

Faculty

- Doug Crawford** Associate Professor of Psychology and Biology
Interests: three-dimensional eye and head movements, visuomotor neurophysiology.
- James Elder** Assistant Professor of Psychology, Computer Science and Mathematics
Project Leader, Human Performance Laboratory
Interests: visual psychophysics, computational vision, virtual reality, telepresence
- Keith Grasse** Associate Professor of Psychology and Biology
Interests: neurophysiology of the visual system, eye movements, auditory processes, neurophysiology, neuropharmacology.
- Laurence Harris** Professor of Psychology and Biology
Project Leader, Human Performance Laboratory
Interests: neurophysiology and psychophysics of visual, vestibular and oculomotor systems.
- Ian Howard** Distinguished Research Professor of Psychology and Biology
Director of the Centre for Vision Research
Co-Director of the Human Performance Laboratory
Interests: space perception, eye movements, visual-vestibular interactions.
- Michael Jenkin** Professor and Chair of Computer Science
Project Leader, Human Performance Laboratory
Interests: computer vision, robotics and virtual reality.
- Evangelos Milios** Associate Professor of Computer Science
Interests: computer vision and auditory scene analysis, human-computer interaction.
- Hiroshi Ono** Professor of Psychology
Research Associate, Human Performance Laboratory
Interests: visual perception of direction and distance, eye movements.
- Jonathan Ostroff** Associate Professor of Computer Science
Research Associate, Human Performance Laboratory
Interests: real-time systems, control systems.
- David Regan** CAE/NSERC Industrial Research Professor
Distinguished Research Professor of Psychology and Biology, York University
Professor of Ophthalmology and Medicine, University of Toronto
Co-Director, Human Performance Laboratory
Foreign Member Netherlands Royal Academy of Science
Fellow of the Royal Society of Canada
Interests: psychophysics of spatial vision, motion, stereopsis, colour vision, vision in aviation, visually evoked brain activity, visual disorders, auditory psychophysics.
- Josée Rivest** Associate Professor of Psychology, Glendon College
Interests: visual attention to moving objects in athletes and non-athletes, shape processing in normals and in brain damaged patients with and without visual neglect.
- Paul Stager** Professor of Psychology

Research Associate, Human Performance Laboratory
 Interests: cognitive engineering, display design and evaluation.

Faculty cont'd.

Martin Steinbach Professor of Psychology and Biology, York University
 Director, Vision Science Research Program, Toronto Western Hospital
 Professor of Ophthalmology, University of Toronto
 Senior Scientist, Dept. of Ophthalmology, Hospital for Sick Children
 Director of Research, Department of Ophthalmology, University of Toronto
 Interests: eye movements, visual-motor coordination, clinical disorders of the oculomotor system.

Wolfgang Stuerzlinger Assistant Professor of Computer Science
 Interests: human-computer interaction, virtual reality, computer graphics.

Evan Thompson Associate Professor of Philosophy
 Interests: philosophical foundations of cognitive science and perception.

Laurie Wilcox Assistant Professor of Psychology
 Interests: fundamental, clinical and applied aspects of 3D depth perception.

New Faculty joining CVR in the year 2000

Lauren Sergio Assistant Professor of Kinesiology, York University
 Interests: neural mechanisms of visually guided reaching in parietal and precentral cortex.

John Tsotsos Professor of Computer Science and new Director of CVR
 Interests: computational, psychophysical and neurobiological dimensions of visual attention with the desire to build practical and predictive models.

Fran Wilkinson Professor of Psychology, Atkinson
 Interests: involvement of the visual system in migraine. Intermediate visual form perception using psychophysical, computational and fMRI methodologies.

Hugh Wilson ORDCF Professor of Biology
 Interests: psychophysical and neural models of form vision, fMRI studies of cortical form vision, nonlinear dynamics of cortical function.

Research Associates

Dr. Robert Allison	With I.P. Howard and M. Jenkin
Dr. Bob Cheung	With I.P. Howard
Ms. Xueping Fang	With I.P. Howard
Dr. Esther Gonzalez	With M. Steinbach
Dr. Xiang-Hua Hong	With D. Regan
Ms. Linda Lillakas	With H. Ono and M. Steinbach
Mr. Al Mapp	With H. Ono

Dr. Elizabeth Irving	With M. Steinbach
Dr. Heather Jenkin	With I.P. Howard
Dr. Maureen Reed	With M. Steinbach
Dr. Marian Regan	With D. Regan
Ms. Marita Rousou	With E. Milos
Dr. Hongying Wang	With D. Crawford
Mr. Gregory Wu	With J. Elder
Mr. Jim Zacher	With I.P. Howard

Post Doctoral Fellows

Dr. Yuquin Hou	With J. Elder
Dr. Stephen Palmisano	With I.P. Howard
Dr. Robert Reeves	With J. Elder
Dr. Masayuki Sato	With I.P. Howard
Dr. Filippo Speranza	With L. Wilcox
Dr. Manickam Umasuthan	With J. Elder

