

Groovy giraffes: Distinct bone structures keep these animals upright

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Giraffe in its natural environment. Photographed by Miroslav Duchacek (from Czech Republic) in Africa. Credit: Wikipedia.org

Researchers at the Royal Veterinary College have identified a highly specialised ligament structure that is thought to prevent giraffes' legs from collapsing under the immense weight of these animals.

"Giraffes are heavy animals (around 1000 kg), but have unusually skinny [limb bones](#) for an animal of this size" explained lead investigator Christ Basu, a PhD student in the Structure & Motion Lab. "This means their leg bones are under high levels of mechanical stress." In giraffes, the

equivalents to our metatarsal bone (in the foot) and metacarpal bone (in the hand) are extremely elongated, accounting for roughly half the leg length. A distinct groove runs along the length of these bones, housing a structure called the suspensory ligament. This structure is found in other large animals, such as horses (which are well known for their ability to sleep whilst standing), but this is the first time that it has been studied in giraffes.

The researchers hypothesised that this arrangement may help solve the mystery of how the giraffes' spindly [legs](#) can support its weight. To test this, the researchers received donations of limbs from EU zoos; these came from giraffes which had died naturally in captivity or been euthanized for reasons unrelated to this work. The limbs were then fixed in a rigid frame. Using a hydraulic press, the researchers applied forces of up to 2500 Newtons (about 250 kilograms), to simulate the bodyweight supported by each limb. It was found that the limbs remained upright and stable without any additional support and could even withstand greater loads.

As the suspensory ligament is elastic tissue, and not muscle, it cannot generate force itself so can only offer passive support. This means that giraffes can support their weight without actively engaging as much muscle, thereby reducing fatigue. The suspensory ligament is also thought to prevent the foot joints from overextending and protect the feet from collapsing. Chris Basu hopes that this information will help to explain how giraffes evolved from small, antelope-like species to the iconic long-necked [animals](#) we know today.

"I'd like to link modern giraffes with fossil specimens to illustrate the process of evolution" Mr Basu said. "We hypothesise that the suspensory ligament has allowed giraffes to reach large sizes that they otherwise would not have been able to achieve".

More information: This work was presented at the Annual Meeting of the Society for Experimental Biology in Manchester on Wednesday 2nd July.

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