

# Insights on fast cockroaches can help teach robots to walk

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Close up of a cockroach. Credit: Wikipedia/public domain

Using the example of cockroaches, the Cologne-based zoologist Dr Tom Weihmann and his team were able to show that quickly running insects change their gait at mid-speed. This behaviour has previously only been observed in fast mammals. This change in gait is similar to the way horses change from trot to gallop. The results of the study have now been published in the journal *Frontiers in Zoology*.

'I was particularly surprised that a change in mechanisms stabilizing the

animal's movement goes hand in hand with a change in leg coordination', Weihmann notes. An insect's slow run is very stable because its centre of gravity is low and three legs are always moving in a coordinated manner. The research showed that the change in gait at high speed and on a [slippery surface](#) was accompanied by a change from static to dynamic stabilization. This minimizes the need of the central nervous system to control the motion while attaining high [energy](#) efficiency.

'This discovery not only has far-reaching implications regarding the behaviour and ecology of insects and other arthropodes', says Weihmann. 'Our results can also contribute to solving some problems we still have with the movement of robots.'

Robots with legs generally have better cross-country mobility than robots with wheels. Particularly at high running speeds, however, robots use up a lot of energy – in contrast to many animals. Thus, the cockroaches' locomotion pattern could contribute to finding a solution that would let robots run at a high speed with an acceptable expenditure of energy. 'Robots with legs that can be used here on Earth after disasters, or on Mars or other planets, are often modelled on insects', Weihmann explains. 'Adapting the coordination patterns of robot legs to those of fast-running cockroaches can help the [robot](#) use energy more efficiently and hence increase its endurance in an inhospitable environment.'

The scientists used the organism *Nauphoeta cinerea* to study its locomotion on slippery and non-slippery surfaces. The results showed that at high [speed](#), the animals reduce the degree to which their legs move in a synchronized manner. This allowed them to avoid disruptions in their coordination or falls even on slippery surfaces.

**More information:** Tom Weihmann et al. Speed dependent phase shifts and gait changes in cockroaches running on substrates of different slipperiness, *Frontiers in Zoology* (2017). [DOI](#):

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