

## York Vision Group

York University, Toronto

Annual Report, July 1988 to June 1989

### **Faculty**

- Stuart Anstis      Professor of Psychology.  
Principal Investigator in the Human Performance in Space  
Laboratory.  
Interests: spatio-temporal aspects of vision including visual  
motion.
- Otmar Bock Scientist in the Human Performance in Space Laboratory.  
Adjunct Assistant Professor of Psychology.  
Interests: intersensory and sensory-motor coordination.
- Howard Flock      Professor of Psychology.  
Interests: achromatic brightness perception and the judgment  
of visual surfaces and spatial arrangements.  
Howard was on sabbatical leave during 1988-89.
- Keith Grasse      Assistant Professor of Psychology.  
Interests: the electrophysiology of the visual system.
- Ian Howard      Professor of Psychology.  
Director of the Human Performance in Space Laboratory.  
Interests: space perception; eye movements; visual-vestibular  
interactions.
- Peter Kaiser Professor of Psychology.  
Interests: colour vision, sensory processes, physiological  
optics, human factors.  
Chairman of CIE Technical Committee 1-20 and Optical  
Society of America delegation to Inter-Society Colour  
Council. Member of CIE Executive Committee and Board of  
Lighting Research Inst.
- Masao Ohmi      Scientist in the Human Performance in Space Laboratory.

Adjunct Assistant Professor of Psychology.  
Interests: oculomotor system and visual-vestibular interactions.

Hiroshi Ono Professor of Psychology.

Principal Investigator in the Human Performance in Space Laboratory.

Interests: the visual perception of direction and distance; eye movements.

David Regan Professor of Psychology at York University.

Professor of Ophthalmology at the University of Toronto.

Principal Investigator in the Human Performance in Space Laboratory. Interests: visually evoked potentials; visual and auditory disorders; psychophysics of visual motion; stereopsis and colour vision; auditory psychophysics; vision in aviation.

David was appointed a Fellow of the Royal Society of Canada in April, 1989.

Paul Stager Professor of Psychology.

Interests: Human factors in aerospace performance.

Paul is Canadian representative to the Council of the International Ergonomics Association, IEA Liaison Officer and Executive Council member of the Human Factors Association of Canada.

Martin Steinbach Professor of Psychology.

Adjunct Professor of Ophthalmology University of Toronto.

Interests: eye movements; visual-motor coordination; Clinical disorders of the oculomotor system.

Martin was on sabbatical leave during 1988-89.

### **Research Associates**

Marian Regan Working with David Regan on time-series analysis of evoked potentials.

Nancy Rush-Smith Working with Steinbach on visual adaptations in enucleated children at the Hospital for Sick Children.

### **Post Doctoral Fellows**

Karin Arnold Working with Anstis on motion perception.

Linda Bowns Working with Ono on the psychophysics of space perception.

Tom Heckmann Working with Howard on illusions of self motion and visual motion.

Xiang-Hua Hong Working with Regan on visual psychophysics.

Angela Kothe Working at the Toronto Western Hospital with Regan on visual disorders in neurological patients.

Yasuhisa Nakano Working with Kaiser on colour vision.

Bill Simpson Working with Howard on mechanisms of spatial orientation.

**Graduate students (supervisors)**

Bob Cheung (Howard)

Carol Dengis (Steinbach)

Debbie Giaschi (Anstis) Debbie won an NSERC Post-Doctoral Fellowship.

D. Hameluck (Stager)

Haruo Hibino (Kaiser) Haruo had his Government of Canada grant renewed.

Lynn Kirshner (Steinbach)

Alistair Mapp (Ono)

Christine Marton (Howard)

Chieko Murasugi (Howard) Chieko won an NSERC Post-Doctoral Fellowship

Steven Nusinowitz (Flock)

Maureen Reed (Anstis) Maureen had a baby boy and had her NSERC award renewed.

Peter Oberle (Flock) Peter obtained his Masters Degree in April, 1989.

