

York Vision Group

York University, North York, Toronto, Ontario, M3J 1P3

Annual Report, July 1990 to June 1991

Faculty

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| John Amanatides | Assistant Professor of Computer Science. Research Associate in the Human Performance in Space Laboratory. Interests: robotics. |
| Stuart Anstis | Professor of Psychology. Stuart moved to University of San Diego in January, 1991. |
| Otmar Bock | Senior Scientist in the Human Performance in Space Laboratory. Adjunct Professor of Psychology. Interests: intersensory and sensory-motor coordination and robotics. |
| Howard Flock | Professor of Psychology. Interests: perception of brightness, visual surfaces and spatial arrangements. |
| Keith Grasse | Associate Professor of Psychology and Biology. Principal Investigator in the Human Performance and Space Laboratory. Interests: the electrophysiology of the visual system, eye movements. |
| Marc Green | Associate Professor of Computer Science, Trent University. Adjunct Professor, York University. Interests: Visual psychophysics, computational models of vision. |
| Laurence Harris | Associate Professor of Psychology. Investigator in the Human Performance and Space Laboratory. Interests: electrophysiology of the vestibular and oculomotor systems. |
| Ian Howard | Professor of Psychology and Biology. Co-Director of the Human Performance in Space Laboratory. Interests: space perception, eye movements, 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 and Biology. Interests: colour vision, sensory processes, physiological optics, human factors. |
| Evangelos E. Milios | Associate Professor of Computer Science. Interests: computer vision, 'eye-hand' coordination and navigation in computers. |
| 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. |
| Jonathan Ostroff | Assistant Professor of Computer Science. |

Research Associate in the Human Performance in Space Laboratory.
Interests: computer-graphics.

- David Regan Professor of Psychology and Biology at York University.
Professor of Ophthalmology and Medicine at the University of Toronto.
Co-Director of the Human Performance in Space Laboratory.
Killam Fellow.
Interests: visually evoked magnetic and electrical brain activity, visual disorders, psychophysics of spatial vision, motion, stereopsis, colour vision and the auditory system; vision in aviation.
- 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.
Research Associate in the Human Performance in Space Laboratory.
Interests: Human factors in aerospace performance and system design.
- Martin Steinbach Professor of Psychology and Biology.
Associate 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; clinical disorders of the oculomotor system.

Visiting Scientists 1990-91

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| Dr. Richard Abadi | Manchester University, England. |
| Dr. Aike Guo | Institute of Biophysics, Beijing. |
| Dr. Jingshen Pei | Institute of Space Medico-Engineering, Beijing. |
| Dr. Brian Rogers | Oxford University. |
| Dr. Henk Spekreijse | Netherlands Inter-University Eye Institute, Amsterdam. |
| Dr. Michael Swanston | College of Technology, Dundee. |
| Dr. Tiande Yang | Institute of Space Medico-Engineering, Beijing. |
| Dr. Nicholas Wade | University of Dundee, Scotland. |
| Dr. Barry Lee | Max Planck Institute, Germany. |
| Dr. Thomy Nilsson | University of Prince Edward Island. |

Visiting Scientists 1991-92

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| Dr. Richard Abadi | Department of Optometry and Vision Sciences, Manchester University, for 6 months from July, with I. Howard. |
| Dr. Sten Bergström | Department of Psychology, Umeå, Sweden, for 6 months from September, with I. Howard. |
| Paola Feresin | Ph.D. student from Trieste for one year in I. Howard's lab. |
| Dr. John Findlay | Department of Psychology, Durham University, England, for 3 months from May, with L. Harris. |

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| Dr. Werner Graf | Rockefeller University. For October, with L. Harris. |
| Dr. Lloyd Kaufman | New York University, with D.Regan. |
| Dr. Tohashi Kikuchi | University of Tsukuta for 2 weeks with H. Ono. |
| Mr. T. Mihashi | Topcon Corporation, Japan for 2 years, with D. Regan. |
| Dr. Horst Mittelstaedt | Max-Planck Inst., Seewiesen. During August with I. Howard. |
| Dr. Robert O'Shea | Otaga University, New Zealand for 2 weeks, with H. Ono. |
| Dr. G. F. Poggio | John's Hopkins, for part of sabbatical, from September, with D. Regan. |
| Dr. Brian Rogers | Oxford for 3 weeks in August, with H. Ono and I. Howard. |
| Dr. Andrew Smith | Psychology Department, Cardiff University, 3 weeks in July, with L. Harris. |
| Dr. Jonathan Victor | Rockefeller University for 3 weeks in August, with D. Regan. |
| Dr. Yaso Nakano | Tokyo Institute of Technology with P. Kaiser |
| Dr. Keiji Uchihawa | Tokyo Institute of Technology with P. Kaiser |

Research Associates

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| Dr. Karin Arnold | Working with O. Bock. |
| Dr. Peiyuan He | Working with D. Regan. |
| Dr. Marian Regan | Working with D. Regan. |
| Dr. Nancy Rush-Smith | Working with M. Steinbach. |
| Mr. T. Mihashi | Working with D. Regan. |

