

# RICHARD F. MURRAY

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## Education

2002 Ph.D., University of Toronto, Department of Psychology  
1994 M.Phil., University of Cambridge, Department of Philosophy  
1992 B.A., University of Toronto, Department of Philosophy

## Positions

2009 - present Associate professor  
2005 - 2009 Assistant professor  
York University, Department of Psychology  
2004 - 2005 Assistant professor  
University of Pennsylvania, Department of Psychology  
2002 - 2003 Postdoctoral fellow (advisor: Wilson S. Geisler)  
University of Texas at Austin, Center for Perceptual Systems

## External research grants

2011 - 2016 Statistical properties of natural 3D scenes and their role in visual perception  
Natural Sciences and Engineering Research Council, Discovery Grant  
2006 - 2011 Perception of shape in two and three dimensions  
Natural Sciences and Engineering Research Council, Discovery Grant  
2005 - 2010 Three-dimensional shape perception  
Canada Foundation for Innovation, Leaders Opportunity Fund  
2004 - 2005 Bayesian shape from shading  
National Eye Institute, R03 Grant

## **Affiliations**

2011 - present CREATE Training Grant, York University; Co-investigator  
2008 - present Neuroscience Diploma Program, York University; Faculty Member  
2005 - present Centre for Vision Research, York University; Faculty Member  
2005 - present Faculty of Graduate Studies, York University; Faculty Member

## **Guest scholar positions**

2012 Université Paris Descartes, Laboratoire Psychologie de la Perception  
2011 - 2012 Technische Universität Berlin, Fachgruppe Modellierung Kognitiver Prozesse  
2000 NASA Ames Research Center, Human Information Processing Research Branch  
2000 Cedars-Sinai Medical Center, Department of Medical Physics and Imaging

## **Journal articles**

Morgenstern, Y., Murray, R. F., & Harris, L. R. (2011). The human visual system's assumption that light comes from above is weak. *Proceedings of the National Academy of Sciences*, 108(30), 12551-12553.

Murray, R. F. (2011). Classification images: a review. *Journal of Vision*, 11(5):2, 1-25.

Murray, R. F., & Morgenstern, Y. (2010). Cue combination on the circle and the sphere. *Journal of Vision*, 10(11):15, 1-11.

MacKenzie, K. J., Murray, R. F., & Wilcox, L. M. (2008). The intrinsic constraint approach to cue combination: an empirical and theoretical evaluation. *Journal of Vision*, 8(8):5, 1-10.

Gold, J. M., Murray, R. F., Sekuler, A. B., Bennett, P. J., & Sekuler, R. (2005). Visual memory decay is deterministic. *Psychological Science*, 16(10), 769-774.

Murray, R. F., Bennett, P. J., & Sekuler, A. B. (2005). Classification images predict absolute efficiency. *Journal of Vision*, 5(2), 139-149.

Murray, R. F., & Gold, J. M. (2004). Troubles with bubbles. *Vision Research*, 44(5), 461-470.

Murray, R. F., & Gold, J. M. (2004). Reply to Gosselin and Schyns. *Vision Research*, 44(5), 479-482.

Murray, R. F., Beutter, B. R., Eckstein, M. P., & Stone, L. S. (2003). Saccadic and perceptual performance during visual search. II. Letter discrimination. *Journal of the Optical Society of America A*, 20(7), 1356-1370.

Murray, R. F., Sekuler, A. B., & Bennett, P. J. (2003). A linear cue-combination framework for understanding selective attention. *Journal of Vision*, 3(2), 116-145.

Murray, R. F., Bennett, P. J., & Sekuler, A. B. (2002). Optimal methods for calculating classification images: Weighted sums. *Journal of Vision*, 2(1), 79-104.

Murray, R. F., Sekuler, A. B., & Bennett, P. J. (2001). Time course of amodal completion revealed by a shape discrimination task. *Psychonomic Bulletin and Review*, 8(4), 713-720.

Gold, J. M., Murray, R. F., Bennett, P. J., & Sekuler, A. B. (2000). Deriving behavioural receptive fields for visually completed contours. *Current Biology*, 10(11), 663-666.

### **Book chapters**

Sekuler, A. B., & Murray, R. F. (2001). Amodal completion: a case study in grouping. In T. F. Shipley and P. J. Kellman (Eds.), *From Fragments to Objects: Segmentation and Grouping in Vision*, pp. 265-294. Elsevier Science.