Graduate students

Supervisor

Melike Ceylan	1 st year Ph.D.	Crawford
Michael Goesele	Dipl.-Inf.	Stuerzlinger
Richard Goldberg	3 rd year M.Sc.	Elder
Philip Grove	2 nd year Ph.D.	Ono
Lorraine Gunther	3 rd year M.A.	Ono
Yeola Harris	2 nd year M.A.	Wilcox
Denise Henriques	3 rd year Ph.D.	Crawford
Ghee Ho	Obtained Ph.D.	Stager
Gang Hu	2 nd year M.Sc.	Howard
Michelle Hudoba	2 nd year M.A.	Harris
Donna Jolic	1 st year M.A.	Rivest
Bill Kapralos	1 st year MSc.	Jenkin
Radha Kohly	1 st year Ph.D.	Regan
Agnieszka Kopinska	Obtained M.A.	Harris
Eliana Klier	2 nd year Ph.D.	Crawford
Dimitrios Llianos	2 nd year M.Sc.	Crawford
Arlene Lipsman	1st year M.Sc.	Jenkin
Lewis Lo	3 rd year M.Sc.	Ostroff
Iraj Mantegh	Obtained Ph.D.	Jenkin
Fara Redlick	Obtained M.A.	Harris/Jenkin
Greg Reid	Obtained M.Sc.	Milios
Adam Sachs	2 nd year M.Sc.	Elder
Tim Salzman	2 nd year M.Sc.	Stuerzlinger
Michael Smith	3 rd year Ph.D.	Crawford
Jennifer Steeves	3 rd year Ph.D.	Steinbach
Masahiro Suzuki	Chukyo Univ. Japan	Visiting with H. Ono
Diana Tajik	2 nd year M.A.	Steinbach
Liliana Velisavljevic	2 nd year Ph.D.	Elder

Jennifer Warner	2 nd year M.A.	Rivest
Dan Zikovitz	1 st year Ph.D.	Harris/Jenkin

Students Arriving Sept. 1999

Alina Constantin	1 st year M.Sc	Crawford
Bogdan Dumitrescu	1 st year M.Sc	Stuerzlinger
Slava Konovalova	1 st year M.A.	Wilcox
Ms. S. Lee	1 st year M.A.	D. Regan
Graham Smith	1 st year M.Sc	Stuerzlinger
Jeffrey Zhifeng Wei	1st year M.Sc	Stuerzlinger

Visiting Scientists 1998-99

Dr. Kwonsaeng Park	Department of Psychology, Keimyung University
Dr. Brian Rogers	Oxford University, U.K.
Dr. Stuart Anstis	University of San Diego, LaJolla

Visiting Scientists 1999-2000

Dr. Kwonsaeng Park	Department of Psychology, Keimyung University
Dr. Brian Rogers	Oxford University, U.K.
Dr. N. Wade	Dundee University, Scotland
Dr. Catina Feresin	University of Trieste
Dr. Valentine Silakov	Newington VA Medical Center

Awards and Honours

Doug Crawford

MRC Scholar
1999 Dean's Award for Outstanding Research

James Elder

Member of Programme Committee, 1999 International Conference on Computer Vision

Denise Henriques

MRC studentship

NSERC Fellowships/Scholarships

Robert Allison
Eliana Klier
Michael Smith

Hiroshi Ono

Faculty of Arts Fellowship, York University, 1999-2000
Faculty of Graduate Studies' Teaching Award, York University, 1998-1999

David Regan

Elected Foreign Member of the Royal Netherlands Academy of Science (Medical Section)
 Annual Clair Bobier Lecture, University of Waterloo, Visual demands on pilots and highway drivers
 Elected to Spinoza Chair for 1999 by Faculty of Medicine, University of Amsterdam.
 Elected to Editorial Board, Vision Research

Martin Steinbach

Emerson Woodruff Lecturer, University of Waterloo, School of Optometry, 1998

E. Lynn Kirshner Memorial Scholarship for 1998

The 1998 Kirshner Award for best senior-authored paper by a graduate student in Vision Science was divided between five outstanding students.

Robert Allison for his paper in Perception, 27, 1287-1304. "Temporal aspects of slant and inclination perception."

Eliana Klier for her 1998 paper in the Journal of Neurophysiology, 80:2274-2294, "Human oculomotor system accounts for 3-D eye orientation in the visual-motor transformation for saccades."

Radha Kohly for her paper in press in Vision Research, "Evidence for a mechanism sensitive to the speed of cyclopean form."

Michael Smith for his 1998 paper in the Journal of Neurophysiology, 80: 2295-2315, "Neural control of rotational kinematics within realistic vestibuloocular coordinate systems."

Daniel Zikovitz for his paper in press in Ergonomics, "Head tilt during driving."

Publications July 1998-June 1999

Books

- Harris L.R. and Jenkin, M. (1998) *Vision and Action*. UK, Cambridge University Press, Cambridge, 360 pages.
- Jenkin, M. and Harris, L.R. (2000) *Vision and Attention*. Springer-Verlag, NY, in press.
- Dudek, G. and **Jenkin, M.** (2000) *Computational Principles of Mobile Robotics*. Cambridge University Press, in press.
- Regan, D. (1999) *Human Perception of Objects: Early Visual Processing of Spatial form Defined by Luminance, Color, Texture, Motion and Binocular Disparity*. New York, Sinauer, in press.

