

# York Vision Group

York University, Toronto

Annual Report, July 1987 to June 1988

## Faculty

Stuart Anstis Professor of Psychology.  
Principal Investigator in the Human Performance in Space Laboratory.  
Interests: spatio-temporal aspects of vision including visual motion.  
Stuart was on sabbatical leave during 1987-88 and spent some time at the University of California at San Diego.

Otmar Bock Scientist in the Human Performance in Space Laboratory.  
Adjunct Assistant Professor of Psychology from September, 1988.  
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 will be 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.  
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.

Hiroshi was on sabbatical leave during 1987-88 and spent two months in Japan as a guest of the Japanese Government.

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.

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.

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

During 1987-88 Martin had a Research Fellowship, was elected Fellow of the Canadian Psychological Association, appointed Adjunct Professor of Ophthalmology at the University of Toronto and gave the Atkinson College Distinguished Faculty Lecture. He is 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 with Regan on visual disorders in neurological patients.
- Bonnie Moidell Bonnie was working with Steinbach and Ono until shortly before she died of cancer in the Fall of 1987.
- Yasuhisa Nakano Working with Kaiser on colour vision.
- Bill Simpson Working with Howard on mechanisms of spatial orientation.

### **Graduate students (supervisors)**

- Richard Bird (Howard) Richard left in June to study journalism.
- Bob Cheung (Howard) Bob was awarded his M. Sc.
- Carol Dengis (Steinbach)
- Debbie Giaschi (Anstis) Debbie won an Ontario Graduate Scholarship.
- Hameluck, D. (Stager)
- Haruo Hibino (Kaiser) Haruo had his Government of Canada grant renewed.
- Lynn Kirshner (Steinbach)
- Alistair Mapp (Ono)
- Chieko Murasugi (Howard)
- Steven Nusinowitz(Flock)
- Maureen Reed (Anstis) Maureen had her NSERC award renewed.
- Peter Oberle (Flock)

Josée Rivest (Ono)

Josée obtained her M.A. and left for University of Montreal.

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. <b>NSERC Equipment Grant.</b> <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. <b>DCIEM Contract,</b> for work on the visual-vestibular system. <b>DCIEM Contract,</b> for work on illusory self motion.
<b>Howard,Regan Anstis, Ono and Grasse</b>	<b>Province of Ontario grant</b> (5 years) for a Human Performance Laboratory in the Institute of Space and Terrestrial Science.
<b>Kaiser</b>	<b>NSERC Operating Grant</b> (continuation) to work on colour vision. <b>President's NSERC Grant.</b>
<b>Ono</b>	<b>NSERC Operating Grant</b> (continuation) to work on binocular vision. <b>Japanese Government Research Award</b> for Foreign Specialists.
<b>Regan</b>	<b>NSERC Operating Grant,</b> (new) Visual motion and form. <b>MRC Operating Grant</b> (new) Sensory deficits from cortical lesions. <b>NIH grant</b> Visual deficits in multiple sclerosis. <b>U.S. Air Force Grant</b> to buy a neuromagnetometer. <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. <b>Indal Technologies Inc.</b> Human-factors evaluation of display system. <b>Transport Canada,</b> Air Traffic Services Contract to study air traffic control. <b>DCIEM contract</b> The peripheral vision horizon display. <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</b>	<b>Atkinson College Grant.</b>
<b>Steinbach, Ono</b>	
<b>Gallie, Chew</b>	<b>NIH Grant</b> (continuation) for work on adaptations to monocular enucleation.

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

## Books and Chapters in Books

- 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.
- Ono, H., Wagner, M. and Ono, K. S. Psychophysics II: precision and accuracy. (Educationa Computer Package). Iowa City: Conduit, in press.
- Regan, D. *Human Brain Electrophysiology: Evoked Potentials and Evoked Magnetic fields in Science and Medicine*. New York: Elsevier, in press.
- 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. Visual sensory loss in patients with Parkinson's disease. In I. Bodis-Wollner (Ed.) *Dopaminergic Mechanisms in Vision*. New York: A. R. Liss, in press.
- Regan, M. P. A method for characterizing rectifier-type nonlinearities. Appendix in D. Regan, *Human Brain Electrophysiology*. Elsevier, 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. 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.

Steinbach, M.J., Musarella, M., and Gallie, B. Extraocular muscle proprioception and visual function: Psychophysical aspects. In G. Lennerstrand, G. von Noorden & E. Campos (Eds.) *Strabismus and Amblyopia: Experimental Basis for Advances in Clinical Management*. London: Macmillan, 1988, pp.327-336.