Post Doctoral Fellows

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| Debbie Giaschi | Working with D. Regan. Now at University of British Columbia. |
| Xiang-Hua Hong | Working with D. Regan. |
| Li Sun | Working with D. Regan and I. Howard. |
| Hiroyasu Ujike | Working with H. Ono. |
| Laura Telford | Working with I. Howard. |
| Bruce Zhang | Working with P.K. Kaiser. |

Graduate students (supervisors)

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| Richard Bird (Howard) | 4th year M.A. |
| Ken Casselman (Grasse) | 2nd year M.A. |
| Laura Childerson (U of T) | 2nd year M.A. at U of T. Working with I. Howard. |
| Carol Dengis (Steinbach) | 2nd year Ph.D. |
| Herb Goltz (Steinbach) | 2nd year M.A. |
| Lorraine Gunther (Ono) | 2nd year M.A. |
| Don Hameluck (Stager) | Obtained Ph.D.in October, 1990. |
| Stan Hamstra (Regan) | 2nd year Ph.D. |
| Suneeti Kausal (Regan) | 1st year M.A. |
| Renate Korn (Ono) | 1st year M.A. |
| Yizhi Li: (Jenkin) | 2nd year M.Sc. |
| Cao Lianqun (Kaiser) | 1st year M.A. |
| Sharon McFadden (Kaiser) | Obtained M.A.in November, 1990. |
| Alistair Mapp (Ono) | 5th year Ph.D. |
| Christine Marton (Howard) | Obtained M.Sc.in May, 1991. |
| Steven Nusinowitz (Flock) | Obtained Ph.D. in June, 1990. Now Post-doctoral Fellow, McMaster. |
| Maureen Reed (Steinbach) | Obtained Ph.D.in February, 1991. |
| Xiaomei Shen (Howard) | 2nd year M.Sc. |
| Zhengyan Wang | Obtained M.Sc. in July, 91. |
| James Zacher (Howard) | 4th year M.A. |

Research Grants

Anstis

NSERC Operating Grant. Human Perception Changes Bright Loud & Visual. \$40,000.
DCIEM Contract. Night Vision Goggles. \$34,000.

Bock

NSERC Operating Grant. Control principles of aimed arm movements in humans. \$13,000.
President's NSERC Grant. Visual localization and motor control. \$1,200.
NATO Exchange Grant. Pointing movements of neurological patients. (with Cooke and Hefter). \$7,000.

Bock, D'Eleuterio

DCIEM Contract. New control concept for robotic manipulators in unstructured environments. \$80,000.

Bock, Howard and Money

Canadian Space Agency Contract. Eye-hand coordination in microgravity. \$43,000.
NRC grant for experiments on parabolic flight. \$4,000.

Grasse

NSERC Operating Grant. \$29,000.
NSERC Equipment Grant. \$18,000.

Harris

York University Grant. \$20,000.
NSERC Operating Grant. The detection of conflict in visual-vestibular interactions. \$30,000.

Harris, Hains and Smith

NATO Exchange Grant. Perceptual and reflect systems used to distinguish motion detection mechanisms. \$8,000.

Howard

NSERC Operating Grant. Visual pursuit and induced visual motion. \$43,800.
NSERC Equipment Grant. \$9,000.
DCIEM Contract. Vection and induced motion. \$60,000.

Howard, Jenkin and Regan

NSERC Conference Grant - Spatial Vision in Humans and Robots. \$10,000.

Howard, Regan, Anstis, Ono, Grasse

Province of Ontario Centre of Excellence Grant. Human Performance in Space Laboratory. \$700,000.

Jenkin

NSERC Operating Grant. Representation and control issues in dynamic stereopsis. \$17,000.
NSERC Equipment Grant. Vision, Graphics; Robotics Lab Upgrade. (with J. Amanatides, M. Spetsakis). \$23,200.
NSERC Equipment Grant. Research machine upgrade. (with J. Liu and five other faculty members). \$76,600.
President's NSERC Grant. Analog film recorder purchase. (with J. Amanatides and M. Spetsakis). \$15,000.
Ontario-Quebec Exchange project grant. Sonar based robotic exploration. (with G. Dudek and E. Milios). \$2,500.

Kaiser

NSERC Operating Grant. Studies in colour vision. \$44,800.

Ohmi

NSERC Operating Grant. Frames of reference for perceived direction of self motion. \$15,000.

Ono

NSERC Operating Grant. Sensory and motor aspects of space perception. \$35,000.

Ono, Howard, Wade, Swanston

NATO Exchange Grant. Motion and orientation in spatial vision. \$8,500.

Regan

NSERC Operating Grant. Neuromagnetic and evoked potential studies of auditory functions in humans. \$65,000.
MRC Operating Grant. Visual psychophysical abnormalities in neuro-ophthalmological disorders. \$56,000.
NIH Grant. Visual abnormalities in multiple sclerosis. \$100,000.
U.S. Air Force Grant. Sensory sensitivities and discriminations and their roles in aviation. \$215,000.

Stager

Transport Canada. }
Canadian Coast Guard Vessel Traffic Services. } \$115,000.

