# *Strain Sensors*

## Biomimetic Principle

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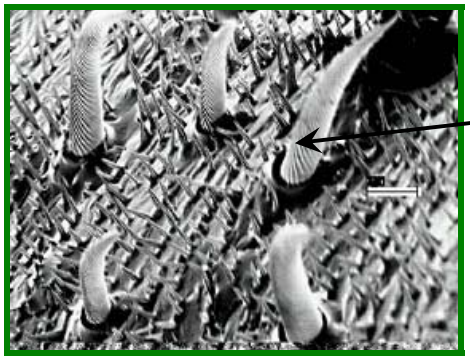
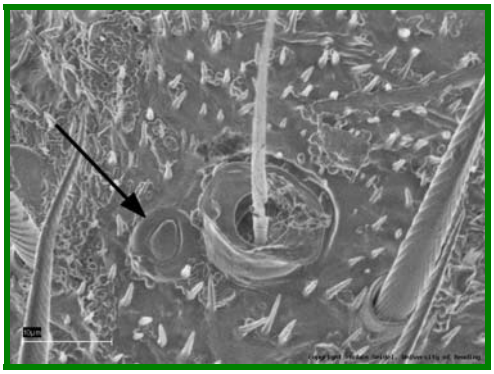
*The cricket Acheta domesticus has two specialized structures at the end of its abdomen, which are called cerci (→).There are up to 3500 sensors on each 2 mm long cerci of the adult cricket.*

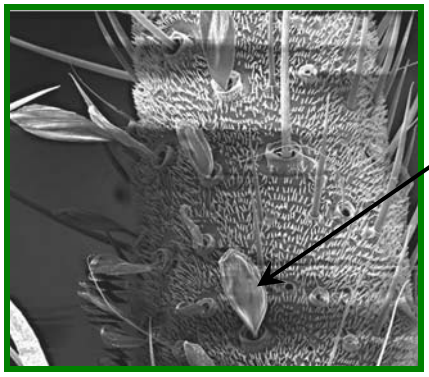
Insects use perturbation of the air-flow field over their bodies, pressure changes and vibrations to detect prey or predator. This is achieved using highly specialised hair sensors.



*About 300 of the sensors are specialised, detecting changes in air flow. They consist of a hair 300-3000µm in diameter, which is anchored into a socket.*



*Often one or more strain sensors are located around the socket*



*Other specialised sensors detect gravitational pull,*

*chemicals, deformation or contact*

***From insects to novel sensing-perception-action systems***

Understanding this complex sensory system will eventually allow us to employ the biological function and mechanical properties of the hairs into Micro Electro Mechanical Systems (MEMS) to create a miniature hybrid model.

***From insects to smart integral strain sensors in composites***

Insects and arthropods have extraordinary sensitive mechanosensors to detect deformations in their exoskeletons. Local modifications of the laminated composite structure of the cuticle are used for mechanical strain amplification.

**Further Information:**

**Papers:**
Skordos, A., P. H. Chan, et al. (2002). "A novel strain sensor based on the campaniform sensillum of insects." Philosophical Transactions of the Royal Society of London Series a-Mathematical Physical and Engineering Sciences **360**(1791): 239-253.
**Websites:**
http://www.rdg.ac.uk/Biomim/projects.htm

## Applications

The chitin fibre architecture around the sensing canals of insects and arthropods can be replicated in man-made composites to introduce integral deformation sensing functions at minimal loss of stiffness and strength

The integration between the mechanical, neurological and signal processing aspects is being investigated to provide information for MEMS-based technologies. Research is ongoing at Reading

## Current Commercial Development

Not yet developed