

MISSION

The Department of Movement and Sports Sciences consists of 5 research units. Two of them are embedded in the Sport Science Laboratory – Jacques Rogge. The goal of the laboratory is to:

- develop novel scientific insights in the various disciplines of movement and sports sciences
- actively pursue technology transfer through the Victoris consortium of the Industrial Research Fund and aims to valorize findings towards society and industry
- offer excellent research infrastructure and expertise to research groups and companies, for observational and interventional experiments on human exercise and locomotion
- support high-quality academic education and training
- perform experimental research on gross human motor skills, with innovative methods and know-how from kinesiology, engineering and musicology within the iRUNman consortium (“Integrated Research UNit for human Motion Analysis”)



“Sports science benefits sport and physical activity participation of everyone in our community, from the youngest to

the oldest and from recreational to elite. It is an established scientific field with rigorous research methods covering expertise from a broad range of disciplines in a multi-disciplinary setting. Let it be beneficial for all.”

Jacques Rogge



Research unit Biomechanics and Motor Control of Human Movement



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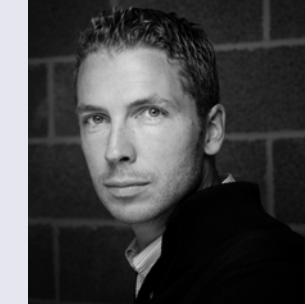
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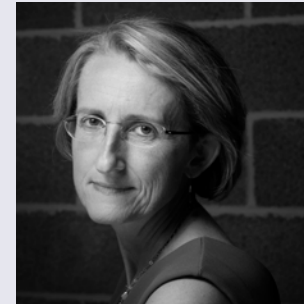


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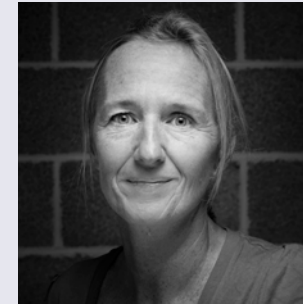


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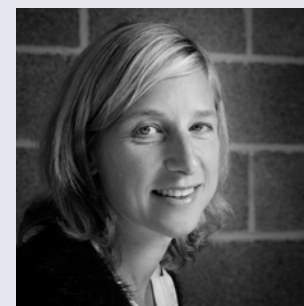


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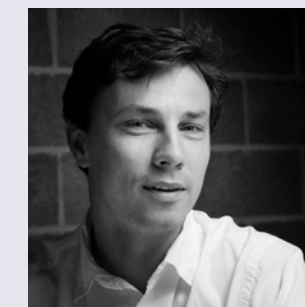
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SPORT SCIENCE LABORATORY

