

York Vision Group

York University, Toronto

Annual Report
July 1, 1989 - June 30, 1990

Faculty

- John Amanatides Assistant Professor of Computer Science
Research Associate in the Human Performance in Space Laboratory
Interests: robotics.
- 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 Professor of Psychology
Interests: sensory-motor coordination and robotics.
- Howard Flock Professor of Psychology
Interests: perception of brightness, visual surfaces and spatial arrangements.
- Keith Grasse Assistant Professor of Psychology
Principal Investigator in the Human Performance and Space Laboratory
Interests: the electrophysiology of the visual system and eye movements.
- Marc Green Associate Professor of Computer Science, Trent University
Adjunct Professor, York University
Interests: visual psychophysics and computer vision.
- Laurence Harris Associate Professor of Psychology
Research Associate in the Human Performance in Space Laboratory
Interests: visual-vestibular system.
- Ian Howard Professor of Psychology
Co-director, Human Performance in Space Laboratory
Interests: space perception, eye movements and visual-vestibular interactions.
- Michael Jenkin Assistant Professor of Computer Science
Research Associate in the Human Performance in Space Laboratory
Interests: computer vision, robotics and image understanding.
- Peter Kaiser Professor of Psychology
Interests: colour vision, sensory processes, physiological optics and human
factors.
- Masao Ohmi Scientist in the Human Performance in Space Laboratory

Adjunct Assistant Professor of Psychology

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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 and eye movements.

Faculty cont'd.

Jonathan Ostroff

Assistant Professor of Computer Science

Research Associate in the Human Performance in Space Laboratory

Interests: computer-graphics.

David Regan

Professor of Psychology at York University

Professor of Ophthalmology and Medicine at the University of Toronto

Co-director, Human Performance in Space Laboratory

Interests: visually evoked potentials, visual disorders, psychophysics of visual motion, stereopsis, colour vision and the auditory system and vision in aviation.

Elected Fellow of the Royal Society of Canada in April, 1989.

Minas Spetsakis

Assistant Professor of Computer Science

Research Associate in the Human Performance in Space Laboratory

Interests: computer vision and robotics.

Paul Stager

Professor of Psychology

Interests: Human factors in aerospace performance and system design

Human engineering implications for automation in air traffic control.

Martin Steinbach

Professor of Psychology

Interim Director of the Eye Research Institute of Ontario

Adjunct Professor of Ophthalmology University of Toronto

Senior Scientist, Dept. of Ophthalmology, Hospital for Sick Children

Interests: eye movements, visual-motor coordination and clinical disorders of the oculomotor system.

Visiting Scientists 1989-90

Jingshen Pei Scientist, Institute of Space Medico-Engineering, Beijing

Brian Rogers University Lecturer, Oxford University

Michael Swanston College of Technology, Dundee

Tiande Yang Scientist, Institute of Space Medico-Engineering, Beijing

Nicholas Wade Professor, University of Dundee, Scotland

Thomy Nielson Professor, University of Prince Edward Island

Research Associates

Peiyuan He Will arrive in October, 1990 to work with David Regan.

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

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

Post Doctoral Fellows

Karin Arnold Working with Otmar Bock on sensory-motor coordination.

Debbie Giaschi
in Working at the Toronto Western Hospital with David Regan on visual disorders neurological patients.

Xiang-Hua Hong Working with David Regan on visual psychophysics.

Angela Kothe
in Working at the Toronto Western Hospital with David Regan on visual disorders neurological patients. Angela left in April, 1990.

Yasuhisa Nakano Working with Peter Kaiser on colour vision until Dec. 1989.

Koichi Shibuta Working with Hiroshi Ono on depth from motion.

Li Sun Will arrive in October, 1990 to work with David Regan.

Graduate students (supervisors)

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Ken Casselman (Grasse)

Bob Cheung (Howard)

Bob obtained his Ph.D. in May, 1990

Carol Dengis (Steinbach)

Debbie Giaschi (Anstis)

Debbie obtained her Ph.D. in January, 1990 and is now a Post-doctoral Fellow at the University of Toronto

Herb Goltz (Steinbach)

Lorraine Gunther (Ono)

Don Hameluck (Stager)

Won a Federal Government Visiting Fellowship in a Canadian Lab

Stan Hamstra (Regan)

Obtained his MA in June 1990 and won an NSERC Graduate Fellowship

Haruo Hibino (Kaiser)

Haruo obtained his Ph.D. in March, 1990 and is now a Research Associate at the University of Tokyo

Sharon McFadden (Kaiser)

Alistair Mapp (Ono)

Christine Marton (Howard)

Chieko Murasugi (Howard)

Chieko obtained her Ph.D. in January, 1990 and is now a Post-doctoral Fellow at Stanford University, Dept. of Neuroscience

Steven Nusinowitz (Flock)

Maureen Reed (Anstis)

