

CHRISTOPHER W. TYLER, Ph.D., D.Sc.

**Curriculum Vitae and Art-Related Activities**

Smith-Kettlewell Eye Research Institute, 2318 Fillmore Street San Francisco, CA 94115, USA.

Website: [http://www.ski.org/CWTyler\\_lab/CWTyler/Art%20Investigations/index.html](http://www.ski.org/CWTyler_lab/CWTyler/Art%20Investigations/index.html)

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INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
University of Leicester, UK	B.A.	1966	Psychology
University of Aston, UK	M.Sc.	1967	Applied Psychology
University of Keele, UK	Ph.D.	1970	Neurocommunication
University of Keele, UK	D.Sc.	2004	Visual Processing

**Research and Professional Experience:**

2013 Professor, City University, London, UK.

2008 (Sept) Visiting Professor, National University of Taiwan, Taipei, Taiwan.

2007 (April) Visiting Professor, Université René Descartes, Paris, France.

2002-present Head, Smith-Kettlewell Brain Imaging Center, San Francisco, CA.

1990-2003 Associate Director, Smith-Kettlewell Eye Research Institute, San Francisco, CA.

1981- Senior Scientist, Smith-Kettlewell Eye Research Institute, San Francisco, CA.

1986-87 Adjunct Professor, School of Optometry, University of California, Berkeley.

1985-89 Visiting Professor, UCLA Medical Center, Jules Stein Institute.

1978-80 External Doctoral Thesis Advisor, Dept. of Psychology, Stanford University, Stanford, CA.

1978-82 Honorary Research Associate, Institute of Ophthalmology, London, U.K.

1975-81 Scientist, Smith-Kettlewell Eye Research Institute, San Francisco, CA.

1974-75 Research Fellow, Dept. of Sensory and Perceptual Processes, Bell Laboratories, Murray Hill, NJ.

1973-74 Research Fellow, Dept. of Psychology, University of Bristol, U.K.

1972-73 Assistant Professor, Northeastern University, Boston, MA. (Psychology Courses: Experimental, Introductory, History, Social Issues, Vision).

1972 Visiting Assistant Professor, Dept. of Psychology, University of California, Los Angeles, CA. (Course: Perception).

1970-72 Research Fellow, Dept. of Psychology, Northeastern University, Boston, MA.

**Dissertations**

M.Sc. A Study of the Electrical Activity of the Brain in a Simple Decision Task. University of Aston, Birmingham (1967). (Supervisor: G. Harding)

Ph.D. A Psychophysical Study of the Dynamics of Colour Vision using Wavelength Modulated Light. University of Keele, Staffs (1970). (Supervisor: D.M. Regan)

D.Sc. Analysis of the Mechanisms of Human Visual Processing. University of Keele, Staffs (2004).

### **Honors:**

Board Member, The Ultimate Block Party, New York (2010)

Keynote address, Asian Conference on Visual Perception, Taipei, (2010).

Organizer, Art and Perception Symposium, SPIE, San Jose (2010).

Invited presentation at the Gombrich Centenary, Warburg Institute, London (2009).

Organizer, NSF Symposium on Art, Creativity and Learning, Washington DC, June, (2008).

Invited lecture tour, Taipei and Taichung, Taiwan (2008).

Invited lecture series on Art and Space Perception, Université René Descartes, Paris, France (2007).

Keynote Address in the Church of San Francesco, Arezzo, Italy, for the European Conference on Visual Perception (ECPV 2007).

Bellagio Fellowship, Rockefeller Foundation (2004). Inaugural Lecture, Frist Art Museum, Nashville, TN (2002). William A. Kettlewell Chair of Research in Visual Science (2003-2004). The Catherine D. Kettlewell Endowed Chair (1995-96). William A. Kettlewell Chair of Research in Visual Science (1984-85).

### **Editorships:**

Editor, *Perception*, 1998-present. Member of Editorial Board, *Vision Research*, 2001-2010. Member of Editorial Board, *Clinical Ophthalmology*, 2006-present. Co-Editor-in-Chief, *Open Medical Imaging Journal*, 2008-present. Member of Editorial Board, *Symmetry*, 2009-present. Guest Editor Art and Symmetry Issue, *Symmetry*, 2011.

