

Paul Linton

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INTRODUCTION

My research focuses on 3D visual experience. In my PhD I demonstrate that the visual system does not appear to use vergence (the angular rotation of the eyes) to triangulate the size and distance of objects. This work has significant implications for visual scale, binocular disparity processing, multisensory integration, and object interaction. In my book *The Perception and Cognition of Visual Space* (Palgrave, 2017), I explore inconsistencies in the 3D vision literature and argue that there are still important gaps between leading theories and our visual experience. I initiated, and I am co-organising, a Royal Society meeting on “New Approaches to 3D Vision” in computer, animal, and human vision, with representatives from Facebook Reality Labs, Google DeepMind, Google Robotics, and Microsoft Research. As an Intern at Facebook Reality Labs, I collaborated with deep learning and computer graphics researchers to study naturalistic real-time gaze-contingent defocus blur (the [DeepFocus](#) project). Before vision science I was a Stipendiary Lecturer in Law at St Hilda’s College Oxford, and a Teaching Fellow at University College London.

CURRENT POSITION

Centre for Applied Vision Research, City, University of London	Feb 2021 – Present
Research Fellow in Visual Neuroscience	London, UK

EDUCATION

PhD, Vision Science, City, University of London	2016 – 2021
Thesis: The role of vergence in visual size and distance perception	London, UK
Supervisors: Prof. Christopher Tyler ¹ and Dr. Simon Grant	
¹ Head of Brain Imaging, Smith-Kettlewell Eye Research Institute	
Postgraduate Courses, Law and Economics, NYU and Harvard University	2008 – 2011
3.9 out of 4.0 GPA. Supervisor: Prof. Amartya Sen (Harvard, Nobel Laureate)	New York, NY
Visiting Research Student, Cambridge University	Cambridge, UK
BA, Law with European Law, University of Oxford	2004 – 2008
2:1. Awards: Gluckstein Scholarship, Hanbury Scholarship, Exhibitioner	Oxford, UK

PREVIOUS POSITIONS

Department of Psychology, University College London	Jan 2021
Visiting Lecturer on Depth Perception for 2nd Year Module on Perception	London, UK
Display Systems Research Team, Facebook Reality Labs	Sept – Dec 2018
PhD Research Intern, DeepFocus Project [link]	Redmond, WA
Faculty of Law, University of Oxford	2011 – 2015
Non-Stipendiary Lecturer in Law	Oxford, UK
Department of Philosophy, University College London	Jan – Aug 2014
Teaching Fellow in Philosophy	London, UK
St Hilda’s College, University of Oxford	2012 – 2013
Stipendiary Lecturer and Tutor in Law	Oxford, UK

BOOK

Linton, P. (2017). *The Perception and Cognition of Visual Space* (Palgrave Macmillan)

Single authored 176-page book arguing for a two-stage account of 3D vision, according to which shape from binocular disparity is resolved first before it is integrated with other depth cues.

Reviewed in *Perception* by Prof. Casper Erkelens (Emeritus Head of Physics and Astronomy at Utrecht University) as “a valuable contribution to the scientific literature on visual perception.” [\[link\]](#)

Serialised on the Brains Blog, the leading online forum for cognitive science

[Post One](#) / [Post Two](#) / [Post Three](#) / [Post Four](#) / [Post Five](#)

PAPERS

Linton, P. (in press). ‘V1 as an Egocentric Cognitive Map’. Explores the role of V1 in the integration of the perception and cognition of visual space [\[Preprint\]](#)

In press for a special issue of *Neuroscience of Consciousness*, other contributors include Stanislas Dehaene, Catherine Tallon-Baudry, Biyu Jade He, Rafael Malach, Athena Dermertzi, and Axel Cleeremans.

