPK), in 1997 has set a new standard for safety of people with transfemoral knee disarticulation and hip disarticulation amputations. Advances in the fields of bionic reconstructive surgery and the use of artificial intelligence in controls allow patients to intuitively move their artificial limbs, and to lead a more active and independent lifestyle.

Clinical evidence provided by us and others has demonstrated that patients with lower mobility grades benefit most from MPKs as evidenced by gains of the health utility score EQ5D.

The translation of these advances in prosthetics into orthotics led to the first knee-ankle foot orthosis (KAFO) with stance and swing phase control: The C-Brace® helps patients suffering from neurological indications such as incomplete spinal cord injury, poliomyelitis and post-polio syndrome to regain a natural gait. Exoskeletons like the personal assistive device Paexo® help prevent work related disorders of the musculoskeletal system.

As the field of wearable human bionics is rapidly evolving, new opportunities emerge to overcome previously unsolved challenges. This includes the optimization of human comfort, and man-machine interfaces for improved control and somatosensory perception to foster embodiment - make users feel that the device becomes part of them.

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### ***Professor Jane Burridge, University of Southampton***



**Biography:** Professor Jane Burridge leads the Neurorehabilitation Research Group at the University of Southampton. Her research aims to understand the mechanisms of sensory-motor recovery following neurological damage. She and her Group use this better understanding to design and evaluate rehabilitation technologies that will improve recovery following central nervous system lesions such as stroke and spinal cord injury. Neurological rehabilitation is changing. Already most rehabilitation takes place in people's own homes and over the next few years, technologies to support them will become commonplace.

### **Abstract – Driving neural recovery following spinal cord injury**

Recent research both with animals and people with SCI has shown the potential for neural recovery. Some studies have used implanted systems, but we have recently designed and tested an inexpensive non-implanted novel cycling ergometer with a small number of patients. The 'iCycle' uses Functional Electrical Stimulation (FES). Electrical stimulation activates the leg muscles during each revolution of the pedals. The position of the crankshaft enables the stimulation to be timed accurately. The amount of effort the person exerts is monitored and used as feedback in a virtual cycle race. We propose that greater neuroplasticity will be achieved by synchronising stimulation with voluntary drive and that the motivation provided by the race will encourage the cyclist to work harder.

In this talk I will explain the neuroscience that underpins the concept, describe the device, how we developed it and report on the effect it had on a small number of people who trained on it for four weeks.

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***Dr Oliver Armitage, BIOS***



**Biography:** Oliver Armitage is Co-Founder and Chief Scientific Officer at BIOS, a leading neural engineering startup. Oliver has always had a vision that the human body could be repaired or made better through augmentative technology and how that can be used to improve people's lives. He studied for his PhD at the University of Cambridge in Bioengineering, working in the world-renowned Nanoscience Centre. He specializes in tissue interfaces and engineering to allow technology to be fused with the body. Oliver was named to Forbes 30 Under 30 in 2018.

**Abstract – Making direct neural therapies a clinical reality**

Direct neural interfaces for limb control have been used in a variety of research and pilot studies for multiple decades now and clinical practice makes regular use of neuromodulation for pain or other conditions. However, continuous bi-directional connections to the nervous system for treating physical health have so far remained clinically elusive. This is in large part due to the technology required for real-time decoding and encoding being unpractical to put in implantable medical devices. Yet this technology is essential for realising the promise shown by direct neural recording and stimulation for prosthetic control, SCI, neurotrauma or a host of other therapies. BIOS is pioneering AI technologies for long-term direct neural interfaces for lifelong health by continuous decoding and encoding of neural information on small-scale devices for bringing to clinical practice the promise shown over decades of research.

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***Professor Anthony Bull, Imperial College London***



**Biography:** Professor Bull leads and is PI on the Royal British Legion Centre for Blast Injury Studies that exists to improve the mitigation of injury, improve and advance treatment, rehabilitation and recovery thus increasing lifelong health and quality of life after blast injury. This has a strong biomechanics focus on lower limb and spinal injuries and he has extensive research activity in the area of ligament injuries due to sporting activities.

