
UNIVERSITY OF LIVERPOOL
Institute of Life Course and Medical Sciences
DEPARTMENT OF MUSCULOSKELETAL AND AGEING SCIENCE
liverpool.ac.uk

WELCOME

Welcome to the Department of Musculoskeletal and Ageing Science.

Our mission is to address the global challenge of ageing by advancing solutions for musculoskeletal diseases. We conduct world-leading, multidisciplinary research across species to understand, diagnose, and treat age-related conditions, improving health across the lifespan.

Our strategy brings together clinicians, epidemiologists, and biomedical scientists to explore genetic, cellular, and molecular mechanisms of ageing, with a focus on joint mobility, regenerative medicine, nutrition, frailty, and chronic pain. Notably, our MicroAge experiment aboard the International Space Station exemplifies our innovative approach.

Aligned with the University of Liverpool's vision, we are a values-led Department committed to collaboration and innovation. We support interdisciplinary research at scale and actively build partnerships with students, researchers, and industry. By harnessing collective expertise, we aim to transform ageing research and deliver impactful solutions for healthier lives.

Professor Mandy Peffers, Head of Department

"We're advancing solutions to age-related diseases and conditions. Bringing together medical and veterinary clinicians, epidemiologists and biomedical scientists."

USEFUL LINKS AND INFORMATION

About us

Our people

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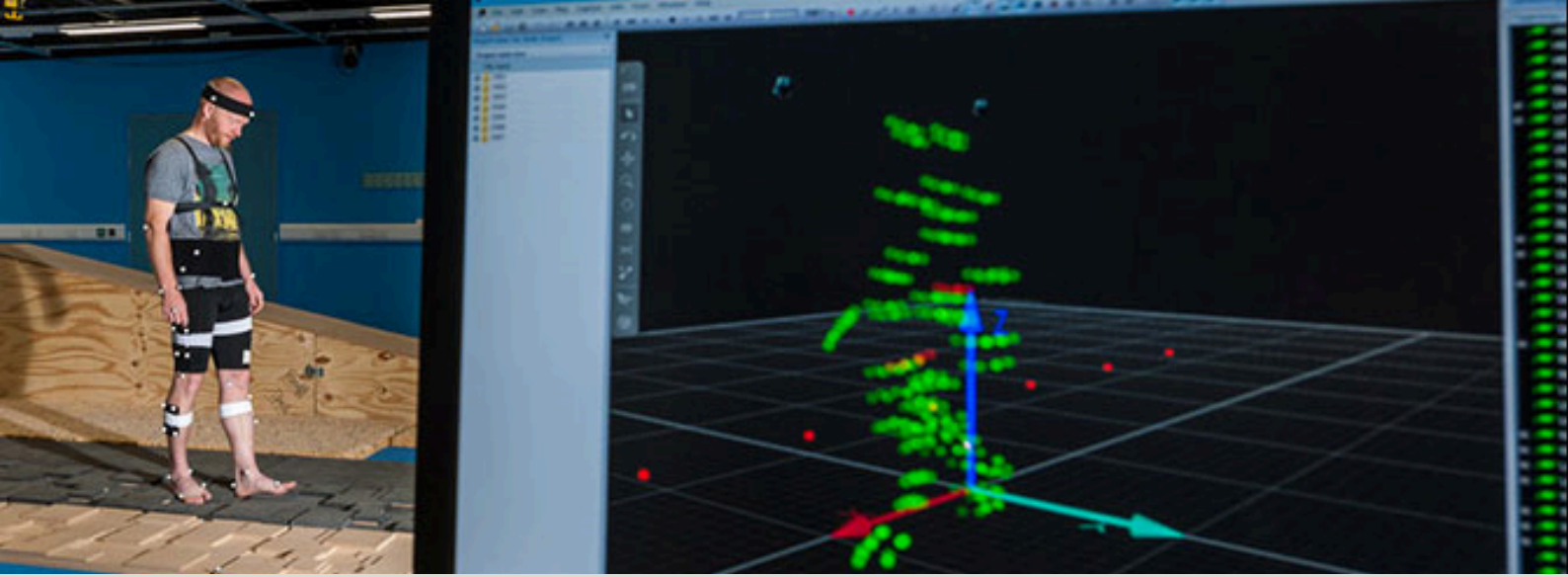


RESEARCH THEMES

1 Mechanisms and models of ageing and disease

Ageing has a profound impact on society and medicine, yet it remains a major puzzle of biology. Our goal is to help understand its genetic, cellular, and molecular mechanisms as well as modelling disease processes in computational and experimental systems.