### **Conference proceedings**

Sekuler, A. B., Gold, J. M., Murray, R. F., & Bennett, P. J. (2000). Visual completion of partly occluded objects: insights from behavioral studies. *Neuro-ophthalmology*, 23(3-4), 165-168.

### **News and views articles**

Geisler, W. S., & Murray, R. F. (2003). Practice doesn't make perfect [News and views]. *Nature*, 423, 696-697.

### **Conference talks**

Murray, R. F. (2011). Shape perception: priors and contextual cues. Invited talk at the *Fourth International Workshop on Shape Perception in Human and Computer Vision*. Naples, Florida, May 5, 2011.

Kim, M., & Murray, R. F. (2011). 3D surface shape and the appearance of glow. *Vision Sciences Society Annual Meeting*. Naples, Florida, May 6-11, 2011. Abstract in *Journal of Vision*, 11(11), 399.

Morgenstern, Y., Murray, R. F., & Geisler, W. S. (2011). A low-dimensional statistical model of natural lighting. *Vision Sciences Society Annual Meeting*. Naples, Florida, May 6-11, 2011. Abstract in *Journal of Vision*, 11(11), 377.

Murray, R. F., & Morgenstern, Y. (2008). The light-from-above prior overrides contextual lighting cues. *Canadian Society for Brain, Behaviour, and Cognitive Science Annual Meeting*. London, Ontario, June 19-21, 2008. Abstract in *Canadian Journal of Experimental Psychology*, 62(4), 311.

MacKenzie, K. J., Murray, R. F., & Wilcox, L. M. (2007). Modelling cue combination: can perceived depth be predicted by JND's? *Canadian Society for Brain, Behaviour, and Cognitive Science Annual Meeting*. Victoria, British Columbia, June 15-17, 2007. Abstract in *Canadian Journal of Experimental Psychology*, 61(4), 369.

MacKenzie, K. J., Murray, R. F., & Wilcox, L. M. (2007). Perceived curvature in depth: a test of cue combination models using motion and binocular disparity. *Vision Sciences Society Annual Meeting*. Sarasota, Florida, May 11-16, 2007. Abstract in *Journal of Vision*, 7(9), 93.

Murray, R. F. (2006). System identification in human visual psychophysics. *Engineering Principles in Biological Systems*. Cold Spring Harbor Laboratory, Cold Spring Harbor, New York, December 3-6, 2006.

- Murray, R. F. (2006). ROC curves refute an unequal-variance account of search asymmetry. *European Conference on Visual Perception*. St. Petersburg, Russia, August 20-25, 2006. Abstract in *Perception*, 35(supplement), 14.
- Murray, R. F. (2005). Psychophysical features from noise classification. *Computational and Systems Neuroscience*. Invited talk in a workshop on 'New approaches to characterizing neural responses'. Snowbird, Utah, March 21-22, 2005.
- Murray, R. F. (2004). An overview of reverse correlation. *Neural Information Processing Systems*. Invited talk in a workshop on 'Inferring features from stimulus classification'. Whistler, British Columbia, December 16-18, 2004.
- Murray, R. F., Sekuler, A. B., & Bennett, P. J. (2003). A linear cue combination framework for understanding selective attention. *Vision Sciences Society Annual Meeting*. Sarasota, Florida, May 9-14, 2003. Abstract in *Journal of Vision*, 3(9), 184.
- Murray, R. F., Beutter, B. R., Eckstein, M. P., & Stone, L. S. (2002). Saccadic targetting during visual search for letters. *Optical Society of America Fall Vision Meeting*. San Francisco, California, October 24-27, 2002. Abstract in *Journal of Vision*, 2(10), 21.
- Murray, R. F., Gold, J. M., Sekuler, A. B., & Bennett, P. J. (2002). Snapshots of perceptual organization. *Annual Interdisciplinary Conference*. Jackson Hole, Wyoming, February 3-8, 2002.
- Gold, J. M., Sekuler, R., Murray, R. F., Sekuler, A. B., & Bennett, P. J. (2002). Decay of visual memory. *Annual Interdisciplinary Conference*. Jackson Hole, Wyoming, February 3-8, 2002.
- Murray, R. F., Gold, J. M., Bennett, P. J., & Sekuler, A. B. (2001). Perceptually interpolated contours in shape discrimination. *European Conference on Visual Perception*. Invited talk in a symposium on 'Noise and efficiency'. Kusadasi, Turkey, August 26-30, 2001. Abstract in *Perception*, 30(supplement), 1.
- Murray, R. F., Gold, J. M., Sekuler, A. B., & Bennett, P. J. (2001). Reverse correlation reveals behavioural effects of perceptual organization. *Association for Research in Vision and Ophthalmology Annual Meeting*. Ft. Lauderdale, Florida, April 29 – May 4, 2001. Abstract in *Investigative Ophthalmology and Visual Science*, 42(4), S723.
- Gold, J. M., Sekuler, R., Baerfeldt, A., Murray, R. F., Sekuler, A. B., & Bennett, P. J. (2001). Decay of visual memory is due to decreased signal, not increased noise. *Association for Research in Vision and Ophthalmology Annual Meeting*. Ft. Lauderdale, Florida, April 29 – May 4, 2001. Abstract in *Investigative Ophthalmology and Visual Science*, 42(4), S316.
- Murray, R. F., Sekuler, A. B., & Bennett, P. J. (2000). Attending to contrast polarity in a global motion task: a quantitative model. *Society for Neuroscience Annual Meeting*. New Orleans, Louisiana, November 4-9, 2000.
- Murray, R. F., Sekuler, A. B., & Bennett, P. J. (2000). A quantitative model of attention in a global motion task. *Optical Society of America Annual Meeting*. Providence, Rhode Island, October 22-26, 2000.