James Tam (Ono)

James Zacher (Howard)

## Research Grants

|                                   |   |
|-----------------------------------|---|
| <b>Anstis</b>                     | <b>NSERC Operating Grant</b> (new) for work on visual motion.   |
| <b>Flock</b>                      | <b>Faculty of Arts Grant.</b>   |
| <b>Grasse</b>                     | <b>NSERC Operating Grant</b> (continuation) for visual electrophysiology.<br><b>NSERC Equipment Grant.</b><br><b>MRC Operating Grant</b> (continuation) for oculomotor studies of brainstem.  |
| <b>Howard</b>                     | <b>NSERC Operating Grant</b> (continuation) for work on visual stability.<br><b>DCIEM Contract</b> for work on the visual-vestibular system.  |
| <b>Howard,Regan</b>               | <b>Province of Ontario grant</b> (5 years) for a Human Performance Laboratory in the Institute of Space and Terrestrial Science.  |
| <b>Anstis, Ono,</b>               |   |
| <b>Grasse</b>                     | <b>NSERC Operating Grant</b> (continuation) to work on colour vision.   |
| <b>Kaiser</b>                     | <b>President's NSERC Grant.</b>   |
| <b>Ono</b>                        | <b>NSERC Operating Grant</b> (continuation)to work on binocular vision.   |
| <b>Regan</b>                      | <b>NSERC Operating Grant</b> (new) Visual motion and form.<br><b>MRC Operating Grant</b> (new) Sensory deficits from cortical lesions.<br><b>NIH grant</b> Visual deficits in multiple sclerosis.<br><b>U.S. Air Force Grant</b> to buy a neuromagnetometer.<br><b>U.S. Air Force Grant</b> (new) Form and depth from motion.   |
| <b>Stager</b>                     | <b>Department of National Defence</b> to evaluate prototype avionics.<br><b>Indal Techologies Inc.</b> Human-factors evaluation of display system.<br><b>Transport Canada,</b> Air Traffic Services Contract to study air traffic control.<br><b>DCIEM contract</b> The peripheral vision horizon display.<br><b>Transport Canada</b> (Arnott Group) Evaluate air traffic control workstations. |
| <b>Steinbach</b>                  | <b>NSERC Operating Grant</b> (continuation) to work on eye movements.   |
| <b>Steinbach, Ono,Gallie,Chew</b> | <b>NIH Grant</b> (continuation) for work on adaptations to monocular enucleation.   |

Total annual value of grants \$2,200,000

## Books

- Regan, D. *Human Brain Electrophysiology: Evoked Potentials and Evoked Magnetic fields in Science and Medicine*. New York: Elsevier, 1989, 672 pp.
- Regan, D. (Ed.) *Spatial Vision* (Volume 10 in "Vision and visual dysfunction" series). London: Macmillan, 1989, in press.
- Regan, D. (Ed.) *Binocular Vision* (Volume 11 in "Vision and visual dysfunction" series). London: Macmillan, 1989, in press
- Ono, H., Wagner, M. and Ono, K. S. *Psychophysics II: precision and accuracy*. (Educationa Computer Package). Iowa City: Conduit, in press.

## Chapters in Books

- Anstis, S. M. The chopstick illusion: Movements of intersections are hard to see. In Troscianko, T. (Ed.) *Artificial intelligence and the eye*. in press.
- Anstis, S. M. Models and experiments on directional selectivity. In Elsendoorn, B. (Ed.) *Working models of human perception*. 1988, London: Academic Press.
- Ono, H. Binocular visual directions of an object when seen as single or double. In D. Regan (Ed.), *Vision and visual dysfunction, Vol 10A, Binocular Vision*. London: MacMillan, in press.
- Regan, D., Frisby, J., Poggio, G., Schor, C. and Tyler, C. W. The perception of stereo depth: cortical mechanisms. In L. Spillman and J.S. Werner (Eds.) *The Neurophysiological Foundations of Visual Perception..* New York: Academic Press, in press.
- Regan, D. Detection and spatial discriminations for objects defined by colour contrast, binocular disparity and motion parallax. In D. Regan (Ed), *Spatial Vision*. London: Macmillan, in press.
- Bodis-Wollner, I. and **Regan, D.** Spatio-temporal contrast vision in Parkinson's disease and MPTP treated monkeys: the role of dopamine. In D. Regan (Ed), *Spatial Vision*. London: Macmillan, in press.
- Collewijn, H., Steinman, R. M., Erkelens, C. J. and **Regan, D.** (1989) Binocular fusion, stereopsis and stereoacuity with a moving head. In D Regan (Ed.) *Binocular Vision*. London: Macmillan, in press.
- Regan, D. Visual sensory loss in patients with Parkinson's disease. In I. Bodis-Wollner, M. Piccolino (Eds.), *Dopaminergic Mechanisms in Vision. Neurology and Neurobiology*, 43. New York: A.R. Liss, 1988, pp. 221-226.
- Regan, D. Human evoked potentials. In T. W. Picton (Ed.) *Handbook of Electrophysiology and Clinical Neurophysiology*. Vol. 3. Amsterdam: Elsevier, pp 159-244.
- Regan, D. To what extent can visual defects caused by multiple sclerosis be understood in terms of parallel processing? In B. Cohen (Ed.) *Vision and the*