Xiaomei Shen (Howard)

James Tam (Ono)

James obtained his Ph.D. in December, 1989 and is now an NSERC Visiting Scientist at the Communication Research Centre, Ottawa

Zhengyan Wang (Jenkin)

James Zacher (Howard)

Anstis	NSERC Operating Grant (continuation) Perception of visual motion DCIEM Contract Work on night-vision devices
Bock	NSERC Grant Eye-hand coordination in microgravity
Bock and Howard	NRC grant NASA microgravity flights
Grasse	NSERC Operating Grant (continuation) Visual electrophysiology NSERC Equipment Grant York University Faculty of Arts Research Fellowship 1989-90
Harris	NSERC Operating Grant (new) Visual-vestibular interactions
Howard	NSERC Operating Grant (new) Mechanisms of visual stability NSERC Equipment Grant DCIEM Contract Visual-vestibular interactions
Howard and Ono	NATO Exchange Grant with N. Wade and M. Swanston at Dundee
Howard, Regan	Province of Ontario Grant (5 years) Human Performance in Space Lab
Anstis, Ono, and	in the Institute of Space and Terrestrial Science
Grasse	
Jenkin	NSERC Operating Grant (new) Environmental layout from stereo information IRIS Network Centre of Excellence
Kaiser	NSERC Operating Grant (continuation) Colour vision President's NSERC Grant Research Contract with Analysis & Technology, Inc.
Ohmi	NSERC Operating Grant Studies of visual heading
Ono	NSERC Operating Grant (continuation) Binocular vision
Ostroff	NSERC Operating Grant (continuation) Design of real time displays NSERC Equipment Grant Research Machine NSERC Infrastructure Grant Research Sun President's NSERC Grants
Regan	NSERC Operating Grant (continuation) Visual motion and form MRC Operating Grant (continuation) Sensory deficits from cortical lesions NIH Grant Visual deficits in multiple sclerosis U.S. Air Force Grant (continuation) Form and depth from motion
Stager	Transport Canada (new) Canadian Automated Air Traffic System (CAATS). Transport Canada (new) Canadian Coast Guard vessel traffic services. Transport Canada (continuation) Error models for air traffic control.
Steinbach	NSERC Operating Grant (continuation) Human Oculomotor Functions York University, Non-leave Research Grant

Total annual value of grants \$1,628,000.

Books

- Regan, D. (Ed.) (1990) *Spatial Vision* (Volume 10 in "Vision and visual dysfunction" series). London: Macmillan, in press.
- Regan, D. (Ed.) (1990) *Binocular Vision* (Volume 9 in "Vision and visual dysfunction" series). London: Macmillan, in press.
- Ono, H. (1990) *Precision and Accuracy with Classical Psychophysical Methods*. (Educational Computer Package). Iowa City: Conduit, in press.

Chapters in Books

- Anstis, S.M. (1989) Kinetic edges become displaced, segregated or invisible. In D.M-K.Lam, and M. Gilbert, M. (Eds.), *Neural Mechanisms of Visual Perception*. Houston, TX: Gulf/Portfolio, pp. 247-260.
- Sekuler, R., **Anstis, S.M.**, Braddick, O.J., Brandt, T., Movshon, J.A. and Orban, G. (1990) The perception of motion. In L. Spillmann, and J.S. Serner (Eds.), *Visual Perception: The Neurophysiological Foundations*. London and New York: Academic Press.
- Anstis, S.M. (1990) Imperceptible intersections: The chopstick illusion. In A. Blake and T. Troscianko, (Eds.), *Artificial Intelligence and the Eye*. London: Academic Press.
- Grasse, K.L. and Cynader, M.S. (1990) The accessory optic system of frontal-eyed animals. In *Vision and Visual Dysfunction* Vol. IV, Chap. 5, *The Neuronal Basis of Visual Function*. In A. Leventhal (Ed.), Macmillan, in press.
- Howard, I.P. (1990) The stability of the visual world and the perception of self motion. In J. Wallman, and F.A. Miles (Eds.), *Visual Motion and its Role in the Stabilization of Gaze*. Amsterdam: Elsevier, in press.
- Howard, I.P. (1990) Adaptations to transformations of the optic array. In G. Obrecht, and L. Stark (Eds.), *Presbyopia Research: from Molecular Biology to Visual Adaptation*. New York: Plenum, in press.
- Howard, I.P. (1990) Spatial vision within egocentric and exocentric frames of reference. In S.T. Ellis (Ed.), *Pictorial Communication*. Taylor and Francis, in press.
- Kaiser, P.K. (1990) Physiology and psychophysics of color vision. In S.F. Bergen and J. Preston (Eds.), *The Art and Science of Color and Esthetics - with a Self Teaching Program*. St. Louis: C.V. Mosby Co., in press.
- Kaiser, P.K. (1990) Flicker as a function of wavelength and heterochromatic flicker photometry. In J. Kulikowski (Ed.), *Limiting Conditions of Visual Perception: Luminance, Pattern and Movement*. London: Macmillan, in press.
- Ono, H. (1990) Binocular visual directions of an object when seen as single or double. In D. Regan (Ed.), *Binocular Vision*. London: Macmillan, in press.
- Ostroff, J.S. (1989) Temporal logic for real-time systems. In J. Kramer (Ed.), *Advanced Software Development Series*. London: Research Press (Wiley).
- Regan, D., Frisby, J., Poggio, G., Schor, C. and Tyler, C.W. (1990) 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, pp. 317-347. (Invited meeting on assigned topics, Regan chaired binocular panel).
- Regan, D. (1990) A brief review of some of the stimuli used to investigate spatiotemporal vision. In D. Regan (Ed.), *Spatial Vision*. London: Macmillan, in press.
- Regan, D. (1990) Spatial vision in multiple sclerosis. In D. Regan (Ed.), *Spatial Vision*. London: Macmillan, in press.
- Regan, D. (1990) 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.** (1990) 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.
- Regan, D. (1990) Depth from motion and motion in depth. In D. Regan (Ed.), *Binocular Vision*. London: Macmillan, in press.
- Collewijn, H., Steinman, R.M., Erkelens, C.J. and **Regan, D.** (1990) Binocular fusion, stereopsis and stereoacuity with a moving head. In D. Regan (Ed.), *Binocular Vision*. London: Macmillan, in press.