As Director of the Musculoskeletal Medical Engineering Centre funded by the Wellcome Trust and EPSRC ([www.imperial.ac.uk/msk](http://www.imperial.ac.uk/msk)) Professor Bull leads his own research group in musculoskeletal dynamics, and provides underlying research technology support for nine other investigators funded through the Centre. He has in addition extensive research activity in orthopaedic implant and surgical design in many areas associated with lower limb and upper limb biomechanics and ageing.

**Abstract – Amputee Biomechanics: it is not just about getting active**

The ability of young, fit, healthy traumatic amputees to achieve very high levels of performance through their own determination, excellent rehabilitation and advanced prosthetics is one of the features of modern life. Expectations have risen that all should be able to achieve these levels of activity and maintain them through to old age, and yet this seems to be out of reach for so many. Biomechanics is



the study of the interaction between forces, motion and deformation and is the underlying science that can shed light on the reasons why such high levels of performance are unsustainable for most, unattainable for many, and detrimental for others. Understanding amputee biomechanics can aid in devising novel rehabilitation, surgery and prosthetics.

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### **Panel Session: scientific directions**

***Chaired by Sir Simon Wessely FMedSci, King's College London***

*See organiser biography on page 6*

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#### ***Air Commodore Rich Withnall QHS, UK Defence Medical Services***



**Biography:** Air Commodore Rich Withnall joined the RAF as a Medical Cadet in 1990. After GP vocational training, he undertook Senior Medical Officer appointments on fast jet, multi-engine and rotary flying stations, and the RAF's recruit training unit. He has completed Command & Staff appointments at HQ Personnel and Training Command, HQ AIR Command, HQ Surgeon General and the Ministry of Defence (MOD). He won the Brooke-Popham Prize (Best Defence Research Paper) and the Sir Michael Howard Prize (Best MA student) on the Advanced Command & Staff Course in 2007/8. After a policy role in MOD, Rich returned to HQ AIR Command as Deputy Director Health Services (RAF) in 2010. He became the first RAF Defence Professor of General Practice & Primary Care in 2013. He was promoted to Air Commodore in 2017, becoming the first primary care clinician to be appointed as Medical Director of the UK Defence Medical Services.

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#### ***Wing Commander Marcus Stow, JHubMed***



**Biography:** Wing Commander Stow has worked all over the world in support of Operations and humanitarian crises. As an example, in 2011, he deployed to Afghanistan with the US Marine Corps and was responsible for the medical evacuation of 1100 sick and wounded people. He volunteered to support the Ebola crisis in Sierra Leone and whilst there helped develop a novel method of moving infective casualties by land and air.

In 2016 Stow was invited into the Order of Saint John for his collective efforts to preserve life and reduce suffering for the good of humanity, and in 2019 Stow received the Worshipful Cutler's prize for Innovation.

Marcus is currently the Chief Operating Officer of JhubMed, the Defence Medical Innovation Hub, working to bring world leading technology into the hands of the Military Medical User, at pace.

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**Miss Alexandra Crick MBBS MD FRCS(Plast), Odstock Centre for Burns, Plastic and Maxillofacial Surgery, Salisbury.**

**Biography:** Alexandra Crick is a consultant plastic surgeon at Salisbury, appointed in 2008.

She qualified from St Thomas' Hospital Medical School in 1992. She completed research in the developmental biology of congenital limb malformations for her MD thesis as a Wellcome Trust Fellow at the University of Oxford in 2002. She then trained in plastic surgery within the Wessex and Oxford region finishing with the Hand Fellowship at the John Radcliffe Hospital and Nuffield Orthopaedic Centre, Oxford in 2007.

Her principle interest is microsurgical limb reconstruction following trauma, working with colleagues in Salisbury and Southampton to develop the acute orthoplastic service for the Major Trauma Centre.

With Neal Jacobs, she has developed the orthoplastic service for secondary reconstruction of lower limb problems including bone sepsis, mal-union and non-union.

With Rod Dunn, she has developed a secondary reconstructive service for military patients with limb injuries acquired during service including blast injuries sustained during the Afghanistan conflict. She has a particular interest in amputation and reconstruction of the residual limb for these patients and for civilian patients via the prosthetic centres at Portsmouth and Bournemouth.