- Brain: the Organization of the Central Nervous System*. New York: Raven, in press.
- Regan, D. Acute spatial discriminations and the unconfounding of visual information. In J. J. Kulikowski (Ed.) *Seeing Colour and Contour*. In press.
- Regan, D. A brief review of some of the stimuli used to investigate spatial vision. In D. Regan (Ed.) *Vision and Visual Dysfunction*. Vol. 10B. London: MacMillan, in press.
- Regan, D. Spatial vision in Multiple sclerosis. In D. Regan (Ed.) *Vision and Visual Dysfunction*, Vol. 10B. London: MacMillan, in press.
- Regan, D. The perception of motion in depth. In Regan, D. (Ed.) *Vision and Visual Dysfunction*, Vol. 10A. London: MacMillan, in press.
- Bodis-Wollner, I. and **Regan, D.** Spatio-temporal contrast vision in Parkinson's Disease and MPTP treated monkeys: The role of dopamine. In D. Regan (Ed.) *Vision and Visual Dysfunction*, Vol. 10B. London: MacMillan, in press.
- Regan, M. P. A method for characterizing rectifier-type nonlinearities. Appendix in D. Regan, *Human Brain Electrophysiology*. Elsevier, in press.
- Regan, M. P. and Regan, D. Evoked potential investigations of nonlinear processing stages in human spatial vision. In J. J. Kulikowski (Ed.) *Seeing Colour and Contour*. In press.

### **Papers in Refereed Journals**

- Anstis, S. M. Spatial and temporal context affects correspondences in apparent motion. *Physica Scripta*, 1989, 39, 122-127.
- Maurer, D., Lewis, T., Cavanagh, P. and **Anstis, S. M.** A new test of luminous efficiency for babies. *Investigative Ophthalmology and Visual Science*, 1989, 30, 297-303.
- Cavanagh, P. and **Anstis, S. M.** The contribution of color to motion in normal and color-deficient observers. *Journal of the Optical Society of America*, in press.
- Anstis, S. M. (in press) Spatial tuning of the motion aftereffect as a function of retinal eccentricity. *Vision Research*, in press.
- Anstis, S. M. Pictures of Fourier series. *Journal of Recreational Mathematics*, in press.
- Cheung, B. and Howard, I. P. Circularvection about horizontal axes in bilateral labyrinthine-defective subjects. *Acta Otolaryngologica*, in press.
- Maurer, D., Lewis, T., Cavanagh, P., and **Anstis, S. M.** Luminous efficiency of colors in infant vision. *Investigative Ophthalmology and Visual Science*, in press.
- Flock, H. R. and Nusinowitz, S. Specularity, brightness, achromatic color and orthogonality. *Perception and Psychophysics*, in press.
- Giaschi, D. and Anstis, S. M. The less you see it, the faster it moves: Shortening the "on-time" speeds up apparent motion. *Vision Research*, 29, 335-347.
- Grasse, K. L. and Cynader, M. S. The effects of visual cortex lesions upon vertical optokinetic nystagmus in the cat. *Brain Res*, 1988, in press.
- Hong, X. and Regan, D. Visual field defects for unidirectional and oscillatory motion in depth. *Vision Research*. 1989, in press.
- Howard, I. P., Giaschi, D. and Murasugi, C. M. Suppression of OKN and VOR by afterimages and imaginary objects. *Experimental Brain Research*, 1989, 75, 139-145.
- Howard, I. P. and Heckmann, T. Circularvection as a function of the relative sizes, distances and positions of two competing visual displays. *Perception*, 1989, in press.
- Howard, I. P. and Simpson, W. Human optokinetic nystagmus is linked to the stereoscopic system. *Experimental Brain Research*, in press.
- Kaiser, P., Ayama, M. and Nakatsue, T. Constant hue loci of unique and binary balanced hues at 10, 100 and 1000 td. *Journal of the Optical Society of America*, A, in press.
- Mapp, A. P., Barbeito, R., Bedell, H. E., and Ono, H. Visual localization of briefly presented peripheral targets. *Biological Cybernetics*, in press.
- Moidell B., Steinbach M. J. and Ono H. Egocenter location in children enucleated at an early age. *Investigative Ophthalmology and Visual Science*, in press.