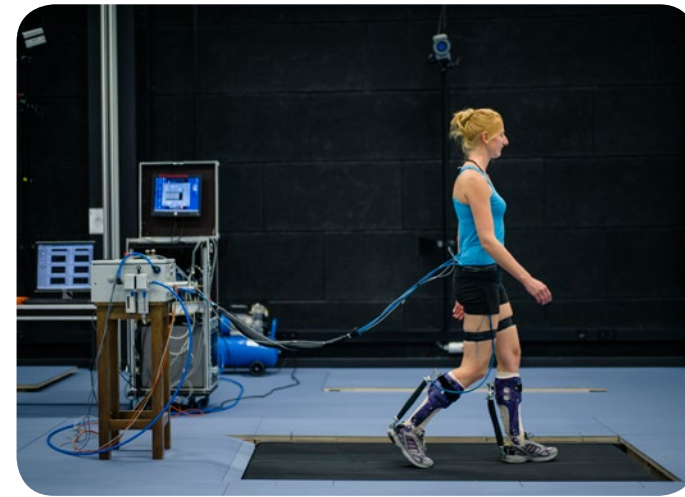
Jacques Rogge



Research unit Biomechanics and Motor Control of Human Movement

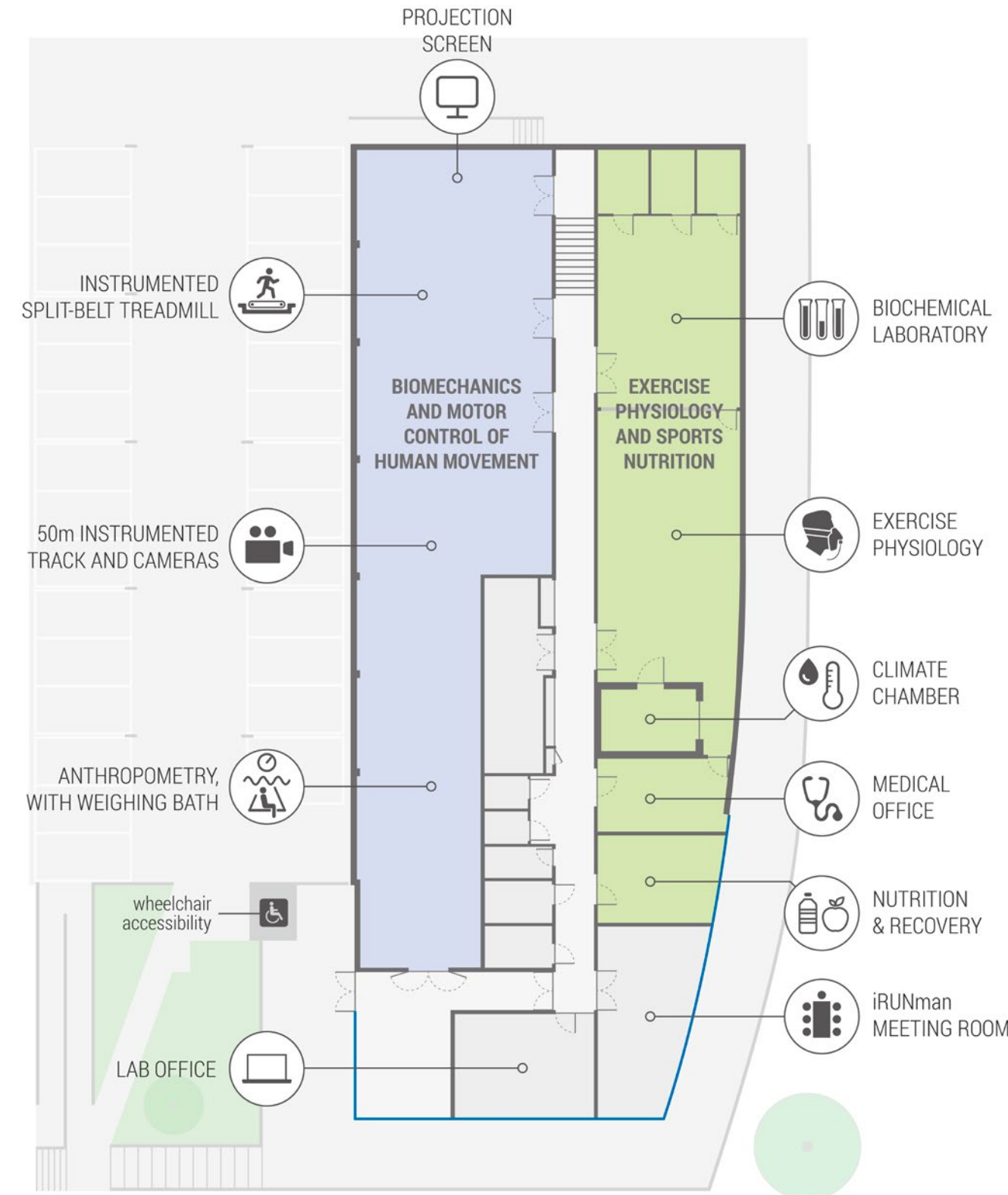
This unit consists of two complementary laboratories that investigate the performance, training and learning of motor skills in daily life situations and sports. Our research targets individuals of all ages and physical abilities and involves both laboratory and field testing.