Chapters in Books cont'd.

- Regan, M.P. and Regan, D. (1989) Evoked potential investigations of nonlinear processing stages in human spatial vision. In J.J. Kulikowski (Ed.), *Seeing Contour and Colour*, pp. 513-518.
- Regan, D. (1989) Acute spatial discriminations and the unconfounding of visual information. In J.J. Kulikowski (Ed.), *Seeing Contour and Colour*, pp. 333-339.
- Regan, D. (1989) 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 Visual System*. New York: Raven, pp. 317-329.

Papers in Refereed Journals

- Anstis, S.M. and Paradiso, M. (1989) Programs for visual psychophysics on the Amiga: A tutorial. *Behavioral Research Methods, Instrumentation and Computers*, 21, 548-563.
- 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. (1990) Motion aftereffects from motionless stimuli. *Perception*, in press.
- Anstis, S.M. (1990) Spatial tuning of the motion aftereffect as a function of retinal eccentricity. *Vision Research*, in press.
- Anstis, S.M. (1989) Pictures of Fourier series. *Journal of Recreational Mathematics*, 21, 182-189.
- Maurer, D., Lewis, T., Cavanagh, P. and **Anstis, S.M.** (1989) A new test of luminous efficiency in babies. *Investigative Ophthalmology and Visual Science*, 30, 297-303.
- Domann, R., **Bock, O.** and Eckmiller, R. (1989) Interaction of visual and non-visual signals in the initiation of smooth pursuit eye movements in primates. *Behavioral and Brain Research*, 32, 95-99.
- Bock, O. (1989) Sensori-motor integration in the posterior parietal cortex: A neural network analysis. *Neural Network*, 2, 351-358.
- Bock, O., Dose, M., Ott, D. and Eckmiller, (1990) Control of arm movements in a two-dimensional pointing task. *Behavioral and Brain Research*, in press.
- Bock, O. Dynamic Characteristics of Human Goal-Directed Arm Movements. *Behavioral and Brain Research*, in press.
- Cheung, B. and Howard, I.P. (1989) Circularvection about horizontal axes in bilateral labyrinthine-defective subjects. *Acta Otolaryngologica*, 108, 336-344.
- Cheung, B. and Howard, I.P. (1990) Visually-induced tilt during parabolic flights. *Experimental Brain Research*, 81, 3391-397.
- Cheung, B. and Howard, I.P. (1990) Motion sickness in labyrinthine defective patients. *Aviation Space and Environmental Medicine*, in press.
- Cheung, B. and Howard, I.P. (1990) Optokinetic torsion: dynamics and relation to circularvection. *Vision Research*, in press.
- Flock, H.R. and Nusinowitz, S. (1990) Specularity, brightness, achromatic color and orthogonality. *Perception and Psychophysics*, in press.
- Giaschi, D. and Anstis, S.M. (1989) 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., Ariel, M. and Smith, I. (1990) Direction selective responses of 8neurons in the dorsal terminal nucleus following intravitreal injections of bicuculline methiodide. *Visual Neuroscience*, 4, 605-618.
- Grasse, K.L., Douglas, R.M., and Mendelson, J.R. (1990) Expansion of visual receptive fields in the superficial layers of the superior colliculus induced by amphetamine. *Experimental Brain Research*, in press.
- Mendelson, J.R. and **Grasse, K.L.** (1990) Neural mechanisms of sound localization in cat primary auditory cortex II. Responses to FM sweeps. *Journal of Neurophysiology*, in press.
- Rauschecker, J.P. and **Harris, L.R.** (1989) Auditory and visual neurones in the cat's superior colliculus selective for the direction of apparent motion stimuli. *Brain Research*, 490, 56-63.
- Hong, X. and Regan, D. (1989) Visual field defects for unidirectional and oscillatory motion in depth. *Vision Research*, 29, 809-819.
- Howard, I.P. and Heckmann, T. (1989) Circular vection as a function of the relative sizes, distances and positions of two competing visual displays. *Perception*, 18, 657-665.
- Howard, I.P. and Simpson, W.A. (1989) Human optokinetic nystagmus is linked to the stereoscopic system. *Experimental Brain Research*, 78, 309-314.
- Howard, I.P., Bergstrom, S.S. and Ohmi, M. (1990) Shape from shading in different frames of reference. *Perception*, in press.