Steinbach

NSERC Operating title: Human Oculomotor Control. \$38,000.
Pres. NSERC title: Spatial Localization in Graves' Ophthalmopathy. \$4,000.

Total annual value of grants \$1,980,000

Publications June 1990-June 1991

Books

- Regan, D. (Ed.) *Spatial Vision* (Volume 10 in "Vision and visual dysfunction" series). London: Macmillan, 1991.
- Regan, D. (Ed.) *Binocular Vision* (Volume 9 in "Vision and visual dysfunction" series). London: Macmillan, 1991.
- Ono, H., Wagner, M. and Ono, K. S. 1990 *Psychophysics II: Precision and Accuracy*. (Educational Computer Package). Iowa City: Conduit, in press.

Chapters in Books

- Sekuler, R., **Anstis, S.M.**, Braddick, O.J., Brandt, T., Movshon, J.A. and Orban, G. The perception of motion. In L. Spillmann and J.S. Serner (Eds.), *Visual Perception: The Neurophysiological Foundations*. London and New York: Academic Press, 1990, pp 205-229.
- Anstis, S.M. Hidden assumptions in seeing apparent motion and shape from shading. In A. Gorea (Ed.), *Representations of Vision: Trends and Tacit Assumptions in Vision Research*. Cambridge University Press, 1991.
- Anstis, S.M. and Ramachandran, V.S. Motion illusions from motion-filled windows. In R.L. Gregory, (Ed.), *The Artful Eye*, in press.
- Grasse, K.L. and Cynader, M.S. The accessory optic system of frontal-eyed animals. In A. Leventhal (Ed.), *Vision and Visual Dysfunction*, Vol. IV, Chap. 5, *The Neuronal Basis of Visual Function*. London: Macmillan, in press.
- Howard, I.P. 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*. Elsevier, in press.
- Howard, I.P. Spatial vision within egocentric and exocentric frames of reference. In S.R. Ellis (Ed.), *Pictorial Communication in Virtual and Real Environments*. New York: Taylor and Francis, 1991, pp 338-358.
- Howard, I.P. Adaptations to transformations of the visual world. In G. Obrecht and L. Stark (Eds.), *Presbyopia Research: From Molecular Biology to Visual Adaptation*. New York : Plenum, 1991, pp 73-81.
- Howard, I.P. The optokinetic system. In J.A. Sharpe and H.O. Barber (Eds.), *The Vestibulo-ocular Reflex, Nystagmus and Vertigo*. New York: Raven Press, in press.
- Kaiser, P.K. Visual photometry: Relating Psychophysics to some aspects of Neurophysiology. In A. Valberg and B.B. Lee (Eds.) *Pigments to Perception, Advances in Understanding Visual Processes*. New York: Plenum, 1991, pp. 281-291.
- Kaiser, P.K. Flicker as a function of wavelength and heterochromatic flicker photometry. In J. Kulikowski (Ed.), *Limiting Conditions as Visual Perception: Luminance, Pattern and Movement*. London: Macmillan, in press.
- Ono, H. Binocular visual directions of an object when seen as single or double. In D. Regan (Ed.), *Vision and Visual Dysfunction*, Vol 10, *Binocular Vision*. London: Macmillan, in press.
- Regan, D. Nonlinearities in psychophysical models of the processing of spatial form and motion. In R. Pinter (Ed.), *Nonlinearities in Visual Processing*, in press.
- Regan, D. A brief review of some of the stimuli used to investigate spatiotemporal vision. In D. Regan (Ed.), *Spatial Vision*. London: Macmillan, 1991, pp 1-42.
- Regan, D. Spatial vision in multiple sclerosis. In D. Regan (Ed.), *Spatial Vision*. London: Macmillan, 1991, pp 239-249.
- 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, 1991, pp 135-178.

- 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, 1991, pp 250-260.
- Regan, D. Depth from motion and motion in depth. In D. Regan (Ed.), *Binocular Vision*. London: Macmillan, 1991, pp 137-169.

Chapters in Books (continued)

- Regan, M.P. and Regan, D. A frequency domain method for testing nonlinear multi-neuron models against data. In R. Pinter (Ed) *Nonlinearities in Visual Processing*, in press.
- Collewijn, H., Steinman, R.M., Erkelens, C.J. and **Regan, D.** Binocular fusion, stereopsis and stereoacuity with a moving head. In D. Regan (Ed.), *Binocular Vision*. London: Macmillan, 1991, pp 121-136.
- Stager, P. Error models for operating irregularities: Implications for automation. In J.A. Wise, V.D. Hopkin, and M.L. Smith (Eds) *Automation and Systems Issues in Air Traffic Control*. NATO ASI Series Vol. F733. Berlin: Springer-Verlag, 1991, pp. 321-338.
- Stager, P. The Canadian Automated Air Traffic Control System (CAATS): An overview. In J.A. Wise, V.D. Hopkin, and M.L. Smith (Eds.) *Automation and Systems Issues in Air Traffic Control*. NATO ASI Series Vol. F733. Berlin: Springer-Verlag, 1991, pp. 39-45.