Chapters in Books

- Crawford, J.D. (1998) Listing's law: What's all the hubbub? In L.R. Harris and M. Jenkin (Eds.) *Vision and Action*, UK: Cambridge University Press, pp 139-162.
- Harris L.R., Zikovitz, D.C. and Kopinska, A. (1998) Frames of reference with examples from driving and auditory localization. In L.R. Harris and M. Jenkin (Eds.) *Vision and Action*, UK: Cambridge University Press, pp 66-81.
- Harris L.R. and Jenkin, M. (1998) Vision and action. In L.R. Harris and M. Jenkin (Eds.) *Vision and Action*, UK: Cambridge University Press, pp 1-12.
- Howard, I.P. (1999) The fidelity of disparity-based stereopsis in helmet-mounted displays. In L. Hettlinger (Ed.) *Virtual Reality Systems*, New York: Elsevier, in press.
- Lesperance, Y., Tam, K. and **Jenkin, M.** (1999) Reactivity in a logic-based robot programming framework. In H. Levesque and F. Pirri (Eds.) *Logical Foundations for Cognitive Agents*, pp 190-207.
- Uhlin, T. and **Jenkin, M.** (1999) Real time issues for active vision hardware. In H. Christensen and J. Crowley (Eds.) *Active Vision Hardware*, Kluwer, in press.
- Coombs, D. and **Jenkin, M.** (1999) The geometry of active binocular vision. In H. Christensen and J. Crowley (Eds.) *Active Vision Hardware*, Kluwer, in press.
- Regan, D., Gray, R., Portfors, C.V., Hamstra, S.J., Vincent, A., Hong, X.H., Kohly, R. and Beverley, K.I. (1998) Catching, hitting and collision avoidance. In L.R. Harris and M. Jenkin (Eds.) *Vision and Action*, UK: Cambridge University Press, pp 171-209.
- Stager, P. (1999) Achieving the objectives of certification through validation: Methodological issues. In J. Wise and V.D. Hopkin (Eds.) *Human Factors Certification*, Mahwah, NJ: Lawrence Erlbaum Associates, in press.
- Steinbach, M. J. (1999) The palisade ending: An afferent source for eye position information in humans. In G. Lennerstrand, J. Ygge and E. Campos (Eds.) *Advances In Strabismus Research: Basic and Clinical Aspects*, London: Portland Press, in press.
- Raskar, R., Cutts, M., Welch, G. and **Stürzlinger, W.** (1998) Efficient image generation for multiprojector and multisurface displays. In M. Drettakis (Ed.) *Rendering Techniques '98*, Springer Verlag, pp 139-144.
- Thompson, E. (1999) Filling in: Visual science and the philosophy of perception. In D. Fiset (Ed.) *Consciousness and Intentionality: Models and Modalities of Attribution*. Dordrecht: Kluwer, pp 145-161.
- Thompson, E. (1999) Comparative colour vision: quality space and visual ecology. In B. Funt (Ed.) *Colour Perception*, Vancouver Studies in Cognitive Science, Toronto and New York: Oxford University Press, in press.
- Thompson, E., Noë, A. and Pessoa, L. (1999) Perceptual completion: a case study for phenomenology and cognitive science. In J. Petitot, J-M. Roy, B. Pachoud and F.J. Varela (Eds.) *Naturalizing phenomenology: Issues in Contemporary Cognitive Science and Phenomenology*, Stanford University Press, in press.

Zikovitz, D.C. and Harris, L.R. (1999) Effects of gravito-inertial-force and vision on head tilt during driving. In A. Gale (Ed.) *Vision in Vehicles VII*, Elsevier North-Holland, in press.

Papers in Refereed Journals

Allison, R.S., Howard, I.P., Rogers, B.J. and Bridge, H. (1998) Temporal aspects of slant and inclination perception. *Perception*, 27, 1287-1304.

Allison, R.S., Zacher, J. and Howard, I.P. (1999) The effect of field size, head motion and rotational velocity on roll vection and illusory self-tilt in a tumbling room. *Perception*, 28, 299-306.

Allison, R.S. and Howard, I.P. Temporal dependencies in resolving monocular and binocular conflict in slant perception. *Vision Research*, in press.

Crawford, J.D., Ceylan, M.Z., Klier, E.M. and Guitton, D. (1999) Three-dimensional eye-head coordination during gaze saccades in the primate. *Journal of Neurophysiology*, 81, 1760-1782.

Elder, J.H. and Zucker, S.W. (1998) Local scale control for edge detection and blur estimation. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 20, 699-716.

Harris, L.R., Jenkin, M. and Zikovitz, D.C. (1998) Vestibular cues and virtual environments. *IEEE Virtual Reality Annual International Symposium (VRAIS)*, 133-138.

Harris, L.R. (1998) The Mars/Sun collision illusion: motion is not visualizable in two different reference frames simultaneously. Commentary on Margolis on Cognitive Illusion. *Psychology*, 9, 33.

Harris, L.R., Jenkin, M. and Zikovitz, D.C. (1999) Vestibular cues and virtual environments: choosing the magnitude of the vestibular cue. *Proceedings of the IEEE Virtual Reality Annual International Symposium (VRAIS)*, 229-236.