Papers in Refereed Journals cont'd.

- Jepson, A.D., Fleet, D., and **Jenkin, M.R.M.** (1990) Improving phase-based disparity measurements, *Computer Vision, Graphics, and Image Processing*, in press.
- Jenkin, M.R.M., Jepson, A. and Tsotsos, J.K. (1990) Techniques for disparity measurement, *Image Understanding*, in press.
- Dudek, G., **Jenkin, M.R.M.**, Milios, E. and Wilkes, D. (1990) Robotic exploration as graph construction, *IEEE Transactions on Robotics and Automation*, in press.
- Jenkin, M.R.M. and Jepson, A.D. (1989) Response profiles of trajectory detectors, *IEEE Transactions on Systems, Man and Cybernetics*, 19, 1617-1622.
- Kaiser, P.K., Vimal, R., Cowan, W.B. and Hibino, H. (1989) Nulling of apparent motion as a method for assessing sensation luminance: An additivity Test. *Color Research and Application*, 14, 187-91.
- Kaiser, P.K., Lee, B.B., Martin, P.R. and Valberg, A. (1990) The physiological basis of the minimally distinct border demonstrated in the ganglion cells of the Macaque retina. *Journal of Physiology*, 422, 153-183.
- Martin, P.R. Lee, BB, Kaiser, P.K. and Valberg, A. (1989) Response of primate retinal ganglion cells to temporal and spatial luminance modulation, *Perception*, 18, 486.
- Kothe, A.C. and Regan D. (1990) The component of gaze selection/control in the development of visual acuity in children. *Optometry and Vision Science*, in press.
- Kothe, A.C. and Regan, D. (1990) Crowding depends on contrast. *Optometry and Vision Science*, 4, 283-286.
- Mapp, A.P., Barbeito, R., Bedell, H. and Ono, H. (1989) Visual localization of briefly presented peripheral targets. *Biological Cybernetics*, 60, 261-265.
- Rivest, J., **Ono, H.** and Saida, S. (1989) The role of convergence and apparent distance in the the perception of motion-parallax depth. *Perception and Psychophysics*, 46, 401-408.
- Swanston, M.T., Wade, N.J. and **Ono, H.** (1990) The binocular representation of uniform motion. *Perception*, 19, 29-34.
- Shimono, K. and **Ono, H.** (1990) Perceived depth for the luminance change of stimuli with zero disparity. *Japanese Journal of Psychology* (in Japanese), in press.
- Ono, H. and Steinbach, M.J. (1990) Monocular stereopsis with and without head movement. *Perception and Psychophysics*, 48, 171-187.
- Ostroff, J.S. (1990) Deciding properties of timed transition models. *IEEE Transactions on Parallel and Distributed Systems*, 1, 170-183.

- Ostroff, J.S. and Wohman, W.M. (1990) A framework for real-time discrete event control. *IEEE Transactions on Automatic Control*, 34, 386-397.
- Ostroff, J.S. (1990) A logic for real-time discrete event processes. *IEEE Control Systems Magazine*, 10, 95-102.
- Ostroff, J.S. (1991) Constraint logic programming for reasoning about discrete event processes. *The Journal of Logic Programming*. New York: Elsevier Science Publishing, in press.
- Regan, D. (Co-Author with 15 other contributors). In D.L. Guyton, and G.S. Rubin (Eds.), "Contrast sensitivity and glare testing in the evaluation of anterior segment disease", *Report to American Academy of Ophthalmology, Archive Ophthalmology*, in press.
- Regan, D., Kothe, A.C. and Sharpe, J.A. (1990) Recognition of motion-defined shapes in patients with multiple sclerosis and optic neuritis. *Brain*, in press.
- Regan, D. and Hamstra, S. (1990) Shape discrimination for motion-defined and contrast-defined form: Squareness is special. *Perception*, in press.
- Regan, D. (1990) High and low contrast acuity. *Optometry and Vision Science*, in press.
- Regan, D. (1989) Do letter charts measure contrast sensitivity? *Clinical and Vision Sciences*, in press.
- Regan, D. and Hong, X. (1990) Visual acuity for optotypes made visible by relative motion. *Optometry and Vision Science*, 67, 49-55.
- Regan, M.P. and Regan, D. (1989) Objective investigation of visual function using a nondestructive zoom-FFT technique for evoked potential analysis. *Canadian Journal of Neurological Science*, 16, 168-179.
- Regan, D. (1989) Orientation discrimination for objects defined by relative motion and objects defined by luminance contrast. *Vision Research*, 29, 1389-1400.
- Steinbach, M.S., Ono, H. and Wolf, M. (1990) Motion parallax judgments of depth as a function of the direction and type of head movement. *Canadian Journal of Psychology*, in press.