Linton, P. (2021). ‘Does Vergence Affect Perceived Size?’, *Vision*, 5(3), 33 [\[link\]](#)

Demonstrates that vergence (the angular rotation of the eyes) does not appear to contribute to our perception of size, with discussion of the implications for size constancy

Invited by Mel Goodale FRS for a special edition of *Vision* on Size Constancy for Perception and Action

Linton, P., (2021). ‘Conflicting shape percepts explained by perception cognition distinction’, *Proceedings of the National Academy of Sciences*, 118 (10) e2024195118 [\[link\]](#)

Letter to the Editor in response to Morales et al. (2020). ‘Sustained representation of perspectival shape’, *PNAS*, 117(26), 14873-82 [\[link\]](#). Provided inspiration for new experiments in Morales et al. (2021). ‘Reply to Linton: Perspectival interference up close’, *PNAS*, 118 (28) e2025440118 [\[link\]](#)

Linton, P. (2020). ‘Does Vision Extract Absolute Distance from Vergence?’, *Attention, Perception, & Psychophysics*, 82, 3176–95. [\[link\]](#)

Demonstrates that vergence (the angular rotation of the eyes) does not appear to provide absolute distance information to the visual system, with discussion of implications for distance perception

Featured on the Psychonomic Society’s “All Things Cognition” podcast [\[link\]](#)

Featured in Prof. Wei Ji Ma (NYU)’s undergraduate course on ‘Psychological Science and Society’

PREPRINT

Linton, P. (2019). ‘Would Gaze-Contingent Rendering Improve Depth Perception in Virtual and Augmented Reality?’, *ArXiv*, 1905.10366 [cs.HC] [\[link\]](#)

First to propose updating the camera frustum in virtual reality with eye movements to account for differences between centre of rotation and nodal point of the eye

PAPER IN PREPARATION

Linton, P. (...). ‘Cognitive Theory of Visual Scale’. Investigates whether Gogel’s insight about familiar size being a cognitive cue to visual scale applies to most other absolute distance cues [\[link\]](#)

Linton, P. (...). 'New Approaches to 3D Vision'. Review of recent theoretical developments computer, animal, and human 3D vision. Working with Prof. Michael Morgan FRS (City), Prof. Jenny Read (Newcastle), Dr. Dhanraj Vishwanath (St Andrews), Prof. Sarah Creem-Regehr (Utah), and Prof. Fulvio Domini (Brown) to organise a Royal Society conference around this theme

AWARDS

Royal Society Scientific Meeting Award for 'New Approaches to 3D Vision'.

Organisers Michael Morgan FRS, Paul Linton, Jenny Read, Dhanraj Vishwanath, Sarah Creem-Regehr, and Fulvio Domini. I was responsible for drafting this conference proposal on artificial intelligence, animal vision, and human vision with confirmed speakers from Facebook Reality Labs, Google DeepMind, Google Robotics, Microsoft Research. Full schedule attached at end of CV

Elsevier / Vision Research Travel Award for Vision Sciences Society Meeting

Gluckstein Scholarship, Lincoln College, University of Oxford

Hanbury Scholarship, Lincoln College, University of Oxford

INVITED TALKS

Size and Distance Perception in Virtual and Augmented Reality	June 2021
Optical Society (OSA), Technical Group on Display Technology	Online

Size and Distance Perception in Virtual and Augmented Reality	June 2021
Virtual Environments and Computer Graphics Group, UCL	Online

The Perception and Cognition of Visual Space	Feb 2021
Institute of Philosophy (invited by Prof. Chris Frith FRS FBA)	London, UK

[Title Redacted]	December 2018
Facebook Reality Labs	Redmond, WA

Talks in the process of being arranged / rearranged:

Centre for Cognitive Science, Rutgers University	New Brunswick, NJ
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Perception & Action Seminar, Brown University	Providence, RI
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Perception Seminar, University of Essex	Essex, UK
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PEER REVIEWED CONFERENCE PRESENTATIONS

Linton, P., 'No Vergence Size Constancy'	June 2020
Poster at Vision Sciences Society [Poster][Poster Walkthrough]	St. Pete Beach, FL

Linton, P., 'Does Human Vision Triangulate Absolute Distance?' [Talk]	January 2020
Talk at '3D Worlds from 2D Images', British Machine Vision Association	London, UK

