

C.V.

Piers Douglas Lionel Howe

Contact Details

Visual Attention Laboratory
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Personal Details

I hold both Australian and British passports, was born in Hong Kong and am resident in the USA.

Specific Research Questions

- How do we use vision to keep track of the current state of our immediate surroundings? What attentional mechanisms are involved, how do they function and to what extent do they determine visual awareness?
- What are the cognitive and neural mechanisms underlying lightness, motion and depth perception? To what extent can computational simulations be used to analyze these processes?
- How can fMRI be used to study visual attention? How are fMRI data best analyzed to determine how brain areas interact when performing a specific cognitive task? To what extent can causal relationships between brain areas be determined from fMRI data?

Academic Appointments

Harvard Medical School & Brigham and Women's Hospital, Boston

Postdoctoral Research Fellow

Research Sponsors: Prof. Jeremy Wolfe and Prof. Todd Horowitz.

Boston, USA
2007-Present

Harvard Medical School

Postdoctoral Research Fellow / Research Associate

Research Sponsors: Prof. Margaret Livingstone and Prof. David Hubel.

Promoted to research associate in 2007.

Boston, USA
2003-2007

Education

Boston University

Ph.D. in Cognitive Science

Boston, USA
1999-2003

PhD Thesis: *Cortical mechanisms of depth and lightness perception: neural models and psychophysical experiments*. Advisor: Prof. Stephen Grossberg.

8 graduate courses in cognitive psychology, grade point average 4.0 (maximum possible = 4.0)

Oxford University

Combined BA & Masters in Physics

Oxford, UK

1994-1998

Masters Thesis: *An investigation into the range of validity of the recollision model of intense field upconversion*. Advisor: Prof. Keith Burnett.

BA thesis: *Calculating polarized neutron scattering cross-sections from experimental data*. Advisor: Prof. Roger Cowley.

Peer-Reviewed Publications

These can be downloaded from: http://search.bwh.harvard.edu/new/staff_files/howe_pubs/howe.html

- 1) Howe PD, Livingstone MS, Morocz I, Horowitz TS. (2009). An fMRI investigation into multiple object tracking. *Journal of Vision*, 9(4), 1-11.
- 2) Hubel, DH, Howe PD, Duffy, AM, Hernandez, A (2009). Scotopic foveal afterimages. *Perception*, 38(2), 313-316.
- 3) Howe PD, Horowitz TS, Wolfe JM (2008). Transient signals per se do not disrupt the flash-lag effect. *Behavioral and Brain Sciences*, 31(2), 206. Commentary with original data.
- 4) Howe PD, Sagreiya H*, Curtis DL*, Zheng CC*, Livingstone MS. (2008) The double-anchoring theory of lightness perception: A comment on Bressan (2006). *Psychological Review*, 114(4), 1105-1110. Commentary with original data.
- 5) Howe PD & Livingstone MS. (2007) The Use of the Cancellation Technique to Quantify the Hermann Grid Illusion. *PLoS ONE* 2(2): e265
- 6) Howe PD, Thompson PG, Anstis SM, Sagreiya H*, Livingstone MS. (2006). Explaining the Footsteps, Bellydancer, Wenceslas and Kickback Illusions. *Journal of Vision*, 6, 12(5), 1396-1405.
- 7) Howe PD & Livingstone MS (2006). End-stopping and the stereo aperture problem in macaque V1. *Cerebral Cortex*, 16(9), 1332-1337.
- 8) Howe PD (2006). Testing the coplanar ratio hypothesis of lightness perception. *Perception*, 35(3), 291-301.
- 9) Howe PD (2005). White's effect: removing the junctions but preserving the strength of the illusion. *Perception*, 34(5), 557-564.

- 10) Grossberg S & Howe PD (2003)[†]. A laminar cortical model of stereopsis and three-dimensional surface perception. *Vision Research*, 43, 801-829.
- 11) Howe PD & Watanabe T (2003). Measuring the depth induced by an opposite-luminance (but not anti-correlated) stereogram. *Perception*, 32(4), 415-21.
- 12) Howe PD (2001). A comment on the Anderson (1997), the Todorovic (1997), and the Ross and Pessoa (2000) explanations of White's effect. *Perception*, 30(8), 1023-1026. Commentary with original data.

[†]This was based on my PhD dissertation; authorship order was alphabetic.

*Indicates that this was my student or research assistant.

Submitted Manuscripts

- 1) Howe PD, Cohen MA*, Pinto Y, Horowitz TS. Eight objects can be tracked in parallel.
- 2) Howe PD, Livingstone MS, Morocz I, Horowitz TS. Undirected graphs for neuroimaging: A principled model-free method for determining the causal relationships between brain areas.
- 3) Howe PD, Cohen MA*, Pinto Y, Horowitz TS. Distinguishing between parallel and serial accounts of multiple object tracking.
- 4) Howe PD, Pinto Y, Horowitz TS. The coordinate systems used in visual tracking.