### **Invited Lectures**

"The Emergent Dualism View of Quantum Physics and Consciousness", Foundations of Mind Conference, UC Berkeley, July, 2015.

"Time, Light and the Nature of Conscious Vision", Institute of Philosophy, University of London, April, 2015

"The Arts and the Brain: What Does Your Brain See? What does Your Brain Hear?", AAAS/Dana Foundation Symposium with Nina Kraus and Gary Vikan, Washington, DC; October, 2013

"Application of Face Encoding to Art Investigations", invited paper for the European Conference on Visual Information Processing (EUVIP), Paris, France; June, 2013.

"Seeing in Depth: Space perception from Leonardo da Vinci to the 21<sup>st</sup> century", U Wisconsin Lecture in Culture and Society, Madison, Wisconsin; September, 2012.

"Thirty Millennia of Perspective", invited paper for the Asian Pacific Conference on Vision, Taipei, Taiwan; July, 2010.

"Eye Candy", panelist with Jules Feiffer, Buzz Hays, Margaret Livingstone, and Patrick Cavanagh; World Science Festival, New York, NY; June 2010.

"Darkness and Depth in Early Renaissance Painting," invited paper for the Human Vision and Electronic Imaging Conference, San Jose; January 2010.

"How Did Leonardo Perceive Himself? Metric Iconography of Da Vinci's Self-Portraits," invited

paper for the Human Vision and Electronic Imaging Conference, San Jose; January 2010.

“Gombrich’s Vault of Perception: Do we “really” see straight lines as curved?” invited paper for the Gombrich Centenary Symposium, Warburg Institute, London; June 2009.

Panelist in “Portraits of Perception: The Human Face”, panelist with Chuck Close, Devorah Sperger, Margaret Livingstone, and Ken Nakayama; World Science Festival New York, 2009.

BBC Radio Oxford Broadcast “Alice’s Adventures in ... Woodstock?”, proposing the novel sources of Lewis Carroll’s creation in the court of Eleanor of Aquitaine.

<http://www.bbc.co.uk/oxford/content/articles/2009/01/02/alice.shtml>.

“The Intersection of Art and Visual Science in the Italian Renaissance,” Keynote Address to the European Conference on Visual Perception, Arezzo, Italy; August, 2007.

“On Painterly Perspective and Divine Proportion in Piero della Francesca’s Oeuvre”, contribution to the *Renaissance Vision* symposium, Arezzo, Italy, sponsored by *Fondazione Piero della Francesca*; August, 2007.

“Space Representation in Art and the Brain”, eight-lecture series at the Department of Psychology, University of Paris, Rene Descartes, Paris; April, 2007.

“The Truth about Curved Perspective”, contribution to the Pictures in Art, Science, and Engineering meeting, UC Berkeley; March, 2007.

“The History of Perspective from Greece to Magritte”, Bellagio International Study Center, Bellagio, Italy; July, 2006.

“The Birth of Renaissance Perspective”, Department of Psychology, Oxford University; August, 2005..

“Human Face Perception: Symmetry, Depth and Form”, Keynote Address to the Society of Photo-Optical Instrumentation Engineers, San Jose, California, Jan, 2004.

“The History of Perspective” and “The Role of Optics”, two lectures in a course on Optics and Art offered at the Department of Art History, Stanford University, Palo Alto, California; March, 2003.

“30,000 Years of Perspective Representation”, Department of Psychology, University of Nevada, Reno, Nevada; November, 2002.

“The History of Perspective from Greece to O’Keefe.” Institute for Neuroscience, University of California, Davis, California, April, 2002.

“Art, Symmetry and Neuroscience”, Frist Art Museum (Opening Lecture Series), Nashville, Tennessee; March, 2002.

“The Evocation of Light”, Invited presentation for the *Seeing the Light* Symposium, Scottish Arts Council, Glasgow, Scotland; March, 2002.

“The Birth of Renaissance Perspective”, Inaugural Summer Lecture of the Craik Club, University of Cambridge, UK; August, 2002.

“The Representation of Space in 20th Century Art.” Invited paper at the Society of PhotoOptical Instrumentation Engineers, San Jose, California, Jan, 2001 (with A. Ione).