Papers in Refereed Journals

- 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. Motion aftereffects from motionless stimuli. *Perception*, 1990, 19, 281-285.
- Anstis, S.M. and Rogers, B.J. No motion aftereffects from spatial-frequency zooming. *Vision Research*, in press.
- Anstis, S.M. Illusory rotary of a spoked wheel. *Perception*, 1991, in press.
- Bock, O. Dynamic properties of human goal-directed arm movements. *Behaviour and Brain Research*, 1990, 39, 240-248.
- Bock, O. Load Compensation in human goal-directed arm movements. *Behaviour and Brain Research*, 1990, 41, 167-177.
- Bock, O. The characteristics of arm movements executed in unusual force environments. *Advances in Space Research*, in press.
- Bock, O., Dose, M., Ott, D. and Eckmiller, R. Control of Arm Movements in a Two-Dimensional Pointing Task. *Behaviour and Brain Research*, 1990, 40, 247-250.
- Bock, O., Howard, I.P., Money, K.E. and Arnold, K.E. Human motor performance in changed gravity. *Aviation space and environmental Medicine*, in press.
- Cheung, B. and Howard, I.P. Illusory body tilt in parabolic flight. *Experimental Brain Research*, in press.
- Cheung, B. and Howard, I.P. Motion sickness in labyrinthine defective patients. *Aviation Space and Environmental Medicine*, in press.
- Cheung, B.S.K. and Howard, I.P. Optokinetic torsion: Dynamics and relation to circularvection. *Vision Research*, 1991, 31, 1327-1336.
- Cheung, B.S.K., Howard, I.P. and Money, K.E. Visually-induced tilt during parabolic flights. *Experimental Brain Research*, 1990, 81, 391-397.
- Cheung, B.S.K., Howard, I.P. and Money, K.E. Visually-induced sickness in normal and bilaterally labyrinthine-defective subjects. *Aviation space and environmental Medicine*, 1991, 62, 527-531.
- Cheung, B.S.K., Money, K., Howard, I.P., Kirienko, N., Johnson, W., Lackner, J. and Evanoff, J. Human ocular torsion during parabolic flights: An analysis with scleral search coils. *Experimental Brain Research*, in press.
- Giaschi, D., Regan D., Kothe A.C., Sharpe J.A. and Hong X.H. 1991 Multiple Sclerosis can degrade the recognition of motion-defined letters while sparing sensitivity to motion. *Neurology*, in press.
- Grasse K.L. Pharmacological isolation of visual cortical input to the cat accessory optic system; effects of intravitreal TTX on DTN unit responses. *Visual Neuroscience*, 1991, 175-183.
- Grasse, K.L., Ariel, M. and Smith, I. Direction selective responses of neurons in the dorsal terminal nucleus following intravitreal injections of bicuculline methiodide. *Visual Neuroscience*, 1990, 4, 605-617.
- Grasse, K.L., Douglas, R.M., and Mendelson, J.R. Expansion of visual receptive fields in the superficial layers of the superior colliculus induced by amphetamine. *Experimental Brain Research*, in press.

- Grasse, K.L. and Lisberger, S.L. Analysis of a naturally occurring asymmetry in vertical smooth pursuit in a monkey. *Journal of Neurophysiology*, in press.
- Mendelson, J.R. and **Grasse, K.L.** FM sweep selectivity in cat primary auditory cortex; a comparison of monaural and binaural responses in single units. *Experimental Brain Research*, in press.

Papers in Refereed Journals (continued)