## Papers in Refereed Journals

- Anstis, S. M., Cavanagh, P., Maurer, D. and Lewis, T. Optokinetic technique measures infants' responses to color. *Applied Optics*, 1987, 26, 1510-1516.
- Cavanagh, P. Macleod, D. I. A. and **Anstis, S.M.** Equiluminance: spatial and temporal factors and the contribution of blue-sensitive cones. *Journal of the Optical Society of America, A*, 1987, 4, 1428-1438.
- Anstis, S. M. and Harris, J. P. Magnification factor for adaptation of a visual transient mechanism. *Journal of the Optical Society of America, A*, 1987, 4, 1688-1698.
- Anstis, S. M. Spatial and temporal context effects in apparent motion. *Scandinavian Journal of Physics*, in press.
- Maurer, D., Lewis, T., Cavanagh, P., **Anstis, S. M.** A new test of luminous efficiency in babies. *Investigative Ophthalmology and Visual Science, A*, in press.
- 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, A*, in press.
- Anstis, S. M. Spatial tuning of the motion aftereffect as a function of retinal eccentricity. *Vision Research*, in press.
- Anstis, S. M. and Harris, J. P. Magnification factor for adaptation of a visual transient mechanism. *Journal of the Optical Society of America, A*, in press.
- Cavanagh, P. Macleod, D. I. A. and **Anstis, S. M.** Contribution of red, green and blue cones to the luminance pathways: Spatial and temporal factors. *Vision Research*, 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., Anstis, S. M. The less you see it, the faster it moves: Speed of apparent motion varies with duty cycle. *Vision Research*, in press.
- Grasse, K. L. and Cynader, M. S. The accessory optic system of the monocularly deprived cat. *Developmental Brain Research*, 1987, 31, 229-241.
- 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.
- Howard, I. P. and Gonzalez, E. G. Optokinetic nystagmus in response to moving binocularly disparate stimuli. *Vision Research*, 1987, 27, 1807-1816.



- Howard, I. P., Giaschi, D. and Murasugi, C. M. Suppression of OKN and VOR by afterimages and imaginary objects. *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., & 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*, in press.
- Murasugi, C. M., Howard, I. P. and Ohmi, M. Human optokinetic nystagmus: competition between stationary and moving displays. *Perception and Psychophysics*, in press.
- Ohmi, M., Howard, I. P. and Landolt, J. Circular vection as a function of foreground-background relationships. *Perception*, 1987, 16, 17-22.
- Ohmi, M. and Howard, I. P. Effect of stationary objects on illusory forward motion induced by a looming display. *Perception*, 1988, 17, 5-12.
- Higashiyama, A. and **Ono, H.** "Koko," "soko" and "asoko" ("here" and "there") as visual dividers of space. *Japanese Psychological Research*, 1988, 30, 18-24.
- Ono, H., Rogers, B.J., Ohmi, M. & Ono, M. E. Dynamic occlusion and motion parallax in depth perception. *Perception*, in press.
- Regan, D. and Regan, M. P. Objective evidence for phase-independent spatial frequency mechanisms in the human visual pathway. *Vision Research*, 1988, 28, 187-191.
- Regan, D. and Regan, M. P. Nonlinearity in human visual response to two-dimensional patterns and a limitation of Fourier methods. *Vision Research*, 1987, 27, 2181-2183.
- Regan, D. and Regan, M. P. The transducer characteristics of hair cells in the human inner ear: a possible objective measure. *Brain Research*, 1988, 438, 363-365.
- Regan, D. Low contrast letter charts and sinewave grating tests in ophthalmological and neurological disorders. *Clinical Vision Science*, 1988, 2, 235-250.
- Regan, D. Low-contrast acuity chart for paediatric use. *Canadian Journal of Ophthalmology*, in press.
- Regan, M. P. and Regan, D. A frequency domain technique for characterizing nonlinearities in biological systems. *Journal of Theoretical Biology*, in press.

Simpson, W. A. The method of constant stimuli is efficient. *Perception and Psychophysics*, in press.

Steinbach, M. J. Anatomy and function of the eye's proprioceptors: Can they specify eye position? *Neuro-ophthalmology, Japan*, 1987, 4, 40-41.

Steinbach, M. J. Spatial localization after strabismus or enucleation surgery: evidence for inflow. *Neuro-ophthalmology, Japan*, 1987, 4, 50-51.

Steinbach, M. J., Kirshner, E. L., and Arstikaitis, M. J. Recession vs. marginal myotomy surgery for strabismus: Effects on spatial localization. *Investigative Ophthalmology and Visual Science*, 1987, 28, 1870-1872.