Murray, R. F., Gold, J. M., Bennett, P. J., & Sekuler, A. B. (2000). Perceptual organization and perceptual efficiency. *European Conference on Visual Perception*. Groeningen, The Netherlands, August 27-31, 2000. Abstract in *Perception*, 29(supplement), 122.

Gold, J. M., Murray, R. F., Bennett, P. J., & Sekuler, A. B. (2000). Snapshots of visual completion. *Association for Research in Vision and Ophthalmology Annual Meeting*. Ft. Lauderdale, Florida, May 1-5, 2000. Abstract in *Investigative Ophthalmology and Visual Science*, 41(4), S317.

Murray, R. F., Sekuler, A. B., Bennett, P. J., & Sekuler, R. (1998). Interference between motion signals of opposite contrast polarity. *Canadian Society for Brain, Behaviour, and Cognitive Science Annual Meeting*. Ottawa, Ontario, June 18-21, 1998.

### Conference posters

Murray, R. F., Morgenstern, Y., & Harris, L. R. (submitted). How to combine direction cues optimally. *International Multisensory Research Forum*. Oxford, U.K., June 19-22, 2012. Abstract to appear in *Seeing and Perceiving*.

Murray, R. F., Morgenstern, Y., & Geisler, W. S. (submitted). How natural light guides visual perception. *Joint AVA/BMVA Meeting on Biological and Machine Vision*. Cambridge, U.K., May 22, 2012. Abstract to appear in *Perception*.

Kim, M., & Murray, R. F. (2011). Does perceived 3D shape influence perceived glow? *Varieties of Human Cortical Colour Vision*. Vancouver, British Columbia, August 5-7, 2011.

Kim, M., & Murray, R. F. (2011). The influence of shape on perceived glow. *York Centre for Vision Research Conference on Plastic Vision*. Toronto, Ontario, June 15-18, 2011.

Morgenstern, Y., Murray, R. F., & Geisler, W. S. (2011). Statistical regularities in the low-frequency structure of natural lighting. *York Centre for Vision Research Conference on Plastic Vision*. Toronto, Ontario, June 15-18, 2011.

Kim, M., & Murray, R. F. (2011). Glow from shape and shape from glow. *Perception of Material Properties*. Schloss Rauischholzhausen, Germany, June 1-5, 2011.

Morgenstern, Y., Murray, R. F., & Geisler, W. S. (2010). Real-world illumination measurements with a multidirectional photometer. *Vision Sciences Society Annual Meeting*. Naples, Florida, May 7-12, 2010. Abstract in *Journal of Vision*, 10(7), 444.

Morgenstern, Y. & Murray, R. F. (2009). Contextual lighting cues can override the light-from-above prior. *York Centre for Vision Research Conference on Vision in 3D Environments*. Toronto, Ontario, June 23-26, 2009.

