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Structure and Motion Laboratory



Mission: *'To undertake fundamental and applied research into musculo-skeletal function.'*

The Structure and Motion Laboratory conducts research into the structure, function and biomechanics of the musculoskeletal system.

This is done from the level of the single muscle fibre all the way up to a whole subject level, including the effects of health and disease on musculo-skeletal function. We are interested in a variety of biomechanical and physiological phenomena in biological systems. This is sometimes most effectively studied in humans and sometimes in animals that have evolved for a narrower range of athletic pursuits. Some of our work relates to musculo-skeletal function and control, while other work focuses on how this is affected by injury and repair of musculo-skeletal disease.

The laboratory aims towards achieving world-class research into comparative biomechanics and physiology, which can be used to further the body of knowledge regarding musculo-skeletal function.

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Structure and Motion Laboratory

Facilities

Facilities

We have facilities for assessment of musculo-skeletal function in large animals.

We were awarded a [BBSRC](#) equipment grant this allowed us to purchase some of the equipment below.

Qualisys Motion Analysis Systems

This 12 camera set up allows us to capture motion at 500 Hz from all 12 cameras. Two of the cameras also facilitate high - speed (500Hz) video recording. Two of the cameras are also able to operate wirelessley. Eight of the cameras in the set up capture at 2.3 Megapixel resolution while the other four are capable of capturing at 4.0 Megapixel resolution



AOS High speed digital video

Eight new [AOS](#) high - speed video cameras supporting Gigabit ethernet allow us to video from a number of directions simultaneously and over a greater distance. Four of the cameras can capture at 1000Hz with a resolution of 800 x 600 pixels, while the other four can capture at 500Hz with a resolution of 1280 x 1040 or 1000Hz with a resolution of 1240 x 600.



Kistler force plate array

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A six Kistler force plate array consisting of force plates 600 x 900mm in size allows us to collect 3-D kinetic data at up to 1000Hz over a maximum distance of 5.4m. The Piezoelectric force plates have on board amplifiers and log data into custom written [LabVIEW](#) software. The force plates can also be rotated to facilitate data collection from animals with smaller stride lengths.



New Kistler Small animal force plates

Two smaller force plates (200 x 120 mm) with external charge amplifiers will allow us to collect highly accurate kinetic data from small animals (such as rodents) with smaller stride lengths.

New Sato Equine Treadmill

This equine treadmill allows us to treadmill a variety of animals up to around 1000Kg in weight. Its speed is autonomously variable with the animal's position on the treadmill. Its speed varies from 2 - 20m/s

Starker Hund SK03 Canine Treadmill

This rolling-belt treadmill is used for training and exercising dogs. It is manufactured by Starker Hund® (Metal Works) of Italy and has been kindly loaned to the Structure and Motion lab to assist in its research. The machine is controlled by a computer microprocessor, by which speed, performance time and inclination can be individually designed.



Tromp medical High speed Cine X-ray system

This system allows us to capture high speed (500Hz) X-ray information and is invaluable in assessing bone and hard tissue movement and performance in locomoting animals. The system has a 38cm diameter X-ray image intensifier and allows up to 16 seconds of high speed acquisition.

BIOSEB Five lane rodent treadmill

This treadmill allows us to exercise and monitor rodents at a variety of speeds and inclines. The system allows us to treadmill five rodents simultaneously while stimulating them independently.

Hydraulic Ram and materials testing machine

This is made up of three main parts. Our system has a 90 KW [Bosch](#) pump and a [Moog](#) valve capable of passing 90litres/minute, with a response time of less than 14ms and less than 0.4% hysteresis between strokes. The ram is from [Eland](#) and has a 210 bar working pressure and dimensions of 38 x 28 x 500mm.

[EMG and Radiotelemetric Devices](#) - EMG, Accelerometers and GPS



Muscle Mechanics Lab

Forge

Mechanical and Electronic Workshops

Imaging Equipment and Tools - Ultrasound, X-Ray, MRI, Fluoroscopy

Software