Papers in Refereed Journals cont'd.

- Gonzalez, E.G., **Steinbach, M.J.**, Ono, H. and Wolf, M.E. (1989) Depth perception in children enucleated at an early age. *Clinical Vision Science*, 4, 173-177.
- Yang, T. and Pei, J. (1990) Motion sickness severity under interaction ofvection and head movements. *Aviation Space and Environmental Medicine*, in press.

Published Proceedings

- Anstis, S. M. Kinetic edges become displaced, segregated, and invisible. In D. Lam, and C. Gilbert (Eds.), *Proceedings of the Second Retina Research Foundation Conference*, in press.
- Bock, O. (1989) Human goal-directed arm movements exhibit oscillatory properties. *European Journal of Neuroscience Supplement*, 22, 175.
- Bock, O. (1989) Control of purposive arm movements under different load conditions. *Proceedings "Spacebound '89"*, Ottawa, Canada.
- Bock, O., Arnold, K., Howard, I.P. and Money, K. (1990) Characteristics of aimed arm movements in humans under low gravity. *Proceedings of the Second Workshop on Microgravity Experimentation*. Ottawa, May.
- Bock, O. (1990) Load compensation in human aimed arm movements. *Society of Neuroscience Abstracts*, 16.
- Cheung, B., Money, K., Howard, I.P., Kirienko, N., Johnson, W., Lackner, J. and Dizio, P. (1990) Human ocular torsion during parabolic flight: An investigation using electromagnetic scleral search coil. *Proceedings of the Second Workshop on Microgravity Experimentation*. Ottawa, May.
- Harris, L.R. and Stelling, J.W. (1989) A six-dimensional computer-controlled system for simultaneous vestibular and full-field visual stimulation. *Journal of Physiology (London)*, 412, 6P.

- Harris L.R. and Stelling, J.W. (1989) Directional responses to otolithic stimulation 10of type I horizontal canal-related neurones in the vestibular nucleus of the awake cat. *Journal of Physiology* (London), 412, 47P.
- Harris, L.R. (1989) The use of modelling in understanding eye movement control with examples taken from TUTSIM, a general purpose stimulation computer program. *British Ocular Motor Group Newsletter*, #2, 1-4.
- Jenkin, M.R.M. (1989) Using trajectory information to assist in time-varying stereopsis. *First European Conference on Computer Vision*, Antibes, France, 341-345.
- Dudek, G., **Jenkin, M.R.M.**, Milios, E. and Wilkes, D. (1989) Using a marker to map an unknown environment. *Vision Interface 89*, London, Ontario.
- Jepson, A.D. and **Jenkin, M.R.M.** (1989) The fast computation of disparity from phase difference. *CVPR 89*, San Diego, California, 398-403.
- Jenkin, M.R.M. and Jepson, A.D. (1989) Measuring trajectory. *IEEE Workshop on Visual Motion*, Irvine, California, 31-37.
- Dudek, G., **Jenkin, M.**, Milios, E. and Wilkes, D. (1990) Using markers to map an unknown environment. *Advances in Intelligent Robotics Systems and Visual Communications and Image Processing '89: Mobile Robotics, SPIE, '89'*, Vol. 1195, 77-87.
- Nickerson, S.B., Camacho, F., Mader, D.L., Milios, E.E., **Jenkin, M.R.M.**, Bains, N. and Braun, P. (1989) Active vision navigation of a mobile robot in a known environment. *Second Workshop of Military Robotic Applications*, Kingston, Ontario.
- Nickerson, S.B., Camacho, F., Mader, D.L., Milios, E.E., **Jenkin, M.R.M.**, Bains, N. and Braun, P. (1989) Active vision navigation of a mobile robot in a known environment. *Canadian Conference on Electrical and Computer Engineering*, Montreal, Vol. 1, 49-52.
- Ostroff, J.S. (1989) Real-time temporal logic decision procedures. *Proceedings 10th IEEE Real-time Systems Symposium*, San Monica CA., Dec., 92-101.
- Ostroff, J.S. (1989) Synthesis of controllers for real-time discret event systems. *Proceedings of the 28th IEEE Conference on Decision and Control*, Tampa, Florida, Dec., 138-144.
- Ostroff, J.S. (1989) Mechanizing the verification of real-time discrete systems. *The Euromicro Journal: Proceedings of Euromicro '89 - Design Tools for the 90's*, North-Holland, Aug., 27, (1-5) 649-656.
- Ostroff, J.S. (1989) Verification of finite state real-time distributed processes. In *Proceedings of the 9th International IEEE Conference on Distributed Computing Systems*, June, 207-216.
- Ostroff, J.S. (1989) Modularity in the ESM/RTL framework. In I.M. Macleod and A.D. Heher (Eds), *Software for Computer Control 1988 (selected papers from the 5th IFAC/IFIP Symposium SOCOCO'88) IFAC Proceedings Series*, (2) Oxford: Pergamon, 15-20.