Linton, P., 'Does Vergence Explain the Taylor Illusion?' Talk at Applied Vision Association [Abstract]	December 2019 Cardiff, UK
Linton, P., 'Do We See Scale?' Poster at Association for the Scientific Study of Consciousness	July 2019 Ontario, Canada
Linton, P., 'Re-Evaluating Vergence as a Distance Cue' Talk at European Conference on Visual Perception [Abstract]	August 2018 Trieste, Italy
Linton, P., 'How Do We See Distance in VR' [Abstract] Poster at 'Frontiers in Virtual Reality', University of Rochester	June 2018 Rochester, NY
Linton, P., 'Are Vergence and Accommodation Effective Cues to Distance?' Talk at Scottish Vision Group	March 2018 Glencoe, UK

TEACHING EXPERIENCE - COURSE LECTURER

Teaching Fellow in Philosophy, University College London

Responsible for curriculum development of 2 undergraduate courses at University College London, one a core first year course with 100+ students, the second a specialist course with 30+ 2nd and 3rd Year students. I created the syllabuses for the two courses from scratch, gave lectures and seminars, and supervised the seminars and marking of three TAs

Evaluation by Head of Department: "contribution to the teaching in our department was unsurpassed ... it was first rate – original but also clear and suitable for undergraduates. I was especially impressed by the way he made his lectures intelligible for undergraduates, but also comprehensive and wide-ranging ... I know from student feedback that the course was a great success."

Stipendiary Lecturer and Tutor in Law, St Hilda's College, Oxford University

Responsible for teaching and curriculum development of 3 courses at St Hilda's College, with significant latitude to develop my own syllabus subject to the Faculty's specified core readings. Students received a disproportionate number of 1sts, especially in my first year course

Responsible for pastoral care of 2nd year undergraduates and taught postgraduates + admissions

Performance evaluated "top 5%" by senior subject tutor with offer of contract renewal

Non-Stipendiary Lecturer, Faculty of Law, Oxford University

Co-responsible for curriculum development and teaching of 3rd year BA course for Faculty

Developed my own course for visiting postgraduate (JD) students from NYU Law

Evaluated as "outstanding in both preparation and delivery" by the Oxford Law Faculty

TEACHING EXPERIENCE - VISITING LECTURER

2nd Year BSc in Psychology, Perception Lecture Series, University College London Lecture + Seminar on Depth Perception	Jan 2021
Wei Ji Ma, 'Psychological Science and Society', New York University	May 2020
Invited Critic, School of Architecture, Cambridge University	2014-2017

NEW APPROACHES TO 3D VISION

1ST NOVEMBER	2ND NOVEMBER	3RD NOVEMBER	4TH NOVEMBER
Seeing Beyond SLAM Andrew Fitzgibbon (Microsoft)	Animals in Action Matteo Carandini (UCL)	Experiencing Space Mar Gonzalez-Franco (Microsoft)	Grasping the World Jody Culham (Western)
15.00 Welcome			
Neural Scene Representations	Localising Prey and Rewards	Theories of Visual Space	One Visual Stream or Two?
15.05 Ali Eslami (Google DeepMind)	15.00 Jenny Read (Newcastle)	15.00 Dhanraj Vishwanath (St Andrews)	15.00 Fulvio Domini (Brown)
15.30 Ida Momennejad (Microsoft Research)	15.30 Aman Saleem (UCL)	15.30 Paul Linton (City, UoL)	15.30 Irene Sperandio (Trento)
16.00 Topic Discussion	16.00 Topic Discussion	16.00 Topic Discussion	16.00 Topic Discussion
16.20 Break	16.20 Break	16.20 Break	16.10 Break
Perception-Action Loop	Navigation in 3D Space	Challenges for Virtual Reality	3D Space and Visual Impairment
16.40 Sergey Levine (Google Robotics)	16.40 Kate Jeffery (UCL)	16.40 Sarah Creem-Regehr (Utah)	16.20 Ione Fine (Washington)
17.10 Andrew Glennerster (Reading)	17.10 Gily Ginosar (Weizmann Institute)	17.10 Douglas Lanman (Facebook Reality Labs)	16.50 Ewa Niechwiej-Szwedo (Waterloo)
17.40 Topic Discussion	17.40 Topic Discussion	17.40 Topic Discussion	17.20 Topic Discussion
18.00 CLOSE	18.00 CLOSE	18.00 CLOSE	17.30 Break
			Future Directions Panel Discussion
			18.30 CLOSE