

## INSIDE JEB

## Burly lantern bugs are lightning-fast leapers



When there's a theme running through a family name there must be something in it; planthoppers, treehoppers, froghoppers and leafhoppers (from the Auchenorrhyncha) – all are prodigious jumpers. Most of these insects depend on a catapult mechanism built into their rearmost legs to fire off their ballistic leaps, although few tip the scales at masses in excess of ~20 mg. However, lantern bugs – also members of the Auchenorrhyncha – are the exceptions that prove the rule, weighing in at gargantuan masses in excess of 450 mg; some even reach 720 mg. Yet Malcolm Burrows from the University of Cambridge, UK, and Greg Sutton from the University of Lincoln, UK, knew that catapult take-off mechanisms can only carry an insect so far, becoming less effective in larger insects. So, in 2019, when Burrows had the opportunity to visit Sanjay Sane at the National Center for Biological Sciences, India, he realised that his chance had come to

find out whether lantern bug behemoths depend exclusively on their springy leg catapults, or require a top up from their wings or other leg muscles, to launch leaps.

After filming *Kalidasa lanata* take-offs with Abin Gosh (Tata Institute), Burrows analysed the insects' manoeuvres with Sutton, Gosh and Stephen Rogers (University of Lincoln), revealing that the insects spring into action in less than 5 ms, accelerating at up to  $91 \text{ g}$  to reach take-off speeds up to  $4.65 \text{ m s}^{-1}$  – the equivalent of a 1.7 m human leaping at almost  $400 \text{ m s}^{-1}$ , or  $1440 \text{ km h}^{-1}$ . And when the team calculated the amount of energy required to power these explosive leaps, it was clear that no muscle was powerful enough; the insects must be using energy stored in a catapult spring, just like their smaller cousins.

In addition, when the team analysed the take-offs of another even larger lantern

bug, *Pyrops candelaria*, from movies collected by Burrows in Malaysia in 2004, the insects were also extraordinarily springy, leaving the ground in just 6 ms but at a slightly reduced speed ( $3.9 \text{ m s}^{-1}$ ). And finally, when comparing the lantern bugs' take-offs with those of their smaller planthopper cousins, the team realised that both lantern bugs' leaps were essentially scaled up versions of other more diminutive planthopper take-offs, with no need for an additional boost. One thing is sure, the burly insects' startling launches are so swift that they are likely to outsmart any predator intent on lantern bug for lunch.

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