- Murasugi, C. M. and Howard, I. P. Human horizontal optokinetic nystagmus elicited by the upper versus the lower visual fields. *Visual Neuroscience*, 1989, 2, 73-79.
- Murasugi, C. M. and Howard, I. P. Up-down asymmetry in human vertical optokinetic nystagmus and afternystagmus. *Experimental Brain Research*, 1989, in press.
- Murasugi, C. M., Howard, I. P. and Ohmi, M. Human optokinetic nystagmus: Competition between stationary and moving displays. *Perception and Psychophysics*, 1989, 45, 137-144.
- Ohmi, M. and Howard, I. P. Effect of stationary objects on illusory forward motion induced by a looming display. *Perception*, 1989, 17, 5-12.
- Ono, H., Rogers, B.J., Ohmi, M. and Ono, M. E. Dynamic occlusion and motion parallax in depth perception. *Perception*, in press.
- Regan, D. Low-contrast acuity test for paediatric use. *Canadian Journal of Ophthalmology*, 1988, 23, 224-227.
- Regan, D. Orientation discrimination for objects defined by relative motion and objects defined by luminance contrast. *Vision Research*, in press.
- Regan, D. Shape discrimination for motion-defined objects. *Perception*, 1989, in press.
- Regan, D. Magnetic fields generated by the human brain. *Canadian Research*, 1989, 22, 11-15.
- Regan, M. P. and Regan, D. A frequency domain technique for characterizing nonlinearities in biological systems. *Journal of Theoretical Biology*, 1988, 133, 293-317.
- Regan, M. P. and Regan, D. Objective investigation of visual function using a nondestructive zoom-FFT technique for evoked potential analysis. *Canadian Journal of Neurological Science*, 1989, in press.
- Simpson, W. A. The method of constant stimuli is efficient. *Perception and Psychophysics*, 1989, 44, 433-436.
- Simpson, W. A. Depth discrimination from optic flow. *Perception*, 1988, 17, 423-560.
- Gonzalez, E. G., **Steinbach, M.J.**, Ono, H. and Wolf, M. E. Depth perception in children enucleated at an early age. *Clinical Vision Science*, in press.

### **Published Proceedings**

- Sekuler, R., **Anstis, S. M.** et al. Mechanisms of motion perception: A review *Proceedings of the Wiesbaden Conference*, Germany, 1987.
- Anstis, S. M. Kinetic edges become displaced, segregated, and invisible. In Lam, D. and Gilbert, C. (Eds.) *Proceedings of the Second Retina Research Foundation Conference*, in press.

- Cheung, B. S. K., Howard, I. P. and Money, K. Visual-vestibular interactions during parabolic flight. *Proceedings of the Second Canadian Workshop on the Opportunities for Microgravity Sciences on Board the Space Station*. Ottawa, May, 1989.
- Howard, I. P. Perception of egocentric direction. *Proceedings of the NASA Conference on Spatial Displays and Spatial Instruments*. Ames Research Centre, 1988, in press.
- Howard, I. P. Adaptations to transformations of the optic array. *Proceedings of the 4th International Symposium on Prebyopia*, Marrakech, June, 1989.
- Howard I. P., Cheung, B. and Landolt, J. Influence of vection axis and body posture on visually-induced self rotation. *AGARD Proceedings*, 1988, 433, 15-1 to 15-8.
- Howard, I. P., Ohmi, M. and Landolt, J. Vection and the spatial disposition of competing moving displays. *AGARD Proceedings*, 1988, 433, 16-1 to 16-8.
- Regan, D. and Regan, M. P. Ultra-high resolution analysis of auditory and visual brain responses using zoom-FFT. *Proceedings of the 7th International Conference on Biomagnetism*, 1989, in press.
- Regan, D. Frisby, J. et al. The perception of stereo depth: cortical mechanisms. *Proc. of the Conference on Neurophysiological Foundations of Visual Perception*. 1988, Freiburg.
- Regan, M. P. and Regan, D. A. frequency domain technique for using evoked magnetic fields to test multi-stage models of sensory processing. *Proceedings of the 7th International Conference on Biomagnetism*, 1989, in press.
- Steinbach, M. J. Behavioral and anatomical evidence for ocular muscle proprioception. In O. Tamura & J. Tsutsui (Eds.) *Proceedings of the International Workshop on Proprioception of the Ocular Muscles*.