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## **Delegate list**

*(correct as of 26 February 2020)*

<b>First Name</b>	<b>Surname</b>	<b>Organisation</b>
Pauline	Aboagye	N/A
Kate	Adlam	Devon Air Ambulance Trading Company Ltd
Nana	Afoakwa	Queen Elizabeth Hospitable Birmingham
Ann-Maria	Ahern	NHS
Kaouthar	Alaoui	University of Reading
Harry	Alexander	The Royal Society
Victoria	Alexander	NHS
Timothy	Allsopp	Videregen
Hema	Ananth	NHS
Søren	Andersen	Danish Defence Veterans Centre
Jenni	Anderson	Invictus Games Foundation
Kirstie	Anderson	University of Newcastle
Arash	Angadji	Orthopaedic Research UK
Oliver	Armitage	BIOS
Natasha	Aswani	DNK
Catalina	B	ACP
Savitrie	Baichoo	PHP Network
Rob	Barker	University of Kent
Iain	Beck	Canadian Armed Forces Transition Group
Paulina	Belkova	QMUL
Daryl	Bell	Royal Air Force RCDM
Alex	Bennett	Defence Medical Services United Kingdom
Heather	Betts	Blesma The Limbless Veterans
Aditya	Bhargava	WA Health
Subhash	Bhargava	WA Health
Helen	Blamey	Invictus Games Foundation
Georgina	Blenkinsop	JHubMed
Peter	Bolhuis	Spiaggia
Philip	Bond	Council for Science and Technology
Christopher	Boos	NHS
Nicholas	Booth	True Patriot Love Foundation
Leo	Borrini	Percy Military Hospital (Clamart - France)

Els	Bos-Maclachlan	SCEM
Charlotte	Bowers	MOD
Caitlin	Bowie	Royal Air Force
Chad	Bradford	US Office of the Secretary of Defense for Health Affairs
Lauren	Bray	RCDM
George	Brooksbank	Supporting Wounded Veterans
Anthony	Bull	Imperial College London
Jane	Burridge	University of Southampton
Walter	Busutil	Combat stress
Paul	Cain	Joint Medical Group
Andrew	Calvis	Contractor
Oliver	Camp	Unilever Foundry
Neill	Campbell	University of Bath
Montana	Cantagalli	King's College London
Isobel	Caplin	Blind Veterans
Nick	Caplin	Blind Veterans
Zoe	Catchpole	McPin Foundation
Richard	Catlow	The Royal Society
Sarah	Cecil	English Institute of Sport
Andrii	Chaikovskiy	Ukrainian Ministry of Defence
Rebecca	Cheung	Magnus Muses
Jenny	Chow	University of Southern California
Florin	Ciociu	The Sports Club of the Romanian Army
Emily	Clarke	Armed Forces Covenant Fund Trust
Emma	Coady	Imperial College London
Charlotte	Coates	The Scar Free Foundation
Rik	Coetzee	Defence Medical Services United Kingdom
Martin	Colclough	Grey Matters
Alan	Collins	Pure-Innocence
Sal	Connolly	Private practice
Alex	Cooper	Forces in Mind Trust
Nicholas	Cooper	MMP
Cyd	Courchesne	Veterans Affairs Canada
Rachel	Cox	
Claire	Crichton	RAF/MOD
Alex	Crick	Salisbury NHS Foundation Trust
Beth	Croak	KCL
Sean	Cullen	Brunel University
Mollie	Darwin	Army
Jessica	Davis	Brunel University London
Guido	De Schutter	Belgian Ministry of Defence
Cecilia	De Villiers	Physiocare LTD
Kyriaki	Derieux	Freelance
Zoe	Derieux	Student secondary
Erwin	Dhondt	Organisation
Rebecca	Digby	Home Office
Kristi	Dode	FTI Consulting
Louisa	Dominguez	Forces in Mind Trust
Harry	Doyle	Nua Healthcare
Rebecca	Dunning	British Army
Neil	Ebenezer	ND Ebenezer Consultancy Ltd
Kitti	Einseln	EDF
Brendan	Eley	Scar Free Foundation
Kara	Emman	Kara Universal
Hailey	Eustace	BIOS
Geraint	Evans	Mod
Julia	Facione	Percy Military Hospital (Clamart - France)
Kimberley	Fairer	OUH NHS Foundation Trust