Steinbach, M. J. Proprioceptive knowledge of eye position. *Vision Research*, 1987, 27, 1737-1744.

Steinbach, M. J., Smith, D. R. and Crawford J. S. Egocentric localization changes following unilateral strabismus surgery. *Journal of Pediatric Ophthalmology and Strabismus*, 1988, 25, 115-118.

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.

Tam, W. J., and Ono, H. Zero horizontal disparity in binocular depth mixture stimuli. *Vision Research*, 1987, 27, 1207-1210.

## **Published Proceedings**

Anstis, S. M. Models and experiments on directional selectivity. *Proceedings of the IPO Conference, Eindhoven*, 1987, in press.

Sekuler, R., **Anstis, S. M.** et al. Mechanisms of motion perception: A review *Proceedings of the Wiesbaden Conference, Germany*, 1987, in press.

Hameluck, D., and Stager, P. Peripheral vision horizon display: A review. *Proceedings of the Fourth International Symposium on Aviation Psychology, Columbus, Ohio*. 1987.

Howard, I. P. Perception of egocentric direction.. *Proceedings of the NASA Conference on Spatial Displays and Spatial Instruments. Ames Research Centre*, in press.

Howard, I. P., Ohmi, M., Simpson, W. A. and Landolt, J. Vection and the spatial disposition of competing moving displays. *AGARD Proceedings*, 1988, 375, in press.

Howard I. P., Cheung, B. and Landolt, J. Influence of vection axis and body posture on visually-induced self rotation. *AGARD Proceedings*, 1988, 375, in press.

Murasugi, C. M. and Howard, I. P. Asymmetries in human horizontal OKN. *Proceedings of the Fourth European Conference on Eye Movements. Vol. 1. Hogrefe*: 1987, pp 101-102.

- Stager, P. Air Traffic Control. Invited presentation to the Seminar in transportation ergonomics. *Proceedings of the Transportation Development Centre Seminar in Transportation Ergonomics*, Montreal, October 14, 1987.
- 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, in press.
- Regan, D. and Regan, M. P. 'Dissecting the visual and auditory pathways by means of the two-input technique. *Proc. of the Conference on Electrical and Magnetic Activity of the Central Nervous System*. Trondheim, Norway. AGARD Conf. Proc., 1987, #432, pp. 6-1 to 6-8.
- Regan, D. and Neima, D. Relation between VEP and visual function in lesions of the optic nerve and visual pathway. *Proc. of the Conference on Electrical and Magnetic Activity of the Central Nervous System*. Trondheim, Norway. AGARD Conf. Proc., 1987, #432, pp. 38-1 to 38-8.
- Regan, D. and Regan, M. P. Spatial tuning and disorientational tuning in pattern evoked potentials measured by nonlinear analysis. In Barber, C. (Ed.) *Proceedings of 3rd Internat. Symposium on Evoked Potentials*. Butterworths, 1987.
- 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*. In press.

## **Talks and Abstracts**

- Anstis, S. Models of motion perception. Paper presented at the *1st Annual Conference of Visual Scientists in and around Ontario*, Toronto, October 31, 1988.
- Anstis, S. M. and Ramachandran V. S. Correspondence strength in apparent motion: depth, form and color. *Investigative Ophthalmology and Visual Science*, 1988, 29 (ARVO suppl.), 327.
- Giaschi, D., Anstis, S. M. and Rogers, B. Adaptation to spatially uniform flicker raises the apparent spatial frequency of low-frequency test gratings. *Investigative Ophthalmology and Visual Science*, 1988, 29 (ARVO suppl.), 370.
- Mendelson, J. R., Schreiner, C. E., **Grasse, K. L.**, and Sutter, M. Spatial distribution of responses to FM sweeps in cat primary auditory cortex. *Association for Research in Otolaryngology, Abstract*, 1988.
- Schreiner, C. E., Mendelson, J. R., **Grasse, K. L.** and Sutter, M. Spatial distribution of basic response properties in cat auditory cortex. *Association for Research in Otolaryngology, Abstract*, 1988.
- Grasse, K. L., Douglas, R. M., and Mendelson, J. R. Amphetamine increases receptive field size in the superficial layers of cat colliculus. *Society of Neuroscience, Abstract*, 1988, 14.
- Howard, I. P. Spatial vision within egocentric and exocentric frames of reference. Keynote address to the *NASA Conference on Visual Displays*. Asilomar, California, August, 1987.
- Howard, I. P. Oculomotor mechanisms of visual stability. Invited speaker. *New York Neuroscience Society*, Museum of Natural History, New York, September, 1987.
- Howard, I. P. The stability of the visual world. Invited speaker at the *Human Spatial Orientation Conference*. Eye Research Institute of Ontario, November, 1987.