Harris, L.R., Jenkin, M. and Zikovitz, D.C. (1999) Vestibular capture of the perceived distance of passive linear self motion. *Archives Italiennes de Biologie*, in press.

Abadi, R.V., **Howard, I.P.** and Ohmi, M. (1999) Gaze orientation during full-field and peripheral field passive optokinesis. *Ophthalmic and Physiological Optics*, 19, 261-265.

Howard, I.P., Fang, X., and Allison, R.S. (1999) Effects of stimulus size and eccentricity on horizontal vergence. *Experimental Brain Research*, in press.

Groen, E.L., **Howard, I.P.** and Cheung, B.S.K. (1999) Influence of body roll on visually induced sensations of self tilt and rotation. *Perception*, 28, 287-298.

Howard, I.P. (1999) The Helmholtz-Hering debate in retrospect. *Perception*, 28, in press.

Howard, I.P., Jenkin, H.L. and Hu, G. (1999) Visually induced reorientation illusions as a function of age. *Aviation, Space and Environmental Medicine*, in press.

Grove P. M., and Ono, H. (1999) Ecologically invalid monocular texture leads to longer perceptual latencies in random dot stereograms. *Perception*, 28, 627-640.

Irving, E. L., Goltz, H.C., Steinbach, M.J. and Kraft, S.P. (1998) Vertical latent nystagmus component and vertical saccadic asymmetries in subjects with dissociated vertical deviation. *Journal of the American Association for Pediatric Ophthalmology and Strabismus*, 2, 344-350.

Irving, E. L., Goltz, H.C., Steinbach, M.J. and Kraft, S.P. (1999) Reply to Letter to the Editor: Vertical latent nystagmus component and vertical saccadic asymmetries in subjects with dissociated vertical deviation. *Journal of the American Association for Pediatric Ophthalmology and Strabismus*, 3, in press.

Nickerson, B., Jasiobedzki, P., Wilkes, D., **Jenkin, M.**, **Milios, E.**, Tsotsos, J., Jepson, A. and Bains, O.N. (1998) An autonomous robot for an industrial environment. *Robotics and Autonomous Systems*, in press.

Kohly, R.P. and Regan, D. (1999) Evidence for a mechanism sensitive to the speed of cyclopean form. *Vision Research*, 39, 1011-1024.

- Klier, E.M. and Crawford, J.D. (1998) The human oculomotor system accounts for 3-D eye orientation in the visual-motor transformation for saccades. *The Journal of Neurophysiology*, 80, 2274-2294.
- Mapp, A.P. and Ono, H. (1998) Wondering about the wandering cyclopean eye. *Vision Research*, 39, 2381-2386.
- Nakamizo, S., **Ono, H.** and Ujike, H. (1999) Subjective staircase: A multiple wallpaper illusion. *Perception and Psychophysics*, 61, 13-22.
- Gray, R. and **Regan, D.** (1998) Spatial frequency discrimination and detection characteristics for gratings defined by orientation texture. *Vision Research*, 38, 2601-2617.
- Gray, R. and **Regan, D.** (1998) Motion in depth: adequate and inadequate simulation. *Perception and Psychophysics*, 61, 236-245.
- Regan, D. and Gray, R. (1999) Hand-eye coordination: visual aspects. *Trends in Cognitive Science*, in press.
- Gray, R. and **Regan, D.** (1999) Adapting to expansion increases perceived time to collision. *Vision Research*, 39, 3602-3607.
- Papers in Refereed Journals cont'd.**
- Gray, R. and **Regan, D.** (1999) Do monocular time to collision estimates necessarily involve perceived distance? *Perception*, in press.
- Gray, R. and **Regan, D.** (1999) Estimating time to collision with a rotating nonspherical object. *Vision Research*, in press.
- Kwan, L. and **Regan, D.** (1998) Orientation—tuned spatial filters for texture-defined form. *Vision Research*, 39, 3849-3855.
- Smith, M.A. and Crawford, J.D. (1998) Neural control of rotational kinematics within realistic vestibulo-ocular coordinate systems. *Journal of Neurophysiology*, 80, 2295-2315.
- Steeves, J., Reed, M.J., Steinbach, M.J. and Kraft, S.P. (1999) Monocular horizontal optokinetic nystagmus in observers with early- and late-onset strabismus. *Behavioural Brain Research*, in press.
- Gonzalez, E.G., **Steinbach, M.J.**, Gallie, B. and Ono, H. (1999) Egocentric localization: Visually directed alignment to projected head landmarks in binocular and monocular observers. *Binocular Vision and Strabismus Quarterly*, 14, 127-136.
- Pessoa, L., **Thompson, E.** and Noë, A. (2000) Filling In: One or many, response to continuing commentary by R. Van Lier on Pessoa, Thompson and Noë, Finding out about filling In [see below], *Behavioral and Brain Sciences*, in press.
- Thompson, E. and Varela, F.J. (2000) Autopoiesis and lifelines: The importance of origins. Open peer commentary on Steven Rose, Précis of lifelines: biology beyond determinism. *Behavioral and Brain Sciences*, in press.
- Noë, A., Pessoa, L. and **Thompson, E.** (2000) Beyond the grand illusion: What change blindness really teaches us about vision. *Visual Cognition*, 7, 93-106.
- Noë, A. and **Thompson, E.** (1999) Seeing beyond the modules toward the subject of Perception. Open peer commentary on Zenon Pylyshyn, Is vision continuous with cognition: The case for cognitive impenetrability of vision. *Behavioral and Brain Sciences*, 22, 386-387.
- Pessoa, L., **Thompson, E.** and Noë, A. (1998) Finding Out About Filling In: A Guide to Perceptual Completion for Visual Science and the Philosophy of Perception. *Behavioral and Brain Sciences* ("Target Article") 21, 723-802.
- Wilcox, L.M. (1999) 1st and 2nd-order contributions to surface interpolation. *Vision Research*, 39, 2335-2347.
- Hess, R.F., Baker, C.L. and **Wilcox, L.M.** (1999) Comparison of 2nd-order processing in motion and stereopsis. *Journal of the Optical Society of America*, 16, 987-994.
- Wilcox, L.M. and Hess, R.F. (1998) When stereopsis does not improve with increasing contrast. *Vision Research*, 38, 3671-3680.
- Zikovitz, D.C. and Harris, L.R. (1999) Head tilt during driving. *Ergonomics*, 42, 740-746.