Nicola	Fear	Kings College London
Alex	Fei	Good Health center
Hannah	Fisher	Invictus Games Foundation
Melinda	Fitzgerald	Curtin University
Alex	Flavell	Raf
Ciocoiu	Florin	Army Sports Club "Steaua" Bucharest, Romania
Dennis	Flynn	Veterans With Dogs
Oliver	Foster	
Peta	Foster	Sonofoss Design
Russell	Foster	University of Oxford
Stephen	Foster	Kennedys law
Jon	Francis	MOD Joint Medical Group
Guy	Fraser	Advance study, DMRC
Daniel	Freeman	University of Oxford/Oxford VR
Ornella	Garofalo	University Alliance
Kirsty	Gates	RBL
Salim	Ghoussayni	MindMaze Healthcare UK
Adam	Gill	Otto Bock Healthcare
George	Gill	GGMR
Anthony	Glastonbury	IMECHE
Anthony	Goldstein	Peace of Mind
Renata	Gomes	Blind Veterans
José	González-Alonso	Brunel University
Holly	Goodberry	The Royal British Legion
Andreas	Goppelt	Ottobock
Timothy	Granville-Chapman	DNRC
Susan	Grayeff	The Technion
Rylie	Green	Imperial College London
Neil	Greenberg	Kings College London
Ann	Griffiths	Independent
Philip	Hall	Help for Heroes
Hajira	Hamdi	State Street Bank & Trust
Simon	Harmer	CASEVAC Club
Gemma	Harris	Kings
Megan	Harris	The Royal British Legion
Ingrid	Heinaru	Estonia Support Centre
Helen	Helliwell	Armed Forces Covenant Fund Trust
Dave	Henson	Imperial College London
Maria	Hill	MD&A
Karen	Hoffman	Centre for Trauma Sciences, C4TS
Ralf	Hoffmann	The Bundeswehr
Anna	Hogg	Norfolk County Council
Ayesha	Holland	Oxford university hospital
Ed	Holme	CAS
Guy	Holthouse	Australian High Commission
Sonia	Howe	Armed Forces Covenant Fund Trust
Jeroen	Hulst	Dutch Ministry Of Defence
Jackie	Hunter	BenevolentAI
Marco	Iannuzzi	Italian Defence Secretary General
Insherah	Ibrahim	UoN
Sue	Ion	Royal Society
Sue	James	Sport of England
Valerie	Jamieson	New Scientist
Léon	Jans	Military Rehabilitation Centre Aardenburg
Rakesh	Jetly	Canadian Forces Health Services Group
Debbie	Jevans	Invictus Games Foundation
Sarah	Jones	Help For Heroes