- Mendelson, J.R., Schreiner, C.E., Sutter, M. and **Grasse, K.L.** Functional topography of cat primary cortex: II. Responses to frequency modulated sweeps. *Journal of Neurophysiology*, in press.
- Harris, L.R., and Smith, A.T. Use of plaid patterns to distinguish the corticofugal and direct inputs to the brainstem optokinetic generator. *Experimental Brain Research*, in press.
- Harris, L.R. and Stelling, J.W. The effect of canal/visual and canal/otolith conflict on type I vestibular nucleus neurones. *Acta Otolaryngology*, in press.
- Heckmann, T. and Howard, I.P. Induced motion: Isolation and dissociation of egocentric and vection-entrained components. *Perception*, 1991, 20 in press.
- Howard, I.P., Bergström, S.S. and Ohmi, M. Shape from shading in different frames of reference. *Perception*, 1990, 19, 523-530.
- Howard, I.P. and Zacher, J.E. Human cyclovergence as a function of stimulus frequency and amplitude. *Experimental Brain Research*, in press.
- Dudek, G., **Jenkin, M.**, Milios, E., and Wilkes, D. Robotic exploration as graph construction. *IEEE Transactions on Robotics and Automation*, in press.
- Jepson, A. D., Fleet, D., and **Jenkin, M.** Improving phase-based disparity measurements. *CVGIP: Image Understanding*, 1991, 53, 198-210.
- Jenkin, M., Jepson, A., and Tsotsos, J. K. Techniques for disparity measurement. *CVGIP: Image Understanding*, 1991, 53, 14-30.
- Kaiser, P.K., Lee, B.B., Martin, P.R. and Valberg, A. The physiological basis of the minimally distinct border demonstrated in the ganglion cells of the macaque retina. *Journal of Physiology*, in press.
- Mapp, A.P., Barbeito, R., Bedell, H.E., and Ono, H. Visual localization of briefly presented peripheral targets. *Biological Cybernetics*, in press.
- Ono, H., Rogers, B.J., Ohmi, M. and Ono, M.E. Dynamic occlusion and motion parallax in depth perception. *Perception*, in press.
- Shimono, K. and **Ono, H.** Perceived depth for the luminance change of stimuli with zero disparity. *Japanese Journal of Psychology*, 1990, 60(4), 263-267 (in Japanese).
- Ono, H. and Steinbach, M.J. Monocular stereopsis with and without head movement. *Perception and Psychophysics*, 1990, 48, 179-187.
- Ono, H. Precision and accuracy with classical psychophysical methods, in press.
- Regan, D. High and low contrast acuity. *Optometry and Vision Science*, 1990, 67, 650-53.
- Regan, D. Visual judgements and misjudgements in cricket, and the art of flight. *Perception*, in press.
- Regan, D. Do letter charts measure contrast sensitivity? *Clinical and Visual Science*, in press.
- Regan, D. A sensitive method for quantifying functional loss caused by veiling glare in patients and in elderly nonpatients. *Optical Society of America, Technical Digest*, In press.
- Regan, D. Specific tests and specific blindness: keys, locks and parallel processing. *Optometry and Visual Science*, In press.
- Regan, D. and Hamstra, S. Shape discrimination for motion-defined and contrast-defined form: Squareness is special. *Perception*, in press.
- Regan, D. and Hong, X. Visual acuity for optotypes made visible by relative motion. *Optometry and Visual Science*, 1990, 67, 49-55.
- Regan D, Hong XH, Kothe AC, Giaschi D, Hamstra S. Motion-defined letter reading test. *Optical Society of America, Technical Digest*. In press.
- Regan, D., Kothe, A.C. and Sharpe, J.A. Recognition of motion-defined shapes in patients with multiple sclerosis and optic neuritis. *Brain*, in press.
- Karnavas, W.J., Bahill, A.T. and **Regan, D.** Sensitivity analysis of a model for the rising fastball and breaking curveball. *Proceedings of the IEEE Systems Man and Cybernetics*, Los Angeles, in press.
- Bahill, A.T., Karnavas, W.J. and **Regan, D.** The perceptual illusion of the rising fastball and breaking curveball. *Journal of Experimental Psychology, Human Perception and Performance*, in press.

- Stager, P. and Hameluck, D. Ergonomics in air traffic control. *Ergonomics*, 1990, 33, 493-499.
- Steinbach, M.S., Ono, H. and Wolf, M. Motion parallax judgments of depth as a function of the direction and type of head movement. *Canadian Journal of Psychology*, 1991, 45, 92-98. .
- Wade, N.J., Swanston, M., Howard, I.P., Ono, M. and Shen, X. Induced rotary motion and ocular torsion. *Vision Research*, 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*, 1990.
- Howard, I.P. Spatial vision within egocentric and exocentric frames of reference. *NASA Conference Publication 3118*, Ames Research Centre, Moffett Field, CA. 1991.
- Howard, I.P. Image cyclorotation, cyclovergence and perceived slant. *The Engineering Society for Advanced Mobility Land, Sea, Air and Space*. Technical Paper Series, 911392, 1-8. 1991.
- Jenkin, M. Using stereomotion to track binocular targets. *CVPR 91*, Maui, Hawaii, 96-102, 1991.
- Wang, Z., and **Jenkin, M.** Detection and localization of bar-like targets using Gabor filters, *Vision Interface 91*, Calgary, Alberta, 97-103, 1991.
- Wilkes, D., Dudek, G., **Jenkin, M.**, and Milios, E. The simulation of sonar mapping in complex environments using multiple reflecting surface, *Vision Interface 91*, Calgary, Alberta, 213-217, 1991.
- Dudek, G., **Jenkin, M.**, **Milios, E.** and Wilkes, D. Robotic exploration as graph construction. *IEEE Transactions on Robotics and Automation*, in press.
- Prassler, E. and **Milios, E.** Parallel distributed robot navigation in the presence of obstacles. *Proceedings of the Second IEEE Symposium on Parallel and Distributed Processing*, Dallas, December, 1990.
- Regan, D. Procedures for establishing low-contrast vision and glare susceptibility standards for pilots and drivers, and the selection of personnel for visual search and surveillance. In *Proceedings of Symposium on Aeromedical Aspects of Vision*, 1991, Toronto, pp 35-56.
- Regan, D., Hong, X.H. and Hamstra, S. Visual sensitivity to camouflaged motion-defined objects and the limits of safety in nap-of-the-Earth helicopter navigation. In *Proceedings of Symposium on Aeromedical Aspects of Vision*, 1991, Toronto, pp 161-166.
- Regan, D. and Regan, M.P. Ultra-high resolution analysis of auditory and visual brain responses using zoom-FFT. In S.J. Williamson, M. Hoke, G. Stoink, M. Kotaini (Eds.) *Advances in Biomagnetism*, New York, Plenum Press, pp 201-204.
- Regan, M.P. and Regan, D. A frequency domain technique for using evoked magnetic fields to test multi-stage models of sensory processing. In S.J. Williamson, M. Hoke, G. Stoink, M. Kotaini (Eds.) *Advances in Biomagnetism*, New York, Plenum Press, pp 205-207.
- Stager, P. 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, 1990.
- Stager, P. 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, 1990.
- Stager, P. and Hameluck, D. Visual acuity and contrast sensitivity in air-to-ground detection. *Proceedings of the Aeromedical Aspects of Vision Symposium. Aircrew Standardization Coordinating Committee Working Party 61*. Toronto, November 6-15. 1990. pp. 39-50.
- Webb, R.D.G. and **Stager, P.** Conceptual and practical issues affecting professional education in ergonomics/human factors. *Proceedings of the Human Factors Association of Canada 23rd Annual Conference*, Ottawa, September, 1990.