Published Proceedings cont'd.

- Regan, M.P. and Regan, D. (1990) A frequency domain technique for using evoked magnetic fields to test multi-stage models of sensory processing. *Proceedings of the 7th International Conference Biomagnetism*, in press.
- Regan, D. and Regan, M.P. (1990) Ultra-high resolution analysis of auditory and visual brain responses using zoom-FFT. *Proceedings of the 7th International Conference of Biomagnetism*, in press.
- Karnavas, W.J., Bahill, A.D. and **Regan, D.** (1990) Sensitivity analysis of a model for the rising fastball and breaking curveball. *IEEE Systems Man and Cybernetics*, in press,
- Hameluck, D. and **Stager, P.**(1989) Instrument scanning and subjective workload with the peripheral vision horizon display. *Proceedings of the 5th International Symposium on Aviation Psychology*, Columbus, Ohio.
- Stager, P., Hameluck, D. and Jubis, R. (1989) Underlying factors in air traffic control incidents. *Proceedings of the Human Factors Society 33rd Annual Meeting*, 43-46.
- Hameluck, D. and **Stager, P.** (1989) Instrument scanning and subjective workload with the Peripheral Vision Horizon Display. *Proceedings of the Human Factors Society 33rd Annual Meeting*, 18-22.

- Stager, P. and Reid, L. (1989) Simulation assessment of a pilot visual cue system 11for shipboard landings. *Proceedings of the Human Factors Association of Canada 22nd Annual Conference*, 277-281.
- Hameluck, D. and **Stager, P.** (1989) Instrument scanning and subjective workload with the Peripheral Vision Horizon Display. *Proceedings of the Human Factors Association of Canada 22nd Annual Conference*, 83-87.
- Stager, P. (1990) Error models for operating irregularities: Implications for automation. *Proceedings of the NATO Advanced Study Institute on Automation and Systems Issues in Air Traffic Control*. Maratea, Italy.
- Stager, P. (1990) The Canadian Automated Air Traffic System (CAATS): An overview. *Proceedings of the NATO Advanced Study Institute on Automation and Systems Issues in Air Traffic Control*. Maratea, Italy.

Technical Reports

- Howard, I.P. Illusory self motion and disorientation. Final Report for Contract 07SE. W97711-7-7012, *Defence and Civil Institute of Environmental Medicine*, September, 1989.
- Jenkin, M.R.M. and Milios, E. Low level vision for mobile robotics. *RBCV-TR-89-31, Research in Biological and Computation Vision*, Technical Report, University of Toronto, 1989.
- Jenkin, M. Active vision navigation of a mobile robot in a known environment. *Precarn Feasibility Report*, Ottawa, June, 1989.
- Fleet, D., Jepson, A.D. and **Jenkin, M.R.M.** Phase-based disparity measurement. *RBCV-TR-89-29, Research in Biological and Computation Vision*, Technical Report, University of Toronto, 1989.
- Kaiser, P.K. A New Supplemental Standard: CIE 1988 Modified 2^o Spectral luminous efficiency function for photopic vision, Published. *No. CIE 86, 1st Edition 1990, Commission Internationale*.
- Ostroff, J.S. and Wonhamm, W.M. A framework for real-time discrete event systems, *Technical Report 8910*, Department of Electrical Engineering, University of Toronto, 1989.
- Ostroff, J.S. Synthesis of controllers for real-time discrete event systems, *Technical Report CS-89-09*, Department of Computer Science, York University, 1989.
- Ostroff, J.S. Constraint logic programming for reasoning about discrete event systems, *Technical Report CS-89-02*, Department of Computer Science, York University, 1989.
- Steinbach, M.J. (1990) Eye Movement Research - Physiological Aspects. (Book Review). *Binocular Vision*, 5, 99.