Published Abstracts and Proceedings

Allison, R. and Jenkin, M. Depth perception with a robotic stereo head. *Perception*, 1999, 28(suppl), 132.

Allison, R.S. and Howard, I.P. Depth perception with persisting and dynamic textures. *Investigative Ophthalmology and Visual Science*, 1999, 40, S419.

Ceylan, M., Henriques, D., D., Llianos, D., Tweed, D. and Crawford, J.D. Context-dependent visual-motor adaptation of eye-head coordination in humans and monkeys. *Society for Neuroscience Abstracts*, 1998, 24, 670.

Andersen, R.A., Goldberg, M.E., **Crawford, J.D.** and Kleinfeld, D. Maintaining stable spatial representations (Symposium). *Society for Neuroscience Abstracts*, 1998, 24, 755.

Elder, J.H., Beniaminov, D. and Pntilie, G. Edge classification in natural images. *Investigative Ophthalmology and Visual Science*, 1999, 40, S357.

Elder, J.H. and Goldberg, R.M. Inferential reliability of contour grouping cues in natural images. *Perception*, 1998, 27, (suppl) 11.

Grove, P. M., Kaneko, H. and Ono, H. Corresponding points measured over a 22 x 22 degree field using the minimum motion technique. *Investigative Ophthalmology and Visual Science*, 1999, 40, 2203.

Harris, L.R., Jenkin, M. and Zikovitz D.C. Vestibular capture of self motion. *Archives Italiennes de Biologie*, 1999, 137(suppl) 29-30.

Henriques, D.Y.P. and Crawford, J.D. Visual-motor miscalibrations of remembered vertical and oblique retinal errors when pointing. *Society for Neuroscience Abstracts*, 1998, 24, 2096.

Published Abstracts and Proceedings cont'd.

Hu, G., Howard, I.P. and Palmisano, S.A. The role of intrinsic and extrinsic polarity in generating reorientation illusions. *Investigative Ophthalmology and Visual Science*, 1999, 40, S801.

Hudoba, M., Crawford, J.D., Harris, L.R. Three dimensional gaze movements evoked by passive rotation in cats. *Neuroscience Abstracts*, 1999, in press.

Jenkin, H. and Howard, I.P. and Hu, G. Visually induced disorientation as a function of age. *Investigative Ophthalmology and Visual Science*, 1999, 40, S801.

Dymond, P, and **Jenkin, M.** Plugin-based WWW distribution of private information with watermarking. *HICCS '99*.

Jenkin, M., Harris, L., Redlick, F. and Zikovitz, D.C. The same perception of self-motion from different combinations of visual and non-visual cues. *ECVP'99 Symposium on Optic Flow and Heading, Perception*, 1999, 28(suppl), 2.

Klier, E.M., Guitton, D. and Crawford, J.D. Trajectories and 3-D fixation ranges of the eye and head during large gaze shifts in the monkey. *Society for Neuroscience Abstracts*, 1998, 24, 1743.

Kohly, R.P. and Regan, D. Coincidence detectors with outputs labeled with orientation difference and mean orientation. *Investigative Ophthalmology and Visual Science*, 1999, 40, S42.

Ono, H., Lillakas, L. and Suzuki, M. Perceptual displacement of stimuli on the non-fixated plane helps solve Leonardo's paradox. *Investigative Ophthalmology and Visual Science*, 1999, 40, 2192.

Ono, H., Gonzalez, E., Ohtsuka, S. and Steinbach, M.J. Exploring the causes of the Kanisza amodal shrinkage. *European Conference on Visual Perception*, Trieste, Italy, 1999.

Ostroff, J.S. Composition and refinement of discrete real-time systems. *ACM Trans. on Software Engineering Methodology*, 1999, 8, 1-48.

Paige, R.F. and **Ostroff, J.S.** A comparison of the business object notation and the unified modeling language. To appear in *Proc. Second International Conference on the Unified Modeling Language (UML'99)*, LNCS 1723, 67-82, Springer-Verlag, October 1999.