Technical Reports

- Steinbach, M.J. Eye Movement Research, Book Review, *Binocular Vision*, 1990, 5, 99.

Conference Presentations and Abstracts

- Anstis, S.M. and Hutahajan, P. Visual adaptation to a negative, brightness-reversed world. *Investigative Ophthalmology and Visual Science*, 1991, 32, 1025.
- Bock, O. The characteristics of arm movements executed in unusual force environments. *XXVIII COSPAR Meeting*. The Hague, NL, July, 1990.

- Bock, O. and Howard, I.P. Aimed arm movements under changed gravity. Paper presented at "*Spacebound 1991*". Ottawa, April, 1991.
- Bock, O., Howard, I.P., Money, K. and Arnold, K. Control of arm movements in humans under changed gravity. Paper presented at the *Canadian Society for Brain, Behaviour and Cognitive Science*, Calgary, April, 1991.
- Cheung, B.S.K., Money, K.E. and Howard, I.P. Torsional, vertical and horizontal eye movements under altered gravitoinertial forces. Paper presented at "*Spacebound 1991*". Ottawa, April, 1991.
- Dengis, C.A., Steinbach, M.J. and Kraft, S.P. Extraocular injections of botulinum toxin only produce long term changes in registered eye position. *Investigative Ophthalmology and Visual Science*, 1991, 32, 901.

Conference Presentations and Abstracts (continued)

- Giaschi, D., Regan, D., Hong, X.H., Sharpe, J. Multiple sclerosis can degrade detection and/or discrimination of motion-defined form while sparing motion sensitivity. *Annual Research Day, Department of Ophthalmology, University of Toronto.*
- Giaschi, D. Regan, D. Kothe, A., Hong, X. and Sharpe, J. Multiple sclerosis can degrade detection and/or discrimination of motion-defined form while sparing motion sensitivity. *Investigative Ophthalmology and Visual Science*, 1991, 32, 1282.
- Fresco, B., **Giaschi, D.** and Regan, D. Sensitive measurement of glare susceptibility in cataract patients and in nonpatients. *Investigative Ophthalmology and Visual Science*, 1991, 32, 1084.
- Grasse, K.L. The effects of positional disparity on motion selective responses in the cat accessory optic system. *Society for Neuroscience Abstracts*, in press.
- Gunther, L. and Ono, H. Apparent movement during alternate occlusion following vergence adaptation. Association for Research in Vision and Ophthalmology Meeting. *Investigative Ophthalmology and Visual Science*, 1991, 32, 901.
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- Hamstra, S. and Regan, D. Shape discrimination and the judgement of perfect symmetry. *International Conference on Spatial Vision in Humans and Robots*, York University, June 18-22, 1991.
- Harris, L.R., Lewis, T.L. and Maurer, D. Plaids used to evaluate cortical and subcortical involvement in human optokinetic nystagmus (OKN). *Investigative Ophthalmology and Visual Science*, 1991, 32, 1738.
- Harris, L.R. and Stelling, J.W. The response of vestibular nucleus neurones to sensory conflict. *Society for Neuroscience Abstracts*, 16, 401.4.
- Smith, A.T. and **Harris, L.R.** The direction of eye movements elicited by drifting plaid patterns. *Perception*, 1990, 19, 339.
- Howard, I. P. Visual-vestibular interactions in perceived stability. Invited paper, *17th CVS Symposium on Orientation in Space*. University of Rochester, June, 1990.
- Howard, I.P. Visual and vestibular contributions to induced visual motion. Paper presented at the *Vestibular Symposium of the Dohman Society*, Toronto, Nov, 1990.
- Howard, I.P. Human Cyclovergence. Paper presented at the *Conference on Spatial Vision in Humans and Robots*, York University, June, 1991.
- Hong, X.H. and Regan, D. Motion blindness for unilateral and oscillatory motion in depths. *International Conference on Spatial Vision in Humans and Robots*, York University, June 18-22, 1991.
- Dudek, G., **Jenkin, M.**, Milios, E. and Wilkes, D. Sonar and obstacle modelling", *3rd Conference on Military Robotic Applications*, Medicine Hat, Alberta, 1991.
- Jenkin, M., Milios, E. and Tsotsos J. The design of TRISH: The Toronto-IRIS Stereo Head, *IRIS-Precarn 1st Annual Conference*, Vancouver, June, 1991.
- The R&D programme at York University in the area of AI, Vision Systems and Robotics under the auspices of Precarn", *CFFTP*, February, 1991.
- Wilkes, D., Dudek, G., **Jenkin, M.**, and Milios, E. A ray-following model of sonar range sensing. *SPIE OPTCON '90*, 1990.
- Kaiser, P.K., Kremers, J. and Lee, B.B. Luminance and Chromatic Additivity Measured Psychophysically in Human and Physiologically in Monkey Ganglion Cells. *Investigative Ophthalmology and Visual Science*, 1991, 32, 1115.
- Lu, F. and **Milios, E.** Optimal local spline approximation for planar shape. *IEEE International Conference on Acoustics, Speech and Signal Processing*, 1991, pp. 2469-2472.
- Lee, J. and **Milios, E.** Matching of range images of human faces. *International Conference on Computer Vision*, Osaka, Japan, December, 1990.