Conference Presentations and Abstracts

- Anstis, S.M. Optomotor test for wavelength sensitivity in guppyfish. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 30, 110.
- Bock, O. The characteristics of arm movements executed in unusual force environments. XXVIII *COSPAR Meeting*. The Hague, NL, July, 1990.
- Dengis, C.A., Steinbach, M.J, Kraft S.A. and Graham, J.E. Egocentre location remains unchanged after strabismus surgery. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 603.

Conference Presentations and Abstracts cont'd.

- Grasse, K.L., Ariel, M. and Smith, I.D. Pharmacological isolation of visual cortical input to the accessory optic system of cat: effects of intraocular injections of bicuculline methiodide on DTN responses. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 398.
- Goltz, H., Steinbach, M.J. and Gallie, B.L. Head turn in monocular viewing. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 604.

- Harris, L.R. and Smith, A.T. Plaids used in distinguished direct retinal and cortical 12 contributions to horizontal optokinetic nystagmus. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 591.
- Hibino, H. R-G & Y-B opponent colour responses as a function of human retinal eccentricity. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 262.
- Howard, I.P. Visual stability and the perception of self motion in a three-dimensional world. Invited paper, *NASA Workshop on Visually Guided Control of Movement*. Ames Research Center, August, 1989.
- Howard, I.P. and Cheung, B. Optokinetic torsion in response to sinusoidal stimulus rotation. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 84.
- Howard, I. P. Visual-vestibular interactions in perceived stability. Invited paper, *17th CVS Symposium on Orientation in Space*. University of Rochester, June, 1990.
- Valburg, A., Lee, B.B. and **Kaiser, P.K.** The residual response in Macaque Phasic ganglion cells is related to trianopic parity difference across equal liminance borders. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 265.
- Kaiser, P.K., Lee, B.B. and Valberg, A. MDB: Additivity, transitivity, proportionality demonstrated physiologically. *Optical Society of American Technical Digest Series*, 1989, 18, 175.
- Kothe, A. and Regan, D. Visual crowding in children. *American Academy of Optometry*, New Orleans, December, 1989.
- Kothe, A.C., Regan, D. and Sharpe, J.A. Motion blindness and insensitivity in patients with multiple sclerosis. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 279.
- Ono, H. (Director) and others. *Daughter of Parallax* [Video] North York: York University Television, 1989.
- Regan, D. Low contrast visual acuity in adult and pediatric optometry. *American Academy of Optometry*, New Orleans, December, 1989.
- Regan, D. Low-contrast visual acuity in neuro-ophthalmological disorders. Abstract 17, *25th Canadian Congress of Neurological Sciences*. Banff, 1990.
- Regan, D., Sharpe, J.A. and Kothe, A. Motion blindness and insensitivity in patients with multiple sclerosis. Abstract 87, *25th Canadian Congress of Neurological Sciences*, Banff, 1990.
- Regan, M.P., Hong X.H., Hamstra, S. and Regan, D. Location and quantitative analysis of visual and auditory convergence areas using zoom-FFT analysis of evoked magnetic fields. Abstract 4, *International Evoked Potential Symposium*, 1990.
- Regan, D. and Hamstra, S. Sharpe and orientation discrimination for motion-defined and contrast-defined objects: temporal integration. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 524.
- Hong, X. and Regan, D. Visual acuity for letters made visible by relative motion. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 523.
- Bahill, A.T., Karnavas, W.J. and **Regan, D.** A model for the rising fastball and breaking curveball. *IEEE Systems Man and Cybernetics*. Los Angeles, November, 1989.
- Reed, M., Steinbach, M.J., Gallie, B., Smith, D.R. and Kraft, S.P. OKN asymmetry and early monocular deprivation in children. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 120.
- Steinbach, M.J. and J. Lerman. Gravity affects resting eye position in anesthetized, paralyzed humans. *Society for Neuroscience*, 1989.
- Steinbach, M.J. and J. Lerman. Gravity affects resting eye position in humans. *Investigative Ophthalmology and Visual Science (ARVO Supplement)*, 1990, 31, 533.
- Steinbach, M.J. Oculomotor Proprioception: Its existence and its raison d'etre. Invited paper, *17th CVS Symposium on Orientation in Space*. University of Rochester, June, 1990.

Colloquia**Otmar Bock**

University of Waterloo, June 1989
University of Dusseldorf, 1989
York University, 1989
NASA Ames Research Center Moffett Field, March 1990
University of Western Ontario, 1990
University of Nijmegen, July, 1990
University of Louvain, July 1990.