The Laboratory for Biomechanics of Human Movement performs state of the art analysis of human movement by combining kinematic and kinetic measurements, often in combination with electromyography. Through a better understanding of the neuromechanical interaction of the moving body and the environment, we aim to answer research questions related to the optimisation of learning processes, (sports)performance, and musculoskeletal loading. A first research line, *locomotion biomechanics*, focuses on modulation of impact loading in distance running, determinants of gait transition, and player-shoe-surface interactions during fast cutting manoeuvres. Secondly, *locomotion related injury risk factors* are determined and translated to broader intervention studies on primary prevention of sports injuries. A third line of research is involved with *developing efficient exoskeletons* that assist human walking in able-bodied as well as impaired individuals, by conducting optimisation experiments that allow to understand how the metabolic cost of walking can be reduced. Finally, we perform sports biomechanical analysis in situ, e.g. on elite high jumping.



The Laboratory for Motor Control of Human Movement seeks to better understand processes involved in the development and control of skillful human behavior. Our research involves the detailed study of motor competence in order to reveal the intrinsic (individual) and extrinsic (environmental) factors explaining differences in competence. To unravel the mechanisms of human motor control and the role of sensory information (visual, auditory, kinesthetic) we study human movement and gaze patterns during different motor tasks while manipulating sensory feedback. Our target populations include children with obesity, children with movement disorders, typically developing children and elite athletes. With our research evidence we aim to optimise motor learning of complex skills (e.g. bicycle riding) and to support elite sports clubs and federations with structured talent identification.

Our complementary research infrastructure is embedded in a 260m² laboratory allowing to study three dimensional kinematics and kinetics of gross motor skills without any encumbrance. The specialist measurement systems possess high spatial and temporal resolutions: marker-based motion capture systems (Qualisys Oqus and ProReflex), markerless motion capture with automated visual analysis, high speed video cameras, ground reaction force registration with multiple force plates (Kistler, AMTI), high speed plantar pressure plates (RSscan), force-instrumented and inclinable split belt treadmill (Bertec), wireless electromyography (16 channel Noraxon), and various force, acceleration and inertial sensors. Specialist software is used for modeling and inverse dynamics (Visual 3D). For research on issues such as anticipation and decision-making we have a life-size video screen, head-mounted and head-free eye tracking systems (SMI RED, SMI HED). In most research topics also morphometrical measurements are used: from segment anthropometrics to whole body composition.