- Ohmi, M and Howard, I.P. Induced visual motion; dissociation of oculocentric and headcentric (oculomotor) components. *Investigative Ophthalmology and Visual Science*, 1991, 32, 1272.
- Shibuta, K., Ohkura, M. and **Ono, H.** Eye rotation relative to head movement as a cue to absolute distance. *13th European Conference On Visual Perception*. 1990.
- Ono, H., Shioiri, S. and Sato, T. Monocular stereopsis after motion adaptation. *13th European Conference On Visual Perception*, 1990.

Conference Presentations and Abstracts (continued)

- Rogers, B. J., **Ono, H.** and Ohmi, M. Temporal thresholds for perceiving 3-D surfaces from motion parallax information. *Psychonomic Society's 31st annual meeting*, 1990.
- Shibuta, K., Ohkura, M. and **Ono, H.** Eye rotation relative to head movement as a cue to absolute distance. *13th European Conference On Visual Perception*, 1990.
- Ono, H., Shiori, S. and Sato, T. Monocular stereopsis after motion adaptation. *13th European Conference On Visual Perception*, 1990.
- Ono, H. Perception of depth and motion from motion parallax after motion adaptation. *The East of Scotland Vision Group*, 1991.
- Shiori, S., **Ono, H.** and Sato, T. Adaptation of relative motion detectors. Association for Research in Vision and Ophthalmology Meeting. *Investigative Ophthalmology & Visual Science*, 1991, 32, 827.
- Ono, H., Shiori, S. and Sato, T. Parallax depth perception after motion adaptation. Association for Research in Vision and Ophthalmology Meeting. *Investigative Ophthalmology and Visual Science*, 1991, 32, 1276.
- Saida, S. and **Ono, H.** Accommodative Vergence and Hering's law of equal innervation. Association for Research in Vision and Ophthalmology Meeting. *Investigative Ophthalmology and Visual Science*, 1991, 32, 760.
- Bradshaw, M.F. Rogers, B.J., **Ono, H.**, and Ohmi, M. Thresholds for perceiving (i) 3-D structure from motion parallax and (ii) 2-D relative motion as a function of dot lifetime. *Investigative Ophthalmology and Visual Science*, 1991, 32, 831.
- 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, 1990.
- Kothe, A.C., **Regan, D.** and Sharpe, J.A. A motion-defined letter test to detect visual dysfunction in patients with multiple sclerosis. *Annual Meeting of the American Academy of Optometry*, Nashville, December, 1990.
- Regan, D. Specific tests and specific blindness: Keys, locks and parallel processing Prentice Medal Lecture, *Annual Meeting of American Academy of Optometry*, Nashville, December, 1990.
- Regan, D. Procedures for establishing low-contrast and glare susceptibility standards for pilots and drivers. *Symposium on Aeromedical Aspects of Vision*, DCIEM, Toronto, December, 1990.
- Regan, D., Hong, X.H. and Hamstra, S. Visual sensitivity to camouflaged motion-defined shapes and the limits of safety in nap-of-the Earth helicopter navigation. *Symposium on Aeromedical Aspects of Vision*, DCIEM, Toronto, December, 1990.
- Regan, D. A new method for quantifying functional susceptibility to glare. *Annual Research Day, Dept. of Ophthalmology*, University of Toronto.
- Regan, D. A sensitive method for quantifying functional loss caused by veiling glare in patients and elderly nonpatients. *Optical Society of America meeting on Noninvasive Assessment of the Visual System*, Santa Fe, February, 1991.
- Regan, D. and Hong, X.H. Motion-defined letter reacting test. *Optical Society of America meeting on Noninvasive Assessment of the Visual System*, Santa Fe, February, 1991.
- Regan, D. and Hamstra, S. Shape discrimination and the judgement of perfect symmetry. *Investigative Ophthalmology and Visual Science*, 1991, 32, 1271.
- Regan, D. Medical Research Council of Canada Lecture. Selective visual loss in patients and super-sight in athletes: Opposite ends of a continuum. *Sherbrook Symposium*, September, 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. *Fourth International Evoked Potentials Symposium*, Toronto.
- Reed, M. Steinbach, M.J. and Kraft, S.P. The effect of spatial frequency on OKN asymmetry in strabismic subjects. *Investigative Ophthalmology and Visual Science*, 1991, 32, 895.