### **Technical Reports**

- Howard, I. P. An investigation of induced self-rotation as a function of body posture and axis of scene rotation. Final Report for Contract 97711-4-7936-1, Defence and Civil Institute of Environmental Medicine, July, 1988.
- Howard, I.P. Illusory self motion and disorientation. Final Report for Contract W7711-7-7012/01-SE, Defence and Civil Institute of Environmental Medicine, May, 1989.

### **Talks and Abstracts**

- Anstis, S. Luminance edges can kill motion. *Investigative Ophthalmology and Visual Science*, 1989, 30, 427.

- Grasse, K.L., Douglas, R.M., and Mendelson, J.R. Amphetamine increases receptive field size in the superficial layers of cat colliculus. *Soc. Neurosci. Abstr.*, 1988, 14
- Howard, I. P. A three-dimensional approach to vection and visual pursuit. Paper presented to the *2nd Annual Conference of the Ontario Vision Society*, Sept. 24th., 1988.
- Howard, I. P. Mechanisms of human spatial orientation. Paper presented to the *5th Annual Conference of Canadian Aeronautics and Space Institute*, Ottawa, Nov. 17th., 1988.
- Murasugi, C. M. and Howard, I. P. Human vertical optokinetic nystagmus: up-down asymmetry with and without central retinal stimulation. Poster presented to the *18th Annual Meeting of the Society for Neuroscience*, Toronto, Nov. 18th., 1988.
- Murasugi, C. M. and Howard, I. P. Human vertical OKN and OKAN: Directional asymmetries and stimulus position. *Investigative Ophthalmology and Visual Science*, 1989, 30, 49.
- Howard, I. P. Visual stability and the perception of self motion in a three-dimensional world. Invited address to the *NASA Workshop on Visually Guided Control of Movement*. Ames Research Center, June, 1989.
- Howard, I. P. Mechanisms of human spatial orientation on earth and in space. Guest speaker at the *Symposium on Frontiers in Physiology and Pharmacology*. University of Toronto, April, 1989.
- Howard, I. P. and Simpson, W. Human optokinetic nystagmus: gain as a function of retinal disparity. *Investigative Ophthalmology and Visual Science*, 1989, 30, 49.
- Heckmann, T. and Howard, I. P. Induced visual motion: dissociation of exocentric and egocentric components. *Investigative Ophthalmology and Visual Science*, 1989, 30, 74.

## **Colloquia**

### **Stuart Anstis**

Tübingen University. June, 1988.

Tübingen Max Planck Institute. June, 1988.

Institute for Psychological Medicine, Munich. July, 1988.

Institute for Perceptual Research, Eindhoven. July, 1988.

### **Ian Howard**

Department of Physiology, University of Toronto, April, 1989.

### **Plans for the Coming Year**

Dr. Tiande Yang, Head, Research Labs of Environmental Medicine in Space Cabin, Institute of Space Medico-Engineering, Beijing, will be visiting the Institute of Space and Terrestrial Science for one year from August, 1988.

Dr. Kenzo Sakurai, Associate Professor, Liberal Arts Department, Tohoku Gakuin University, Sendai will be visiting the Institute of Space and Terrestrial Science for 1 year from August 1, 1988.

Dr. Masaaki Ohkura, Associate Professor of Psychology will be visiting York University for one year from April 1, 1989.

Dr. Koichi Shibuta, from Kyshu University will be starting as a Post-doctoral Fellow in March, 1989.