Paige, R.F. and **Ostroff, J.S.** Developing BON as an industrial-strength study formal method. *Proceedings FM'99: World Congress on Formal Methods*. Springer-Verlag, September 1999.

- Ostroff, J.S. and Paige, R. Formal methods in the Classroom: The logic of real-time software design. *3rd IEEE Real-Time Systems Education Workshop*, Poznan, Poland, November 1998.
- Paige, R. F. and **Ostroff, J.S.** From Z to BON/Eiffel. *13th IEEE International Conference on Automated Software Engineering*, 1998, 209-212.
- Palmisano, S.A., Allison, R.S. and Howard, I.P. Effects of decorrelation and disparity noise on stereoscopic surface perception. *Investigative Ophthalmology and Visual Science*, 1999, 40, S417.
- Redlick, F., Harris, L.R. and Jenkin, M. Active motion reduces the perceived self displacement created by optic flow. *Investigative Ophthalmology and Visual Science*, 1999, 40, 4199.
- Gray, R. and **Regan, D.** Adaptation to expansion and perceived time to collision: psychophysical and driving simulator observations. *Perception*, 1999, in press.
- Regan, D. and Gray, R. Estimating the direction of motion and time of arrival of an approaching object. *Perception*, 1998, 27, 46.
- Regan, M.P., Hong, X.H. and Regan, D. Orientation tuning of cyclopean mechanism in human measured objectively by exploiting nonlinearity. *Investigative Ophthalmology and Visual Science*, 1999, 40, S374.
- Gray, R. and **Regan, D.** Estimating time to collision with a rotating nonspherical object. *Investigative Ophthalmology and Visual Science*, 1999, 40, S800.
- Sato, M. and Howard, I.P. Effects of visual frame on depth contrast. *Investigative Ophthalmology and Visual Science*, 1999, 40, S419.
- Smith, M.A. and Crawford, J.D. Accounting for 3-D eye rotations in the mechanisms for spatial memory and visuomotor transformation. *Society for Neuroscience Abstracts*, 1998, 24, 1742.
- Steeves, J., Gray, R., Regan, D. and Steinbach, M.J. Accuracy of estimating time to collision using only monocular information in unilaterally enucleated observers and monocularly viewing normal controls. *Investigative Ophthalmology and Visual Science*, 1999, 40, S800.
- Kraft, S. P., Irving, E. L. and **Steinbach, M. J.** A Case of hypotropic dissociated vertical deviation. *American Association of Pediatric Ophthalmology and Strabismus Meeting*, Toronto, 1999.
- Stuerzlinger, W. Ray tracing triangular trimmed free-form surface. *IEEE Transactions on Visualization and Computer Graphics*, 1998, 4, 202-214.
- Stuerzlinger, W. Imaging all visible surfaces. *Graphics Interface* (Kingston, Ontario), 1999, 115-122.

Published Abstracts and Proceedings cont'd.

- Goesele, M. and **Stuerzlinger, W.** Semantic constraints for scene manipulation. *Conference in Computer Graphics* (Budmerice, SK), 1999, 140-146.
- Aliaga, D., Cohen, J., Wilson, A., Zhang, H., Erickson, C., Hoff, K., T. Hudson, T., **Stuerzlinger, W.**, Baker, E., Bastos, R., Whitton, M., Brooks, F. and Manocha, D. A framework for the real-time walkthrough of massive models. *ACM Symposium on Interactive 3D Graphics* (Atlanta, GA), 1999, 199-206.

Technical Reports

- Elder, J.H. and Velisavljevic, L. An Experimental Investigation of the Effect of Texture Scaling Properties on the Visual Judgement of Surface Attitude. *PWGSC contract 03SV.W8477-8-AC38 for the Canadian Department of National Defense*, 1999.
- Howard, I.P, Palmisano, S., Allison, R.S. and Fang, X. Effects of noisy binocular disparity in stereoscopic virtual-reality systems. Final Report for Contract W7711-7-7393. *Defence and Civil Institute of Environmental Medicine*, July, 1999.
- Gray, R. and **Regan, D.** Risky driving behaviour: a consequence of motion adaptation. Technical Report, TR-99-3 *Cambridge Basic Research, Nissan Research and Development Inc.*, Cambridge, MA, USA, 1999.

Gray, R. and **Regan, D.** Overtaking control strategies and the possible role of adaptation to expansion in overtaking road accidents. Technical Report, TR-99-5. *Cambridge Basic Research, Nissan Research and Development Inc.*, Cambridge, MA, USA, 1999.

