## **Complex Navigation System**

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Space and defence scientists are studying a complex navigation system that tracks the horizon, detects blue, green and ultra-violet light, has a compass that works on sunlight polarisation, gauges airspeed and changes in direction, and computes how fast images of surrounding objects pass by. No, it is not a secret device stolen from some mysterious military research establishment. It is the bee.

According to a report in *New Scientist* 25 August 2001, p38 scientists and engineers are particularly interested in the bee's ability to navigate very accurately in three dimensions by using optic flow - the movement of images across the field of vision as the bee flies. You will have experienced optic flow as you look out the window of a moving vehicle. Objects that are close to you move across your field of view much faster than those that are far away. Scientists at Australian National University in Canberra are studying optic flow in bees in order to help design navigation systems for military aircraft and robot space explorers that could be sent to other planets.

The reason scientists want to know how bees navigate is that bees only have a brain the size of a sesame seed, so optic flow navigation seems to require much less computer power than other systems of 3D vision. Biomedical scientists are hoping to use the technology to design electronic devices to help blind people move around safely.

**Editorial Comment**: Darwin admitted the eye was a real challenge to his theory, but the eye is only the beginning of understanding how any creature can see as it moves about in a constantly changing environment. The optic flow studies remind us there is far more to vision than good optics. Vision involves collecting images and then processing the characteristics of the image, including movement, into useful information about the surrounding environment. This requires a brain that also matches the visual information with information from other senses. Machine vision has been one of the greatest challenges to engineers and they are turning to biological systems more and more for clues. Isn't it about time they acknowledged that the biological systems were designed by a smarter engineer? (Ref. bee, vision, navigation)