

## INSIDE JEB

## Gangly giraffes walk in slow motion



Giraffes walking on the force plate runway installed in their enclosure at Whipsnade Zoo, UK. Photo credit: John Hutchinson.

Sauntering gracefully across the savannah, giraffes could be the definition of unconventional. ‘There’s a lot of stuff written about how weird and specialised giraffes are in terms of locomotion’, says Christopher Basu from the Royal Veterinary College (RVC), UK, describing how the lanky animals appear to move in slow motion, raise both feet on one side of the body as they wander along, and nod their heads gently to and fro while walking. ‘Anne Innis Dagg and Robert McNeill Alexander ... did some important early work throughout the 1960s and 1970s’, says Basu, but adds that there hasn’t been much done since. As Basu’s PI, John Hutchinson, also from the RVC, has a long-standing interest in outsized creatures, the duo decided to find out how the massive mammals’ movements compared with those of other four-legged creatures.

But before Basu, Hutchinson and the RVC’s Alan Wilson could begin getting to grips with the giraffes at Whipsnade Zoo, UK, the trio had to install a massive force plate runway in the animals’ enclosure to measure the forces that they

exert on the ground while walking and running. ‘We hired a contractor to bring in a digger’, says Basu, who recalls that the massive installation had to be accomplished in a matter of hours while the giraffes waited patiently in an adjacent paddock. After overcoming their initial distrust of the newly laid area, the giraffes were usually happy to follow a tasty willow branch along the track, although they were easily distracted. ‘I have a lot of footage of giraffe chaos’, chuckles Basu. And, despite the keepers’ best efforts to get the stately animals moving faster, they stuck stubbornly to speeds of around  $1 \text{ m s}^{-1}$ .

Eventually, after filming 1500 strides, Basu identified 75 that were recorded fully by the force plates, each taking 2 s; the animals were clearly walking in slow motion. However, when he calculated how fast other animals would move if scaled up to giraffe size, Basu realised that they would also stride at the same rate, because it costs more energy to swing long limbs fast. So giraffes aren’t particularly slow, they’re just making the best of being leggy. However, Basu

was surprised that they would only walk over a narrow range of speeds ( $0.74$  to  $1.3 \text{ m s}^{-1}$ ). ‘I’d go as far as saying that they are lazy walkers’, he chuckles, ‘although if you spend 19 h a day foraging for food, being slow and lazy makes sense’, he adds.

Analysing the force plate measurements to find out how the animals carry their weight, Basu realised that, again, giraffes aren’t so different from other animals, balancing most of their weight on their forelimbs; which makes sense as they carry their heavy 2 m long necks forward. However, when he examined the amount of force exerted on the ground as they shifted up through the gears, the force traces remained unchanged. ‘Usually, we expect peak limb force to go up with speed’, says Basu, explaining that runners on sand leave deeper foot prints than walkers because they exert greater forces; which means that fast-walking giraffes are doing something different. ‘We think that’s because they [giraffes] have long stretchy tendons, which dampen the peak force at faster speeds’, says Basu. And when he investigated how their nodding heads move relative to each step, they were out of sync, possibly helping the animals to save energy, although he suspects that head nodding might be another factor that naturally restricts their top walking speeds.

So, although the giraffes’ reputation for walking in slow motion appears to be justly deserved, their movements are not so different from those of other animals; they’re just more gangly, that’s all.

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