Jim	Jorkasky	National Alliance for Eye and Vision Research
Mona	Kab Omir	Industry
Andriy	Karachevskyy	Shupyk National Medical Academy of Postgraduate Education of Ukraine
Madeline	Kenley	Community options
Kam	Khan	Defence Primary Healthcare
Jimin	Kim	King's College London
Thomas	Knight	Royal Air Force
Zbigniew	Kolendowicz	OLI organisation
Kristina	Koller	University of Nottingham
Terry	Kynaston	MOD
Ellen	Lambert	King's College London
Edward	Lane Fox	Invictus Games Foundation
Christelle	Langley	University of Cambridge
Franziska	Langner	The Bundeswehr
Pamela	Lau	IPPFA
Hannah	Lawton	Help For Heroes
Peter	Le Feuvre	Ministry of Defence
Oluwakeji	Lebi	NAPTIP
Gege	Li	New Scientist
Anneli	Liivamägi-Hitrov	Estonia Support Centre
Andreas	Lison	The Bundeswehr
Qing	Liu	n/a
Victoria	Liubcenko	Kings college London
Ann	Logan	University of Birmingham
Amilcar	Loureiro	Life Art Lab
Kate	Lowles	DPHC
James	Macleod	Ministry of Defence
Rebecca	Magner	Osteopathy For All
Nicole	Mahoney	Canadian Armed Forces
Habib	Man sour	Slifg
Anne	Manktelow	University of Cambridge Division of Anaesthesia
Ranjit	Mann	Cognacity
Mollie	Marti	National Resilience Institute
Andrea	Martinez	King's College London
Ava	Mason	King's College London
Tony	Masters	New Zealand High Commission, London
Joseph	Matthew	Alfred Health and Monash University
Julie	Maxton	The Royal Society
Emily	Mayhew	Imperial College London
Thomas	McBarnet	Forces in Mind Trust
Lindsey	McElroy-Baker	Royal Navy
Amber	McKenzie	King's College London
Saagar	Mehay	n/a
Mohammed Faruk	Memon	Vital care associates
David	Menon	University of Cambridge
Adina	Michael-Titus	Centre for Trauma Sciences, C4TS
Nicola	Middlebrook	Centre of Precision Rehabilitation for Spinal Pain, University of Birmingham
Samantha	Miller	Royal Air Force
Keith	Mills	Invictus Games Foundation
Alan	Mistlin	Defence Medical Services United Kingdom
Midori	Miyazaki	ISPS Handa
Janet	Morrison	Black Stork Charity
David	Morton	Australian Department of Defence
Robert	Munteanu	Romanian Ministry of National Defence
Robert	Munteanu	Romania Ministry of National Defence
Federica	Murgia	Italian Defence Veterans Centre

Tim	Murphy	Queens
Parvathy	Nair	King's College
Stefan	Navaratnam	London
Bryan	Naylor	Blind Veterans UK
Deborah	Newberry	Kennedys
Samuel	Newell	Invictus Games Foundation
Caitriona	Ni Mhurchu	WA Health
Paddy	Nicoll	Invictus Games Foundation
Rachel	Norris	Defence Medical Services United Kingdom
RC	Norris	MOD
Florin	Oancea	Romania Ministry of National Defence
Sarah	Oates	Ascot Rehab
David	Ojogbede	KCL
Stella	Oramadike	Federal Fire Service, Nigeria
Sally	Orange	MOD
Justin	Packshaw	The Borough of London
Saroj	Parekh	Carer
Adrian	Parker	Devon Air Ambulance Trading Company Limited
Michelle	Partington	Mentis training and consultancy
Priya	Patel	Queen Mary University of London
Ruth	Pat-Horenczyk	Hebrew University of Jerusalem
Mark	Perkins	MOD
Ioana	Popescu	NHS
Ben	Rahilly	Deloitte
Rita	Rajababoo	NHS
Urmas	Rajaver	Team Estonia
Hannah	Ralph	The Lancet
Jacqueline	Rappoport	Queen Mary University of London
Marianna	Recchia	Zinc
Adam	Reckless	40 Commando Royal Marines
Julia	Reed	Pins and Needles Charity
Sue	Rees	Independent
Alastair	Reid	Defence Medical Services United Kingdom
Dominic	Reid	Invictus Games Foundation
Matthew	Reid	University of oxford
Luisa	Riccardi	
Mickaela	Richards	Invictus Games Foundation
Rory	Rickard	Royal Centre for Defence Medicine
Fiona	Riddoch	University of Edinburgh
Paul	Robinson	Devon Air Ambulance
Laina	Rosebrock	University of Oxford
Barbara	Rothbaum	Emory University
Evgeniya	Ryabchikova	Independent Contractor
Katie	Saddleton	The Royal Society
Anagha	Sardesai	CPFT
Tommaso	Sciarra	Italian Defence Veterans Centre
Jay	Sea	Jaysea Medical Researcher
Omer	Senol	The Sports Club of the Romanian Army
Rach	Seymore	Health
Syed	Shah	NHS
Don	Shell	US Office of the Secretary of Defense for Health Affairs
Simon	Shepherd	Royal Navy
Alex	Sheppard	Senseutics
Celina	Shirazipour	Cedars-Sinai Medical Center
Piers	Shotter	Optimi Health
Amos	Simms	KCL
Jaskaran	Singh	QMUL
Cait	Smith	Bolton Armed Forces Centre 4 Veterans