Laurence Harris

Warwick, UK, March 1990
Washington, DC, March 1990
Paris, Dec. 1989
Cardiff, UK, Dec. 1989

Ian Howard

Center for Visual Science, University of Rochester, March 1990

Michael Jenkin

York University, Feb. 1990

Hiroshi Ono

Advanced Telecommunication Research Lab, Nov. 1989
University of Tokyo, Dec. 1989
University of Waterloo, Feb. 1990

Jonathan Ostroff

University of Toronto, July 1989
University of Eindhoven, The Netherlands, Sept. 1989
McGill University, Nov. 1989
Carnegie Mellon University, April 1990

David Regan

University of Toronto, April, 1990

Martin Steinbach

Hospital for Sick Children, Ophthalmology Rounds, Dec. 1989
University of British Columbia, Aug. 1989
York University, Feb. 1990

Vision Group Seminars

N. Swindale	B.C.	Mapping and modeling the visual cortex
P. Bennett	Toronto	Spatial phase discrimination in central and peripheral vision
M. King	Rochester	Does vergence determine vestibuloocular reflex (VOR) gain
A. Sokolov	Moscow	Influence of simulated micro-gravity (water immersion) on vestibular sensory and motor responses in man
P. Lennie	Rochester	The design of colour-opponent mechanisms
J. Enright	Scripps	Exploration of 3D with eye movements
M. Cohen	NASA	Perceptual and behavioral adaptation to altered gravity
H. Hibino	York	Opponent-color responses and retina eccentricity
C. Cicerone	Irvine	Colour perception and human the cone mosaic
M. Corballis	New Zealand	Pattern recognition for rotated objects
C. Murasugi	York	Asymmetries in the human optokinetic response
D. Giaschi	York	Spatial-frequency discrimination following flicker
J. Tam	York	Saccadic latency and unoculomotor unlocking process
B. Rogers	Oxford	Vertical disparities, deformation and the induced effect
A. Nagy	Wright State	Color vision differences and visual search or how to find something quickly without really looking
M. Akita	Kyoto Ins.	Color vision studies of the Kyoto Institute of Technology
J. Tsotsos	Toronto	Analysing vision at the complexity level

The Vision group and The Institute for Space and Terrestrial Science are holding a Distinguished Speakers Seminar Series from September, 1990 to September, 1991. Speakers will include: B. Frost, W. Graf, J. Lackner, B. Lee, P. Lennie, F. Miles, B. Rogers, H. Spekreijse and G. Sperling.

Otmar Bock will continue to travel to the Dept. of Neurology, University of Dusseldorf to work on a joint project on a new approach to the study of tremor patients. He will continue his experiments on visual localization and arm movements under reduced gravity conditions in the NASA KC-135 airplane at Houston. Otmar will also start a cooperative venture with G. D'Eleuterio, ISTS, on a new control principle for robotic manipulators.

Keith Grasse has begun a new collaboration with H. Yucel and M. Cynader at UBC on the iontophoresis of neuropharmacological agents onto visual neurons.

Jonathan Ostroff is an invited Speaker at the European Control Conference, Grenoble, France July 1991.

David Regan is invited to give 1990 Medical Research Council of Canada Lecture, Sherbrooke Meeting. "Selective visual loss in patients and super-sight in athletes: opposite ends of a continuum".

Honours and Awards

Congratulations to the recipients of the first E. Lynn Kirshner Memorial Scholarship, established by her husband Ron, to honour the memory of Lynn, an accomplished and promising student of visual science, who died in 1989.

Debbie Giaschi for her dissertation-based presentation at the 1990 ARVO meeting and published as "Changes in spatial-frequency discrimination and detection following adaptation to flicker" in *Investigative Ophthalmology and Visual Science*, 1990, 31, 324. Awarded \$500 in recognition for her excellent work.

Marian Regan for her paper entitled "A frequency domain technique for using evoked magnetic fields to test multi-stage models of sensory processing" in press in *Proceedings of the Seventh International Conference on Biomagnetism*, and based on her dissertation research. Awarded \$250 in recognition for her excellent work.

Bob Cheung for his paper entitled "Visually-induced tilt during parabolic flights" in press in *Experimental Brain Research*, and based on his dissertation research. Awarded \$250 in recognition for his excellent work.

Stuart Anstis has been granted an educational leave to write a book on scientific writing and speaking, and was awarded the Faculty of Arts Dean's Prize for his outstanding contribution to teaching.

Ian Howard was appointed to the Life Sciences Advisory Committee of the Canadian Space Agency.

David Regan has been elected Fellow of the Optical Society of American.

The Regan low-contrast acuity chart have been adopted in a multi-centre study of multifocal implant lenses (cataract surgery) under auspices of the Federal Drug Administration (USA).

Paul Stager was elected as the first Fellow of the Human Factors Association of Canada in November 1989. He has also been Canadian representative to the Council of the International Ergonomics Association (IEA).

Martin Steinbach was appointed Interim Director of the Eye Research Institute of Ontario. He was awarded the Atkinson College Research Fellowship for 1990-1991 and appointed a member of the Natural Sciences and Engineering Research Council, Scholarships and Fellowships Grants committee for 1989-1991.