“What Perspective Construction Reveals about Hockney’s Optical Hypothesis”, Invited presentation for the Art and Optics Symposium, New York Institute for the Humanities, New York; December, 2001.

“The History of Perspective from Greece to Magritte”, Invited presentation for *The Art of Vision and the Vision of Art* Symposium at the Australian National University, Canberra Australia, December, 2001.

“Masolino da Panicale and the Development of One-Point Perspective”, School of Optometry, University of California, Berkeley, California, November, 2001.

- “The Optical Innovations of Masolino da Panicale”, Society for the History of Ophthalmology, Stanford, California; October, 2001.
- “The Historical Development of Display in Art”, Society for Information Display, Santa Clara, California; June, 2001.
- “The Perspective Innovations of Masolino da Panicale”, The Warburg Institute, University of London, London, U.K.; November, 2000.
- “The Van Eycks and the Birth of Northern Perspective”, The Maastricht McLuhan Institute, Maastricht, The Netherlands; November, 2000.
- “Masolino da Panicale, A Neglected Genius of Renaissance Perspective”, School of Architecture, University of Rome, “La Sapienza”, Rome, Italy; October, 2000.
- “The Van Eycks and the Birth of Northern Perspective”, School of Liberal Arts, University of Ghent, Ghent, Belgium: October, 2000.

## **Publications:**

### **Art and Philosophy**

- Gombrich’s Vault of Perception: Do we “really” see straight lines as curved? *Art and Perception*, 2104; doi: 10.1163/22134913-00002028.
- Application of face encoding to art investigations. *Proc. 4th European Workshop on Visual Information Processing (EUVIP) 4*, 226-231, 2013.
- Chinese perspective as a rational system: relationship to Panofsky's symbolic form. *Chin J Psychol* **53**, 7-27, 2012.
- Did early Renaissance painters trace optically projected images? The conclusion of independent scientists, art historians and artists. In *Digital Imaging for Cultural Heritage Preservation*, edited by Filippo Stanco, Sebastiano Battiato, Giovanni Gallo, 253—274, CRC Press, 2011 (with David G. Stork, Jacob Collins, Marco Duarte, Yasuo Furuichi, David Kale, Ashutosh Kulkarni, M. Dirk Robinson, Sara Schechner and Nicolas Williams).
- How did Leonardo perceive himself? Metric iconography of da Vinci's self-portraits. *Proc SPIE* **7527**, 1D, 2010.
- Darkness and depth in early Renaissance painting. *Proc SPIE* **7527**, 0V, 2010.
- Eye-centring in portraits: Reply to McManus & Thomas. *Perception* **36**, 183–188, 2007
- Some principles of spatial organization in art. *Spatial Vision* **20**, 509–530, 2007.
- Traversing the highwire from Pop to Optical (review of Lichtenstein exhibit). *PLoS Biol* **3**, e136 doi:10.1371/journal.pbio.0030136, 2006.
- A horopter for two-point perspective. *Proc SPIE*, **5006**, 306-315, 2005.
- Rosetta Stone?: Hockney, Falco and the sources of ‘opticality’ in Lorenzo Lotto’s Husband and Wife. *Leonardo* **37**, 2004.
- What makes Mona Lisa smile? *Vision Research* **44**,1493-8, 2004 (with L.L. Kontsevich)
- Where art, optics and vision intersect. *Perception*, **31**, 1285-1288, 2002.
- The representation of space in 20th century art. *Proc SPIE*, **3966**, 565-577, 2001. (with A. Ione).
- Perspective as a geometric tool that launched the Renaissance. *Proc SPIE* **3959**, 492- 497, 2000.
- The Renaissance search for vivid depth representations. *Proc Jampolsky Festschrift*, SKERI Press: San Francisco, 171-176, 2000.
- Perspectives: neuroscience. Is art lawful? *Science*. 285, 673-4,1999.

Painters centre one eye in portraits. *Nature*, 392, 877-878, 1998.

Eye placement principles in portraits and figure studies of the past two millennia. *Proc SPIE*, 3299, 431-437, 1998.