Richard	Smith	Invictus Games Foundation
Kadri	Soots	Estonia Support Centre
Anders	Sørensen	University of Denmark
Maria Grazia	Spillantini	University of Cambridge
James	Squires	Academy of Medical Sciences
Muthia Govindataj	Srikanthan	Freelancer
Sophie	Stathi	National Army Museum
Marcus	Stow	JHubMed
Isabel	Summers	Forces in Mind Trust
Amreen	Taj	-
Ross	Taylor	FCO
Robert	Thorburn	Forces in Mind Trust
Tetyana	Timoshenko	Government of Ukraine
Katherine	Tindall	Australian Defence Force
Oliver	Tobin	University of Reading
Guiseppe	Tortora	Italian Defence Staff
Steven	Tracey	Ministry of Defence
Jack	Tsang	King & Wood Mallesons
Otilia	Turiac	ELFT NHS FT
Kyriakos	Tzafestas	The Royal Society
Jeroen	Van den Bossche	Belgian Ministry of Defence
David	Vanhoutte	Belgian Defence
Patrici	Ventimiglia	IRC
Eric	Vermetten	Dutch Ministry of Defense
Laurent	Vitiello	Percy Military Hospital (Clamart - France)
Axel	von Bredow	German Ministry of Defense
Kseniia	Voznitsyna	Ukraine Mental Health and Rehabilitation Center for War Veterans
Kristeen	Waller	Forces in Mind Trust
David	Walter	Birkbeck
Steve	Ward	US Office of the Secretary of Defense for Health Affairs
Melanie	Waters	Help For Heroes
Kaja	Wawrzak	Oxford University
Thea	Waxman	The Royal Society
Brendan	Weekes	University of Cambridge and University of Hong Kong
Simon	Wessely	Kings College London
Haydyn	Whateley	British Army
Evie	Wheeler	Sports therapist
Seamus	Wilson	MOD
David	Wiseman	Invictus Games Foundation
Richard	Withnall	Defence Medical services
Ahmed	Wobi	Zinc
Ben	Woodington	University of Cambridge
Lucy	Wray	Brunel University London
Dimitris	Xydas	Zinc VC
Nada	Yousif	University of Hertfordshire
Ginger	Zampieri	Blind Veterans Association
Tom	Zampieri	Blind Veterans Association









The Royal Society is a self-governing Fellowship of many of the world's most distinguished scientists drawn from all areas of science, engineering, and medicine. The Society's fundamental purpose, as it has been since its foundation in 1660, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity.

The Society's strategic priorities emphasise its commitment to the highest quality science, to curiosity-driven research, and to the development and use of science for the benefit of society.

These priorities are:

- Promoting excellence in science
- Supporting international collaboration
- Demonstrating the importance of science to everyone

#### **For further information**

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Registered Charity No 207043



The Invictus Games Foundation uses the power of sport and the Invictus Spirit to inspire recovery, and support the rehabilitation of wounded, injured and sick Servicemen and women and veterans (WIS) to improve their life beyond injury or illness.

The Foundation manages the process of selecting the hosts of the Invictus Games and oversees the delivery of this international sporting event involving competitors and their friends and family from 20 nations.

The Invictus Games Foundation also seeks to provide competitors past and present with opportunities in all areas of life to help them develop new skills and allow them to engage fully in society.

We will:

- Use the power of sport to develop and deliver international competitions through the Invictus Games.
- Support initiatives internationally for WIS service personnel to regain a sense of purpose.
- Support initiatives internationally for WIS service personnel to re-engage with and contribute to their communities.
- Curate and share best practice to foster greater international collaboration for recovery and rehabilitation.

#### **For further information**

**W** [invictusgamesfoundation.org](http://invictusgamesfoundation.org)

**E** [info@invictusgames.org](mailto:info@invictusgames.org)

**T** [@WeAreInvictus](https://twitter.com/WeAreInvictus) [#InvictusGames](https://twitter.com/InvictusGames)

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