- Kaiser, P., Vimal, R. P. L. and Hibino, H. Psychophysical test of R-G channel becoming R+G at high temporal frequency. *Investigative Ophthalmology and Visual Science*, 1988, 29 (ARVO Suppl.), 328.
- Murasugi, C. M. and Howard, I. P. Human vertical optokinetic nystagmus: Up-down asymmetry with and without central retinal occlusion. *Society of Neuroscience*, Abstract, 1988, 14.
- Moidell, B., Steinbach, M. and Ono, H. Egocenter location in children enucleated at an early age. Poster presented at the *Association for Research in Vision and Ophthalmology*, Sarasota, 1988.
- Brooks, T. C., **Ono, H.** and Steinbach, M. J. Exafference and reafference as different cues to relative depth. Poster presented at the *Association for Research in Vision and Ophthalmology*, Sarasota, 1988.
- Ono, H. Binocular single vision and visual direction. *Canadian Psychological Society and Experimental psychology Society*, joint meeting, Oxford, 1987.
- Ono, H. Optic flow as reafference and exafference. *The Psychonomic Society*, 1987.
- Ono, H. On motion parallax. Invited paper. *Japan Physiological Optical Society*, 1988.
- Ono, H. On motion parallax and depth perception. Invited paper. *Kansai chikaku hyoron kai and Kansai Psychological Association*, 1988.
- Rogers, B., **Ono, H.**, and Rogers, S. The role of visual and non-visual information in disambiguating motion parallax transformations. *Association for Research in Vision and Ophthalmology*, Sarasota, 1988.
- Reed, M. and Anstis, S. M. Peripheral acuity as a function of stimulus contrast *Investigative Ophthalmology and Visual Science*, 1988, 29 (ARVO suppl.), 139.
- Regan, D. Visual perception of three-dimensional motion and eye-hand coordination. Invited speaker at the *Human Spatial Orientation Conference*. Eye Research Institute of Ontario, November, 1987.
- Regan, D. Vergence eye movements. Paper presented at the *Inaugural Symposium of the Eye Research Institute of Ontario*, April, 1988.
- Regan, D. Visual defects in multiple sclerosis. Paper presented to the *Association for Research in Nervous and Mental Disorders*. New York, 1988.
- Regan, D. Unconfounding simultaneous changes in the visual environment: opponent mechanisms underlying discriminations of orientation, size and separation. Paper presented to the *U. S. Air Force meeting on vision*, Annapolis, 1988.
- Regan, D. Acute spatial discriminations and the unconfounding of visual information. Invited address to the *2nd World Congress of Neuroscience*, Manchester, England, 1988
- Regan, D. Contrast sensitivity loss in multiple sclerosis and Parkinson's disease. Evoked potential investigation of nonlinear processing stages in human spatial vision. Papers presented to the *2nd. World Congress in Neuroscience*, Manchester, England, 1988.
- Regan, D. Gaze control in amblyopia and multiple sclerosis. Paper presented at the *Association for Research in Vision and Ophthalmology*, Sarasota, 1988.
- Regan, D. Form from Motion. Paper presented at the *1st Annual Conference of Visual Scientists in and around Ontario*, Toronto, October 31, 1987.
- Regan, M. P. and Regan, D. Evoked potential investigation of nonlinear processing stages in human spatial vision. Paper presented at the *3rd Internat. Symposium of the Northern Eye Institute*.
- Regan, M. P. A frequency domain method for testing non-linear models in vision and hearing. Paper presented at the *1st Annual Conference of Visual Scientists in and around Ontario*, Toronto, October 31, 1987.
- Simpson, W. A. Discrimination of depth from optic flow. *Queen's Vision Conference*. Kingston, April, 1988.
- Steinbach, M. J. Visual adaptations to removal of an eye at an early age in humans. Paper presented at the *1st Annual Conference of Visual Scientists in and around Ontario*, Toronto, October 31, 1988.