Conference Presentations

- Demer, J.L., Miller, J., Quaia, C. and **Crawford, J.D.** New concepts of the ocular motor plant and the neural control of eye movements. *Neural Control of Movement Conference*, Kauai, Hawaii, April 11-16, 1999.
- Elder, J.H. and Velisavljevic, L. What is the optimal texture for the perception of surface attitude? *International Conference on Vision and Attention*, York University, Toronto, June, 1999.
- Elder, J.H. Perceptual factors in virtual reality and telepresence. *PRECARN-IRIS IX Annual Conference*, Toronto, June, 1999.
- Fang, X.P., Allison, R.S. and Howard, I.P. Vertical fusional range increases with depth separation from competing stimuli. *International Conference on Vision and Attention*, York University, Toronto, June, 1999.
- Harris, L.R. and Kopinska, A. The effects of eye and head position on auditory localization. *BBCS*, Ottawa, 1998.
- Harris, L., Redlick, F. and Jenkin, M. Active and passive cues to translation, three-dimensional sensory and motor space: Cortical neuronal mechanisms and psychophysics of orientation and motion in three-dimensional space, Castelvechio Pascoli, Italy, April, 1999.
- Howard, I.P. Knowing which way is up. Invited presentation at the *Vision Science Symposium, Celebrating the 75th Anniversary of the School of Optometry*, University of California at Berkeley, December, 1998.
- Howard, I.P. Knowing which way is up on Earth and in space. Invited presentation at the *International Workshop on Human Factors in Space*. Tokyo, July, 1999.
- Hu, G., Howard, I.P., Palmisano, S.A. and Zacher, J.E. Intrinsic and extrinsic polarity cues both generate reorientation. *International Conference on Vision and Attention*, York University, Toronto, June, 1999.
- Jenkin, H. Attention to detail: An examination of objects, orientations and recognition tasks. *International Conference on Vision and Attention*, York University, Toronto, June, 1999.
- Jenkin, H., Howard, I.P., Gang, H. Visually-induced disorientation as a function of age. *International Conference on Vision and Attention*, York University, Toronto, June, 1999.
- Palmisano, S.A., Howard, I.P. and Allison, R.S. Stereo surface detection robust in presence of substantial disparity jitter. *International Conference on Vision and Attention*, York University, Toronto, June, 1999.
- Stager, P. The Canadian Automated Air Traffic System: A retrospective after a decade. *Human Factors Association of Canada 32nd Annual Meeting*, Toronto, October, 1998.

Conference Presentations cont'd.

- Steeves, J. Gray, R., Steinbach, M.J. and Regan, D. Estimating time to collision using only monocular information in one-eyed observers and monocularly viewing normal controls. *International Conference on Vision and Attention*, York University, Toronto, June, 1999.
- Steeves, J., Gray, R., Regan, D. and Steinbach, M.J. Accuracy of estimating time to collision using only monocular information in unilaterally enucleated observers and monocularly viewing normal controls. Presented at the *41st Annual Research Day*, Department of Ophthalmology, University of Toronto, 1998.
- Kraft, S.P., Irving, E.L. and **Steinbach, M.J.** Reversed dissociated vertical deviation. *Jampolsky Strabismus Fellows Meeting*, Dublin, Ireland, 1998.

Steinbach, M.J., Irving, E.L., Goltz, H.C. and Kraft, S.P. Dissociated vertical deviation and latent vertical nystagmus. *Jampolsky Strabismus Fellows Meeting*, Dublin, Ireland, 1998.

Steinbach, M.J. Oculomotor proprioception and strabismus. Invited symposium presentation. *Wenner-Gren Symposium on Strabismus and Amblyopie*, Stockholm, 1999.

Steinbach, M.J. and Donaldson, I.M.L. Passive eye movement in sheep. *Jampolsky Strabismus Fellows Meeting*, Montreal, 1999.

Colloquia

James Elder

University of Toronto, March, 1999

Laurence Harris

Bochum University, Germany, September, 1998

Ian P. Howard

Senior Scholars Lecture, York University, February, 1999

Hiroshi Ono

North Dakota State University, October, 1998

ATR Human Information Processing Research Laboratories, March, 1999

Smith Kettlewell Research Institute, March, 1999

David Regan

Spinoza Lecture. Academic Medical Center, Amsterdam. September, 1999

Dept. of Medical Physics, University of Amsterdam, September, 1999

Faculty of Sports Sciences, Free Univ. Amsterdam, October, 1999

Dept. of Psychology, University of Amsterdam

Interruniversity Eye Institute, Amsterdam

Martin Steinbach

Eye Research Institute of Canada, June, 1999

Wolfgang Stuerzlinger

Centre for Vision Research, York University, November, 1998

University of Ulm, Germany, July, 1998

Laurie Wilcox

Waterloo School of Optometry, March, 1999

Collaborative Research

Doug Crawford

Ravi Menon, Dept. of Radiology, UWO. fMRI

Phil Servos, Dept. of Psychology, Laurier. fMRI and reaching

Mel Goodale, Dept. of Psychology, UWO. Reaching, psychophysics, cortical neuropsychology

Keith Humphrey, Dept. of Psychology, UWO. Object recognition

David Waitzman, Dept. of Neurology, Newington VA Medical Centre. Brainstem saccade control

James Elder

John Tsotsos, Dept. of Computer Science, University of Toronto, Attention and Telepresence

Jim Clark, Dept. of Electrical Engineering, McGill University, Attention and Telepresence

Ron Kruk, CAE, ESVS for Search and Rescue

Greg Dudek, Dept. of Electrical Engineering, McGill University. Contour-based Image Compression

Robert Hess, Dept. of Ophthalmology, McGill University. 1st and 2nd order stereopsis

Collaborative Research cont'd.