Research Unit Exercise Physiology and Sports Nutrition

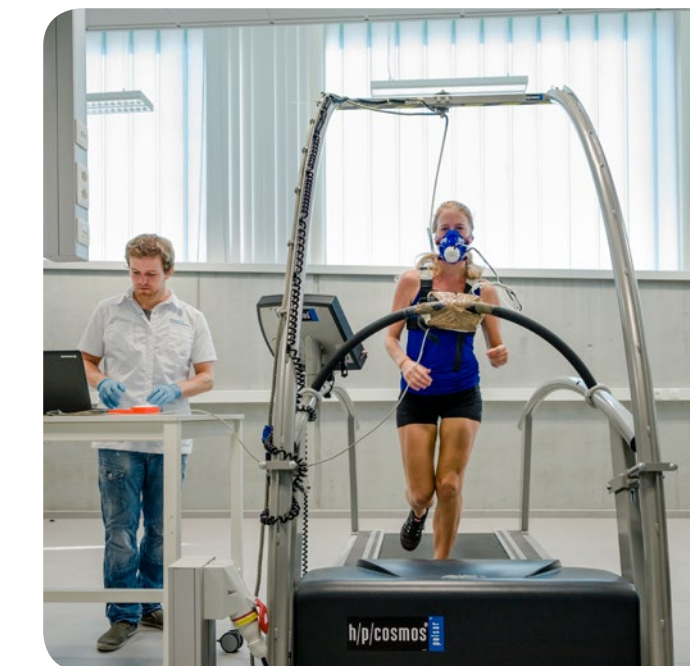
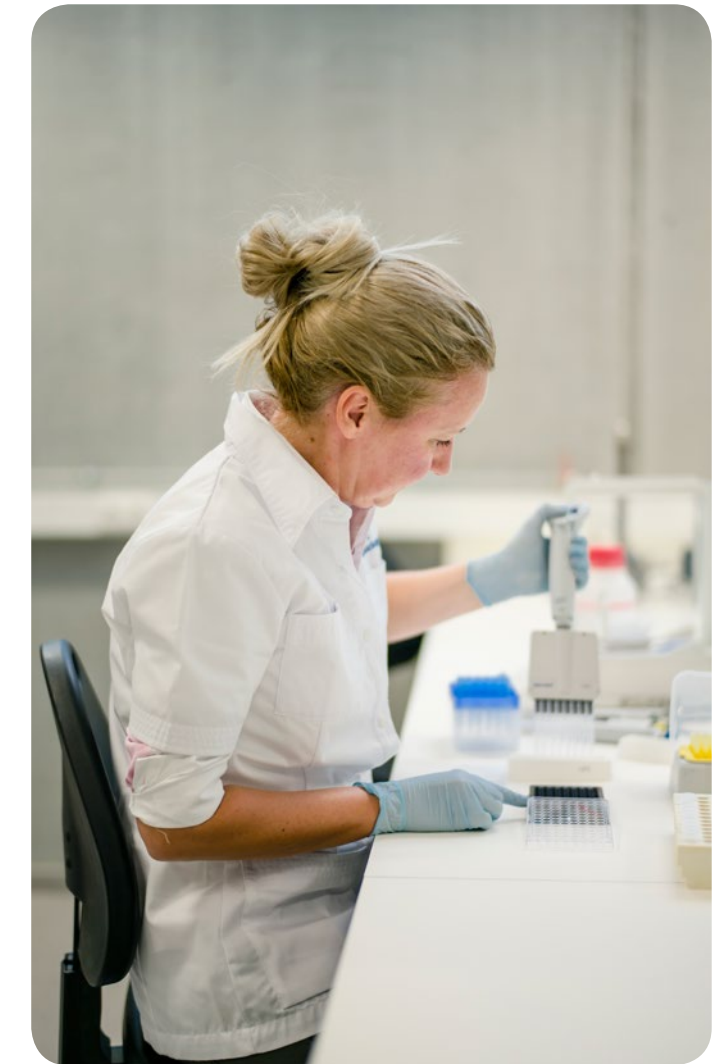
Exercise Physiology

The research group on Exercise Physiology investigates the acute and chronic adaptations of exercise on the human body. The more fundamental research area focuses on the mechanism of oxygen delivery and consumption in contracting skeletal muscle, both in athletic groups as well as in patients groups (e.g. mitochondrial myopathies). The more applied research line investigates the physiology and training methodology of specific sports, such as sailing, rowing, basketball, football and gymnastics. A recent emphasis includes the importance of recovery, immunity and sleep for athletic performance.

The research infrastructure is centralized around a large climatized exercise lab, containing commercial and custom-built ergometers for running, cycling, rowing and sailing. State-of-the-art equipment for oxygen uptake analysis (static and portable systems), blood gas and lactate analysis and near-infrared spectroscopy (for tissue oxygenation) are available. A medical cabinet is present for more invasive procedures (e.g. muscle biopsies).

Sports Nutrition

The research group on Sports Nutrition has a strong expertise in the rational development of novel dietary supplements. Based on a thorough knowledge of the biochemical processes in skeletal muscle cells and of the limiting factors of exercise capacity, new nutritional strategies are explored and tested. Applications include both the performance enhancement to (elite) athletes as well as health targets for the active population.



Research infrastructure includes a research kitchen, a biochemistry lab for blood and muscle sample analysis, a hydrostatic weighing tank for body composition and a climatic chamber for thermoregulatory and hydration experiments.

The "Integrated Research UNIT for human Motion Analysis" (iRUNman) is embedded in the Sport Science Laboratory - Jacques Rogge.

iRUNman performs experimental research on gross human motor skills, with innovative methods and know-how from kinesiology, engineering and musicology.