2 Tendon and ligament

Tendons and ligaments undergo age related degeneration causing insidious changes within the functional musculoskeletal system including osteoarthritis. Omics, stem cell and biomechanical analyses inform our work in this area.

3 Biomechanics

Anatomical and engineering approaches as well as gait analyses inform our understanding of the functional morphology and biomechanics of the musculoskeletal system.

4 Cartilage, bone and joints

Functional joints are necessary to maintain mobility in ageing. We aim to characterise basic mechanisms and identify key targets to maintain joint function in ageing.

RESEARCH THEMES

5 Muscle and clock biology

We are collaborating with the UK Space Agency and Kayser Space Ltd to carry out experiments on the International Space Station to help us understand what happens to human muscles as we age, and why.

6 Pain

Ageing and musculoskeletal deterioration is associated with chronic pain. Our research aims to understand and mitigate pain for patients to promote long-term physical and mental health.

7 Nutrition and frailty

Identifying how nutrients can modulate the ageing process and detrimental effects of ageing has the potential to facilitate low-cost and high-value interventions to slow the effects of ageing on the musculoskeletal system.

8 Mammalian embryogenesis and stem cells

We are harnessing understanding of the mechanisms of development and the regenerative potential of stem/progenitor cells to drive cellular therapy approaches.

FACILITIES AND MODELS

Our Gait Lab is fully equipped with motion capture systems, force plates and additional techniques including electromyography, inertial sensors and isokinetic muscle testing. We also house the CIMA/MRC biplanar X-Ray facilities.

USEFUL LINKS

Virtual tour of Gait Lab

Virtual tour of Microscopy Lab

In vivo, in vitro and in silico models

We use a wide range of research models to investigate musculoskeletal ageing. Human-based studies, including clinical trials, pain clinics and intervention models, allow us to evaluate new treatments and understand the impact of ageing and disease in people. We also employ animal models to study the mechanisms and progression of conditions like osteoarthritis and osteoporosis.

At the cellular level, we use 2D and 3D muscle models, reporter cell lines, 3D organoid models and stem cell systems to explore the pathways of ageing and diseases, and circadian rhythmic regulation and manipulation. Human and animal gait models provide further insights into mobility and biomechanics of the musculoskeletal system using a variety of modelling techniques.

Together, these diverse models enable us to better understand, diagnose, and treat musculoskeletal diseases, advancing strategies for healthier ageing.

TRAINING AND EDUCATION

Our students learn the necessary technical knowledge, clinical skills and patient care values to progress into successful medical, dental and research careers.

Postgraduate Research Programmes

MSc in Clinical Sciences

The MSc in Clinical Sciences advances expertise in molecular mechanisms that underpin human health with cutting-edge clinical applications, equipping students with globally relevant skills.

Course information

MRes in Clinical Sciences

This programme enables students to develop advanced knowledge, such as recent advances and contemporary methodologies in clinical sciences as well as important techniques and laboratory skills vital for medical research.

Course information

MSc in Musculoskeletal Biomechanics

Biomechanics draws from a range of specialities such as functional anatomy, exercise physiology and mechanical engineering.

Course information

Advanced Postgraduate Research Programmes

Advanced postgraduate degrees (PhD/MPhil/MD) in Musculoskeletal Science offer a comprehensive exploration of the biological, mechanical, and clinical aspects of musculoskeletal health.

PUBLIC ENGAGEMENT

Public and Patient Involvement and Engagement (PPIE)

Our goal is to embed Patient and Public Involvement (PPI) at every stage and across all aspects of research. We are committed to meaningful engagement with the public and individuals with lived experience, ensuring their voices help shape the direction and impact of our work. A key part of this mission is supporting early career researchers by offering guidance on implementing PPI and facilitating connections with community members.