- Rogers, B. and Howard, I.P. Differences in the mechanisms used to extract 3-D slant from disparity and motion parallax cues. *Investigative Ophthalmology and Visual Science*, 1991, 32, 695.
- Shen, X. and Howard, I.P. Optokinetic torsion: the effects of the area and position of the visual display. *Investigative Ophthalmology and Visual Science*, 1991, 32, 1020.
- 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.
- Steinbach, M.J. The eye as an otolith organ. Paper presented at *The Vestibular Symposium of the Dohlman Society*, Toronto, Nov. 1990.

Colloquia

Otmar Bock

Department of Psychology, Brandeis University, November, 1990.
 Faculty of Medicine, University of Aachen, and Institute für Aerospace Medicine, Köln, 1990.
 Department of Kinesiology, University of Waterloo, 1991.
 Department of Clinical Neuroscience, University of Calgary, 1991.

Keith Grasse

Symposium on vestibular function, Sunnybrook Hospital Medical Centre, Toronto, November, 1990.

Laurence Harris

Department of Optometry, Cardiff University, Jun, 1991.
 Institute of Ophthalmology, London, June, 1991.

Ian Howard

Department of Psychology, University of Miami, Ohio, January, 1991.
 National Eye Institute, National Institutes of Health, Bethesda, May, 1991.

Peter Kaiser

Department of Biology, York University, October, 1990.
 Department of Biology, University of Tübingen, Germany. Jun, 1991.

David Regan

Massachusetts Institute of Technology, Boston, October, 1990.
 Department of Neuroscience, Johns Hopkins University, Baltimore.
 Department of Psychology, University of Toronto, November, 1990.
 Department of Biomedical Engineering, University of Toronto, January, 1991.
 Department of Ophthalmology, Dalhousie University, Halifax.
 Ophthalmology, Neurology and Pediatrics Residents, Dalhousie University, Halifax.

Paul Stager

EUROCONTROL Human Factors Discussion Group, Paris, November, 1990.

Martin Steinbach

Grand Rounds, Hospital for Sick Children, Toronto, November, 1990.
 School of Optometry, University of Waterloo, March, 1991.

Awards

Stuart Anstis

Winner of a Faculty of Arts Teaching Fellowship, 1990.

David Regan

Charles F. Prentice Medal, the highest honour of the American Academy of Optometry, 1990.
 Winner of a Killam Fellowship, May, 1991.

Martin Steinbach

Atkinson College Research Fellowship, 1990-1991.

Don Hameluck

Awarded the Alphonse Chapanis Award for the Best Student Paper at the Human Factors Society Annual Meeting in October 1990.

Conference on Spatial Vision in Humans and Robots

A international conference on the above topic was held at York University on June 18th to 22nd, 1991. There were 22 invited speakers, 26 posters and 212 registrants. The conference was sponsored by the York Vision Group, the Institute for Space and Terrestrial Science, the Department of Computer Science, the Information Technology Research Centre, and NSERC.

We plan to hold another international conference on Optic Flow in June of 1993.

Seminars given by visiting scientists

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| S. Anstis | York | A run-through of his Paris Conference Talk. |
| J. Findlay | Durham | Human Saccadic Eye Movements: Problems and Puzzles. |
| B. Frost | Queen's | The Neural Processing of Visual Motion. |
| W. Graf | Rockefeller | Comparative Anatomy and Physiology of Head-Movement Control. |
| M. Green | Trent | Visual Search, Visual Streams and Visual Architectures. |
| J. Lackner | Brandeis | Human Sensory-Motor Adaptation to the Force of Earth Gravity. |
| S. Leat | Wales | Requirements for Reading and Performance of Low Vision Aids. |
| B. Lee | Max Planck | Physiological Basis of Chromatic and Luminance Channels. |
| P. Lennie | Rochester | The Design of Colour-Opponent Mechanisms. |
| S. McFadden | York | Discrimination of Colours in Complex Images. |
| F. Miles | Washington | The Parsing of Optic Flow by the Primate Oculomotor System. |
| A. Nyman | Toronto | Edge Localization and the Readability of Computer Text. |
| F. Owen | Franklin | Oculomotor Information for Three-Dimensional Space. |
| M. Reed | York | Optokinetic Nystagmus in Strabismus and Monocularly Enucleation. |
| B. Rogers | Oxford | A Lifetime of Parallax: Perception and Representation of 3-D Surfaces. |
| J. Sivak | Waterloo | Inducing Refractive Error in Chicks. |
| H. Spekrijse | Amsterdam | Induced Color Blindness in Goldfish. |
| G. Sperling | New York | Stages of Visual Processing. |
| J. Victor | Cornell | Models for the Detection of Features in Visual Textures. |
| W. Warren | Brown | Navigation from Optical Flow. |

C. Westall

Wales

Eye Movements in Children with Poor Vision.