The *Cartesian Broadway*. *Perception* 27, 253-6, 1998;

Perspective. Entry in *Oxford Companion to the Mind* Ed. R.L. Gregory, Oxford University Press, Oxford, 1998.

The autostereogram. *Proc. S.P.I.E.* 1256, 182-197, 1990 (with M.B. Clarke).

Image and Reflection. Review of *Eye and Brain* (3rd Ed.) by R.L. Gregory. *Contemporary Psychology* 25, 50-52, 1980.

Computer art. *Creative Computing*, 88-91, 1976.

## **Symmetry**

Symmetry: modeling the effects of masking noise, axial cueing and salience. *PLoS One* 5(4):e9840, 2010 (with C.C. Chen).

Face configuration processing in the human brain: the role of symmetry. *Cereb Cortex* 17:1423-32, 2007 (with CC Chen, KL Kao)

Instantaneous stimulus paradigm: Cortical network and dynamics of figure-ground organization. *Human Vision and Electronic Imaging*, 6492, 2007 (with LT Likova).

Spatial summation of face information. *J Vis.* 6:1117-25, 2006 (with CC Chen)

Predominantly extra-retinotopic cortical response to pattern symmetry. *Neuroimage*. 24:306- 14, 2005 (with HA Baseler, LL Kontsevich, LT Likova, AR Wade, BA Wandell).

Symmetry activates extrastriate visual cortex in human and nonhuman primates. *Proc Natl Acad Sci U S A*, 102:3159-63, 2005 (with Y Sasaki, W Vanduffel, T Knutsen, RH Tootell).

Human symmetry detection exhibits reverse eccentricity scaling. *Visual Neuroscience*. 16:919-22, 1999.

The structure of perceptual coding. In, *Computational and Biological Mechanisms of Visual Coding*. Jenkin M., Harris L. (Eds.), Cambridge University Press, Cambridge, U.K. 131-156, 1997.

Human symmetry perception. In, *Human Symmetry Perception and Its Computational Analysis*. Tyler CW. (Ed.), VSP: Utrecht, The Netherlands, 3-24, 1996.

Mirror symmetry detection predominance of second-order pattern processing throughout the visual field. In, *Human Symmetry Perception and Its Computational Analysis*. Tyler CW. (Ed.), VSP: Utrecht, The Netherlands, 157-172, 1996 (with L. Hardage).

Empirical aspects of symmetry perception. *Spatial Vision* 9, 1-11, 1995.

Multiple mechanisms for the detection of mirror symmetry. *Spatial Vision* 9, 79-100, 1995 (with L.Hardage, R.T.Miller).

Theoretical issues in symmetry perception. *Spatial Vision* 8, 383-391, 1994.

## **Texture**

Theory of texture discrimination based on higher-order perturbation in individual texture samples. *Vision Res.* 2179-2186, 2004.

Beyond fourth-order texture discrimination: generation of extreme-order and statistically- balanced textures. *Vision Res.* 2187-2199, 2004.

Modular organization of adaptive colouration in flounder and cuttlefish revealed b y independent

component analysis. *Network* 14, 321-33, 2003 (with Anderson J.C., Baddeley R.J., Osorio D., Shashar N., Ramachandran V.S., Crook A.C. & Hanlon R.T.).

Occlusions may explain why natural-image spectra fall with frequency squared. *Vision Res.* 41:955-964, 2001 (with R. Balboa & N. Grzywacz).

Rapid adaptive camouflage in tropical flounders. *Nature* 379, 815-817, 1996 (with V.S. Ramachandran, R.L. Gregory, D. Rogers-Ramachandran, S. Duensing, C. Pillsbury, C. Ramachandran).

Induced twinkle aftereffect as a probe of visual processing mechanisms. *Vision Res.* 35, 757- 766, 1995 (with L. Hardage).

Pattern identification by trajectory analysis in autocorrelation hyperspace. *Proc. World Cong. Neural Networks III*, 312-316, 1994 (with R.T. Miller).

Visual echoes: The perception of repetition in quasi-random patterns. *Vision Res.* 17, 109-116, 1977 (with J.J. Chang).

Visual processing of repetitive images. *Proc. S.P.I.E.* 74, 216-222, 1976 (with J.J. Chang).