Musculoskeletal Biology Patient Involvement Panel

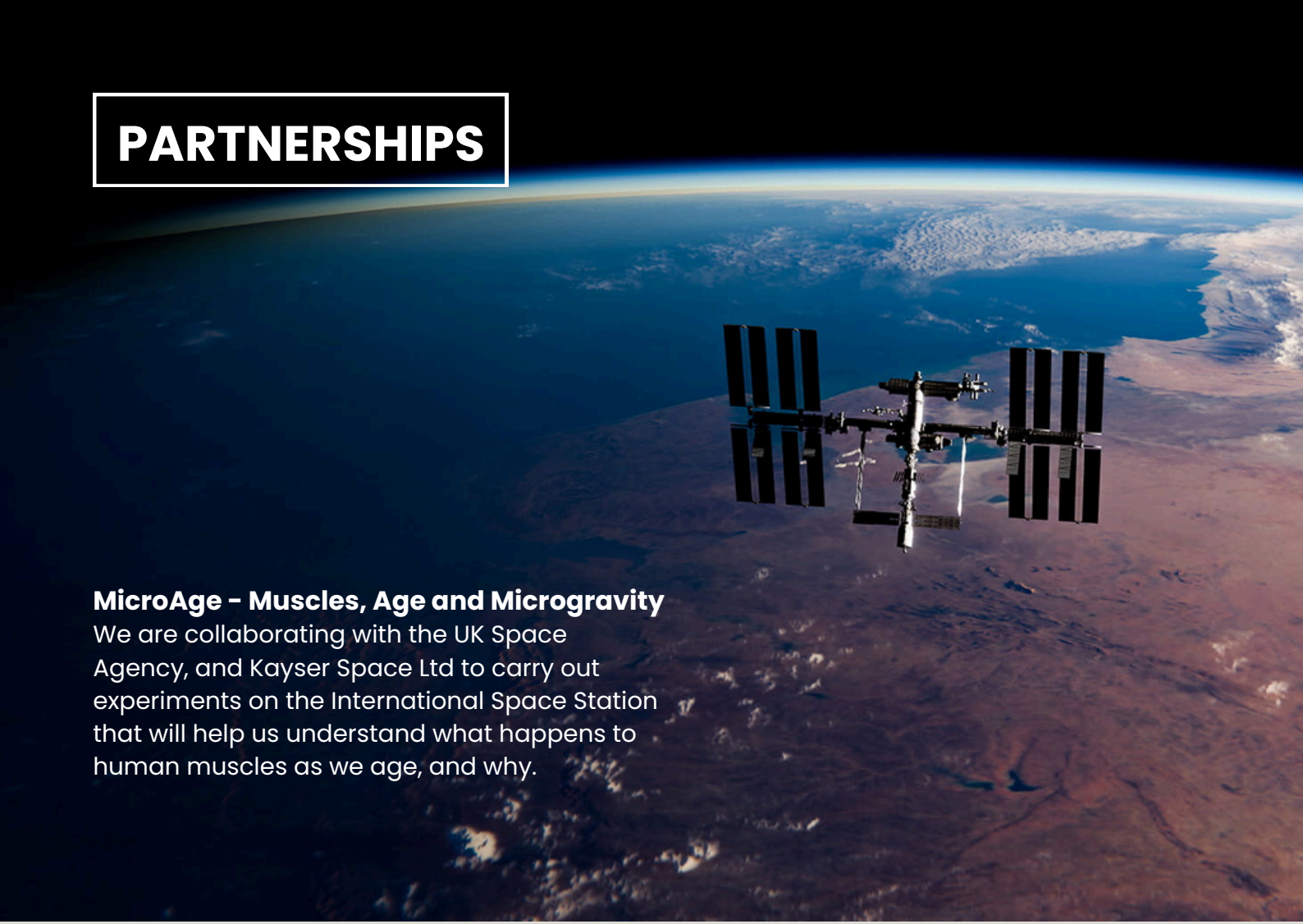
Our patient involvement panel is a collaboration between our musculoskeletal biology researchers and members of the public, with personal or family experience of a range of musculoskeletal conditions.

Outreach Case study : DogMA

Grounded in cutting-edge research, the Dog Mobility App (DogMA) offers a user-friendly and accurate way for dog owners to monitor and better understand their dog's mobility and wellbeing.

"I appreciate all the effort that goes into making the science so accessible. I feel that you are empowering patients to have more productive conversations with health professionals and to become true partners in managing our health conditions." *Patient partner Len*

PARTNERSHIPS



MicroAge - Muscles, Age and Microgravity
We are collaborating with the UK Space Agency, and Kayser Space Ltd to carry out experiments on the International Space Station that will help us understand what happens to human muscles as we age, and why.

UKRI Biotechnology and Biological Sciences Research Council

UKRI Medical Research Council

NIHR | National Institute for Health and Care Research

wellcome

VERSUS ARTHRITIS

Athena Swan Gold Award
GENDER CHARTER