- Steinbach, M. J. Extraocular muscle proprioception and visual function: Psychophysical aspects. Invited symposium paper, *Wenner-Gren Symposium on Strabismus and Amblyopia*, Stockholm, 1987.
- Steinbach, M. J. Proprioceptive knowledge of eye position. Invited symposium paper at joint meeting of *Canadian Psychological Association and British Experimental Psychology Society*, Oxford, 1987.
- Steinbach, M. J., Kirshner, E. L. and M.J. Arstikaitis, M. J. Eye muscle proprioception: Comparing the effects of recessions and marginal myotomies. *Annual Research Day Meeting, Department of Ophthalmology, University of Toronto*, 1987.
- Steinbach, M. J. Symposium Organizer: "Oculomotor Feast" *Inaugural Symposium of the Eye Research Institute of Ontario*, April 1988.
- Tam, W. J. and Ono, H. Visual fixation, pursuit, and saccadic latency. *Association for Research in Vision and Ophthalmology*, Sarasota, 1988.

### **Patents and Reports**

- Hameluck, D. and Stager, P. Fact finding board database system. Report prepared for the *Air Traffic Services Evaluation Division* (Dept. Transport Contract AP-0264) Feb., 1988.
- Stager, P. and Hameluck, D. Factors associated with air traffic control operating irregularities: an analysis of fact finding board reports. Report prepared for the *Air Traffic Services Evaluation Division* (Dept. of Transport Contract AP-0264), Feb., 1988.
- Stager, P. Human factors evaluation of the air traffic controller workstation. Toronto, Canada: Report prepared for *Transport Canada and the Arnott Design Group*, Toronto, 1988.

## **Colloquia**

### **Stuart Anstis**

Department of Psychology, UC Berkeley. Sept, 1987.  
 Ontario Science Centre, May, 1988.  
 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**

School of Optometry, SUNY, New York, Sept. 1987.  
 Department of Psychology, New York University, Sept., 1987.  
 Department of Psychology, Queens University, Nov, 1987.  
 Dolman Society, Toronto, Nov, 1987.

### **Hiroshi Ono**

University of California at Santa Barbara.  
 McGill.  
 University of Hawaii.  
 Smith Kettlewell Institute, San Francisco.  
 University of Tokyo.  
 University of Kyoto.  
 University of Kyushu.  
 Chukyo University.  
 Advance telecommunication research institute, Osaka, Japan.

### **David Regan**

Broadhurst Lecture, Eye Research Institute, Boston.  
 Dept. of Computer Science University of Toronto.  
 Wright-Patterson Air Force Base, Ohio.  
 Playfair Institute, Toronto.  
 Hospital for Sick Children, Toronto.  
 Eye Research Institute, Boston.  
 Dept. Ophthalmology, University of Toronto, Research Day, 1988.  
 Toronto Western Hospital, Research Day, 1988.  
 NRC Aviation Research Facility, Ottawa.  
 Dept. of Physics, York University.  
 Dept. of Physical Education, York University.

### **Marian Regan**

Wright-Patterson Air Force Base, Ohio, May, 1988.

### **Martin Steinbach**

(with S.P. Kraft) Invited talk to the Jampolsky Fellows Meeting, Banff, Alberta, April 1988.  
 Combined Ophthalmology and Neurology Rounds, Henry Ford Hospital, Detroit.  
 Ophthalmology Rounds, Hospital for Sick Children, Toronto.  
 Kellogg Eye Center, Ann Arbor.  
 Vision Group, McMaster University.  
 Psychology Dept., Queen's University.  
 Psychology Dept., York University.

**Vision Group Seminars**

Oliver Braddick	Cambridge.	<i>How long is the short range process?</i>
Hanspeter Molot	Freiburg.	<i>Interaction of modules in depth perception.</i>
Michael Morgan	London University.	<i>Visual integration across saccades.</i>
Takao Sato	Osaka.	<i>Pattern segregation within isoluminant chromatic cinematograms.</i>
Tom Heckmann	York.	<i>Panum's limit, stereothresholds and independent spatial channels.</i>
Karin Arnold	York.	<i>Color discrimination in the turtle Pseudemys Scripta Elegans.</i>
Douglas Watt	McGill.	<i>Measurement of circularvection in space.</i>
Bill Simpson	York.	<i>Depth discrimination from optic flow.</i>
Bob Cole	Hawaii.	<i>Remote viewing systems for flight telerobotics.</i>
Otmar Bock	Dusseldorf.	<i>Interaction of neural signals for visual localization.</i>

## **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 seven months 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.

The first annual conference for Visual Scientists in and around Ontario held at Glendon College in October, 1987 was attended by 70 participants and was very successful.

The second annual Conference will take place at Glendon College on Saturday, September 24.

On September 23 Professor John Kennedy, of the University of Toronto, has organized a conference on Shape from Shading to be held at Scarborough College.