Taylor, C. P., & Murray, R. F. (2009). Classification images reveal the effect of visual attention on shape discrimination. *York Centre for Vision Research Conference on Vision in 3D Environments*. Toronto, Ontario, June 23-26, 2009.

Morgenstern, Y. & Murray, R. F. (2009). Contextual lighting cues can override the light-from-above prior. *Vision Sciences Society Annual Meeting*. Naples, Florida, May 8-13, 2009. Abstract in *Journal of Vision*, 9(8), 65.

- Taylor, C. P., & Murray, R. F. (2008). Classification images reveal the effect of visual attention on shape discrimination. *Canadian Society for Brain, Behaviour, and Cognitive Science Annual Meeting*. London, Ontario, June 19-21, 2008. Abstract in *Canadian Journal of Experimental Psychology*, 64(2), 295.
- Bartlett, A. M., & Murray, R. F. (2008). Modular second-order processing in the human visual system. *University of Rochester Center for Visual Science Symposium*. Rochester, NY, May 29-31, 2008.
- Murray, R. F. (2007). ROC curves refute an unequal-variance account of search asymmetry. *Vision Sciences Society Annual Meeting*. Sarasota, Florida, May 11-16, 2007. Abstract in *Journal of Vision*, 7(9), 723.
- Murray, R. F. (2006). Local 3D shape and orientation statistics of natural surfaces. *Vision Sciences Society Annual Meeting*. Sarasota, Florida, May 5-10, 2006. Abstract in *Journal of Vision*, 6(6), 263.
- Murray, R. F., Bennett, P. J., & Sekuler, A. B. (2002). Predicting absolute efficiency from classification images. *European Conference on Visual Perception*. Glasgow, U.K., August 25-29, 2002. Abstract in *Perception*, 31(supplement), 110.
- Murray, R. F., Bennett, P. J., & Sekuler, A. B. (2001). No pointwise nonlinearity in shape discrimination. *International Society for Psychophysics Annual Meeting*. Leipzig, Germany, October 19-23, 2001.
- Murray, R. F., Bennett, P. J., & Sekuler, A. B. (2001). No pointwise nonlinearity in shape discrimination. *Vision Sciences Society Annual Meeting*. Sarasota, Florida, May 4-8, 2001. Abstract in *Journal of Vision*, 1(3), 52.
- Gold, J. M., Murray, R. F., Sekuler, A. B., & Bennett, P. J. (2001). Learning optimizes the behavioral receptive fields underlying pattern discrimination. *The Learning Workshop*. Snowbird, Utah, April 10-13, 2001.
- Murray, R. F., Beutter, B. R., Eckstein, M. P., & Stone, L. S. (2000). Efficiency of the first saccade in visual search for letters. *Optical Society of America Annual Meeting*. Providence, Rhode Island, October 22-26, 2000.
- Murray, R. F., Bennett, P. J., Sekuler, A. B., & Gold, J. M., (2000). Effect of visual completion on calculation efficiency. *Association for Research in Vision and Ophthalmology Annual Meeting*. Ft. Lauderdale, Florida, May 1-5, 2000. Abstract in *Investigative Ophthalmology and Visual Science*, 41(4), S440.
- Murray, R. F., Bennett, P. J., & Sekuler, A. B. (1999). Amodal completion: calculation efficiency and time course. *York Centre for Vision Research Conference on Vision and Attention*. Toronto, Ontario, June 22-26, 1999.
- Murray, R. F., Sekuler, A. B., & Bennett, P. J. (1999). Grouping of partially occluded contours for symmetry judgement. *Association for Research in Vision and Ophthalmology Annual Meeting*. Ft. Lauderdale, Florida, May 9-14, 1999. Abstract in *Investigative Ophthalmology and Visual Science*, 40(4), S359.

Murray, R. F., Sekuler, A. B., Bennett, P. J., & Sekuler, R. (1998). Attending to component directions in random dot cinematograms. *Association for Research in Vision and Ophthalmology Annual Meeting*. Ft. Lauderdale, Florida, May 10-15, 1998. Abstract in *Investigative Ophthalmology and Visual Science*, 39(4), S1078.