Ian P. Howard

Dr. Ron Kruk, CAE. Visual factors in flight simulators

Dr. C. Oman, MIT. Visual orientation in unfamiliar environments
 Dr. B. Cheung, DCIEM. Orientation in flight simulators
 Drs. Lochlan Magee and Stuart Grant, DCIEM. Effect of noise in stereoscopic systems
 Dr. B. Rogers, Oxford University

Hiroshi Ono

Dr. H. Kaneko, ATR Human Information Processing Laboratories, Kyoto, Japan
 Dr. S. Ohtsuka, NTT Cyber Space Laboratories, Kanagawa, Japan

David Regan

Dr. R. Kruk, CAE. Visual factors in aviation and flight simulator design
 Dr. L. Reid, Institute of Aerospace Science, University of Toronto. Flight simulators

Josee Rivest

Dr. James Sharpe, Toronto Western Hospital
 Dr. James Intriligator, Beth Israel Hospital, Boston
 Dr. Satoru Suzuki, North Western University
 Dr. Norm Park, Baycrest Centre for Geriatric Care

International Conferences

The Centre for Vision Research hosted a conference on Vision and Attention in June 1999.
 The next International Conference will be in June, 2001.

Centre for Vision Research Lecture Series

Kathy Murphy	McMaster	Cortical columns, binocular vision, and plasticity
Toshiyuki Gotoh	Yokohama	What's up in 3D image Processing: A Yokohama perspective
Lin Wang	Portland	Gaze control: active and adaptive
Martin Paré	NIH	Parietal and collicular representation of saccades
Ravi Menon	Western	Ocular dominance columns in V1 revealed using fMRI
Melanie Campbell	Waterloo	Seeing through the optics of the eye both ways
Manickam Umasuthan	York	Rangefinding using time correlated single photon counting
Paul Gamlin	Alabama	Neural control of vergence and accommodation
David I. Shore	U of T	Multimodal prior entry
Hugh Wilson	Chicago	Global processes in higher level form vision
Wolfgang Stuerzlinger	York	Optimized image generation techniques in computer graphics
Doug Crawford	York	Sensorimotor transforms during eye and head movements
Doug Munoz	Queens	The superior colliculus
Lloyd Kaufman	New York	The moon illusion
Gabriel R. De La Torre	Mexico	Internal models of virtual objects
David Fleet	Queens	The correspondence problem
James Elder	York	Contour grouping in natural images
Laurence Harris	York	2nd order motion and OKN and visual capture of self motion
Heather Carnahan	Waterloo	Manual aiming and prehension
Harry G. Sperling	Irvin, CA	Electroretinogram, spectral sensitivity and glaucoma
Kathy Mullen	McGill	Cone combinations
Bob Steinman	Rutgers	Eye and head movements
Casper Erkelens	Utrecht	Headcentric depth perception
Brian Rogers	Oxford	Stereovision

Research Grants (Annual for 1998/99)

Ontario Centre of Excellence Grant (CRESTech) HP Lab	500,000
Ontario Research and Development Fund (ORDCF)	76,000
Canadian Foundation for Innovation (CFI)	2,000,000
Crawford	
MRC Grant with M. Goodale, T. Vilis, D. Tweed, R. Menon	502,230
MRC Operating Grant. Brainstem control of 3-D eye and head movements	88,441
MRC Scholarship. Neural control of 3-D eye and head movements	59,000
NSERC Operating Grant. Human eye, head, and arm movements in 3-D space	23,100
Elder	
IRIS Research Grant, with J. Tsotsos, Toronto and J. Clark, McGill	100,000
Contract with DND DRDB, with P. Shepherd, CRESTech	50,000
NSERC Operating Grant	26,875
CRESTech Opportunity Fund, with J. Tsotsos	20,000
CFI New Opportunities Grant with L. Wilcox	454,500
Grasse	
NSERC Operating Grant	28,000
Harris	
NSERC Operating Grant. The detection of conflict in visual-vestibular interactions	33,495
NSERC Collaborative Research Grant, with M. Jenkin	68,000
Howard	
NSERC Operating Grant. Spatio-temporal disparity detection and vergence	41,000
NASA Grant. Visual orientation in unfamiliar gravito-inertial environments	70,840
DCIEM Contract. Post-rotary effects on attitude perception during rolling manoeuvre	78,000
Jenkin	
NSERC Operating Grant. Embedded stereo vision	23,000
Ono	
NSERC Operating Grant. Sensory and motor aspects of space perception	35,228
ATR Human Information Processing Laboratories. Vertical disparity and visual direction	14,400
Ostroff	
NSERC Operating Grant	28,600
Regan	
NSERC/CAE Industrial Chair	90,000
NSERC Operating Grant	73,000
AFOSR Grant	219,829
Rivest	
NSERC Operating Grant. The role of attention on processing multiple attributes images	18,000
Steinbach	
NSERC Operating Grant. Human oculomotor control	38,000
Jackman Foundation	1,000
Stuerzlinger	
NSERC Operating Grant	14,700
Evan Thompson	
SSHRC Standard Research Grant	28,920
Wilcox	
NSERC Operating Grant	20,000
CRESTech Opportunity Fund	30,000

IMAX Corporation research funding	30,000
Total annual value of grants	\$4,884,783