



Departmental Seminars 2018
Wednesday 8 August 2018 13:00-14:00
HW Pearson Lecture Theatre



**Biosonar Dynamics in
Hipposiderid and
Rhinolophid Bats**

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Abstract:

Using only two pulsed one-dimensional ultrasonic time signals, bats are able to support 3D mobility in complex natural environments. All this is achieved at high speeds and very low computational effort (most bats have brain masses much less than 1 gram). A key feature of sophisticated bat biosonar systems is an additional dynamic dimension that the animals have added to their interfaces for the emission of their ultrasonic pulses and the reception of the returning echoes. Bats change the shape of their noseleaves and pinnae within 1/10 of a second using an intricate muscular actuation system. These shape changes affect the spatial characteristics (beam patterns) of the animals' biosonar system and result in a time-variant periphery. Using numerical and robotic reproductions of the bats' biosonar, we can show that the shape changes allow the animals to vastly increase the amount of sensory information on the direction and the nature of a sound/echo source. Pilot data has demonstrated that speech recognition in the presence of other distracting sounds is substantially improved by a dynamic sensory periphery that mimics bat ears. Dynamic sensing paradigms inspired by bats could hence have wide applicability for difficult, real-world sensory tasks, e.g., in the navigation of small autonomous systems (aerial and underwater), speech recognition, sensing of vegetation for precision agriculture and forestry, biomedical ultrasound, as well as monitoring of machinery and civil-engineering structures.



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**Evolution of soil organic matter
decomposition mechanisms during
humus genesis, and impact on soil
microbial populations**

**Le-Liesse Vermeire
Postdoctoral Fellow, UCT**



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