

**Type of communication:**

**Submitted by:** DAINTY, Chris

*National University of Ireland, Galway*  
c.dainty@nuigalway.ie

## ***Adaptive Optics: A Review of a Technology Key for Vision Experiments***

**J C Dainty**

Adaptive optics was invented by an astronomer, Horace Babcock, in 1953, with the goal of obtaining diffraction-limited resolution in the presence of atmospheric turbulence. In vision science, Roorda and Williams produced the first images of human cones in vivo in 1999 [1], and recently Dubra [2] and others have obtained images of rods in vivo. Apart from imaging the retina, adaptive optics has been used in vision experiments, for example to understand the role of aberrations in visual perception and to demonstrate artificially induced improved acuity ("super-vision"). Adaptive optics also plays an important role in vision simulation for the testing of new designs of intra-ocular lenses and contact lenses.

In this talk I will describe adaptive optics technology for vision experiments. The key components are the wavefront sensor, the wavefront modulator (deformable mirror or liquid crystal spatial light modulator) and the control computer. For vision experiments, these elements have to be integrated into a procedure for carrying out psychophysical tests, such as contrast threshold sensitivity or visual acuity.

With the current state of the technology, the adaptive optics required for vision experiments is overly complex and difficult to implement, although one commercial instrument has recently become available [3]. I shall explore the possibilities for simplifying the optics to the point where it might be more widely used in vision experiments.

### References

- [1] Roorda, A and Williams, D R (1999) "The arrangement of the three cone classes in the human eye", *Nature* 397 520.
- [2] Dubra, A, this workshop.
- [3] <http://www.imagine-eyes.com/content/view/39/99/>

Acknowledgements. I am grateful to Science Foundation Ireland for support (07/IN.1/1906).