### **Contributions to the profession**

Reviewer for the following journals: Attention, Perception, & Psychophysics; Chaos; Cognitive Psychology; Investigative Ophthalmology and Visual Science; Journal of Neuroscience; Journal of Vision; Medical Decision Making; Nature; Neural Computation; Perception; PLoS Computational Biology; PLoS One; Proceedings of the National Academy of Sciences of the U.S.A.; Psychological Review; Psychonomic Bulletin & Review; Trends in Neurosciences; Vision Research; Visual Cognition

Reviewer for the following granting agencies: National Science Foundation; Research Grants Council of Hong Kong

2006 Contributed MATLAB-OpenGL (MOGL) interface to the Psychophysics Toolbox (open source software for visual perception experiments)

### **TEACHING**

#### **Courses**

PSYC 2220 – Sensation and perception I  
PSYC 3270 – Sensation and perception II  
PSYC 4260 – Seminar in sensation and perception  
PSYC 6273 – Computer programming for experimental psychology (graduate)  
PSYC 6274 – Laboratory methods of perceptual psychology (graduate)

#### **Graduate supervision**

2009 - 2011	Minjung Kim	M.A. supervisor
2006 - 2011	Yaniv Morgenstern	minor paper supervisor, Ph.D. supervisor

#### **Graduate committee membership**

2011	Ryan Dearing	M.Sc. defense committee member
2011	Ravindra Baldeo	M.Sc. defense committee member
2011	Hoda Dehmeshki	Ph.D. defense committee member
2010	Timothy Oleskiw	M.Sc. defense committee member
2009 - present	Marwan Daar	M.A. defense committee, Ph.D. committee member
2009	Jean-Francois Nankoo	M.A. defense committee member
2009	Inna Tsirlin	minor paper committee member
2009 - 2011	Adrian Bartlett	M.A. committee member
2008 - 2010	Ashley Curtis	M.A. committee member
2008 - 2009	Steven Prime	Ph.D. committee member
2008	Christopher Zanette	M.Sc. defense committee member
2007 - 2009	Charles Or	minor paper committee member

2006 - 2009	Kevin MacKenzie	Ph.D. committee member
2004 - 2005	Bei Xiao	Ph.D. committee member
2004 - 2005	Rebecca Stone	Ph.D. committee member

### Undergraduate supervision

2011	Scott Munro	independent study
2010 - 2011	Matthew Cutone	honours thesis
2009 - 2010	Meem Siddique	work-study
2009 - 2010	Kye Kim	honours thesis
2008 - 2009	Natalie Levine	work-study
2008 - 2010	Aaron Rosen	independent study, honours thesis
2007 - 2008	Adrian Bartlett	volunteer, work-study, honours thesis
2007	Vivian Chau	volunteer, NSERC summer student
2007 - 2009	Christian Surdivall	volunteer, work-study
2006 - 2007	Charisa Ng	honours thesis
2006 - 2007	Elena Chernenko	work-study
2006 - 2007	Jessica Chevrier	work-study
2006 - 2007	Jean-Francois Nankoo	work-study
2006 - 2008	Jonathan Bega	volunteer, independent study, honours thesis
2006 - 2007	Naheed Hosan	volunteer, work-study
2006	Meera Paleja	work-study
2006	Ava Ghasemi	volunteer
2004 - 2005	Kateki Vinod	independent study, honours thesis
2004 - 2005	Audrey Chin	honours thesis

### Teaching grants

2011 - 2012	MITACS Training Grant, supporting the annual York-MITACS
2010 - 2011	Vision Science Summer School
2009 - 2010	
2008 - 2009	
2009 - 2010	Teaching-Learning Development Grant, York University
2007 - 2008	
2007 - 2008	Release-Time Teaching Fellowship, York University

**SERVICE**

**Positions**

- |                |   |
|----------------|---|
| 2006 - present | Coordinator, York-MITACS Vision Science Summer School<br>Centre for Vision Research, York University                |
| 2009 - 2011    | York University Faculty Association steward<br>Department of Psychology, York University                            |
| 2006 - 2011    | Graduate executive committee member<br>Department of Psychology, York University                                    |
| 2006 - 2010    | Steering committee member<br>Centre for Vision Research, York University  |
| 2006 - 2009    | Coordinator for Brain, Behaviour, and Cognitive Sciences graduate area<br>Department of Psychology, York University |

*c.v. prepared April 9, 2012*