Review Chapters

- 1) Howe PD, Evans KK, Pedersini R, Horowitz TS, Wolfe JM., Cohen M* (2009). Attention: Selective Attention and Consciousness. *Encyclopedia for Consciousness*. Elsevier, UK.
- 2) Howe PD (2009). Attention, Awareness and Neglect. *Encyclopedia for Consciousness*. Elsevier, UK.
- 3) Evans KK, Horowitz TS, Howe PD, Pedersini R, Kuzmova Y, Reijnen E, Pinto Y, Wolfe JM. (in preparation). Visual Attention. In Nadel L (Ed) *Wiley Interdisciplinary Reviews: Cognitive Science* John Wiley & Sons Ltd.

Conference Presentations

- 1) Horowitz TS, Cohen M*, Howe PD (2009). Do multiple object tracking and letter identification use the same visual attention resource? *Journal of Vision*, 9(8), 247.
- 2) Howe PD, Cohen M*, Yair Pinto, Horowitz TS, (2009). Distinguishing between parallel and serial accounts of multiple object tracking. *Journal of Vision*, 9(8), 239.
- 3) Howe PD, Livingstone MS, Istvan M, Horowitz TS, Wolfe JM(2008). A neurophysiological model of multiple object tracking derived from fMRI. *Journal of Vision*, 18(6), 220.
- 4) Cohen M*, Howe PD, Horowitz TS, Wolfe JM(2008). Support for a postdictive account of the flash-lag effect. *Journal of Vision*, 8(6), 600.

- 5) Howe PD, Thompson PG, Anstis SM, Sagreiya H*, Livingstone MS. (2007). Explaining the Footsteps, Bellydancer, Wenceslas and Kickback Illusions. *Journal of Vision*, 7(9), 982.
- 6) Sagreiya, H*, Howe, PD & Livingstone, M.S. (2006). The footsteps illusion is caused by motion capture. *Tenth International Conference on Cognitive and Neural Systems*.
- 7) Howe, PD & Livingstone, M.S. (2006). A simple luminance- and contrast- driven model of lightness perception. *Tenth International Conference on Cognitive and Neural Systems*.
- 8) Howe, PD & Livingstone, M.S. (2006). A simple context-dependent and luminance driven model of lightness perception. *Journal of Vision*, 6(6), 704.
- 9) Howe, PD (2005). Stereoscopic depth discrimination in the visual cortex: V1 partially solves the single object correspondence problem. *48th Annual Meeting of Helen Hay Whitney Fellowship Society*.
- 10) Howe PD & Livingstone, M.S. (2005). Binocular vision and the stereo correspondence problem. *Ninth International Conference on Cognitive and Neural Systems*.
- 11) Livingstone MS & Howe PD (2005). White's effect: removing the junctions but preserving the strength of the illusion. *Journal of Vision*, 5(8), 563
- 12) Howe PD & Livingstone MS (2005). Binocular vision and the correspondence problem. *Journal of Vision*, 5(8), 800.
- 13) Howe PD & Grossberg S (2002). Laminar cortical architecture in depth perception. *6th International Conference on Cognitive and Neural Systems*, 6
- 14) Howe PD & Grossberg S (2002). A laminar cortical model of monocular and binocular interactions in depth perception. *Journal of Vision*, 2(7), 324.

Awards and Grants

Co-Pi ARO 46961-LS Misperception of speed and distance under low visibility conditions. Principle PI: Prof. Margaret Livingstone. \$300,000	2005-2008
Helen Hay Whitney Postdoctoral Research Fellowship \$129,000	2004-2006
Presidential University Graduate Fellowship, Boston University, USA \$66,000 and tuition waiver	1999-2003
Exhibitioner, Magdalen College, Oxford University, UK	1997
Commendation for Excellence for Practical Work, Oxford University, UK	1997
Oppidan Scholar, Eton College, UK	1993

Public / External Lectures

Plymouth University, Plymouth, UK	2008
University of New South Wales, Sydney, Australia	2008
University of Massachusetts, Boston, Department of Psychology	2008
Visual Attention Lab Seminar Series, Brigham and Women's Hospital	2007
Boston University, Tuesday Evening Lecture Series, College of Fine Arts	2007
Harvard Medical School Friday Seminar Series	2007
The College of the Holy Cross, Department of Psychology	2006
Boston University, Anniversary Conference for Department of Cognitive and Neural Systems	2005
Harvard Vision Group (3 times)	2002-2005

Teaching Experience

Lecturer / Instructor / Administration <i>CN520 – Principles and Methods of Cognitive and Neural Modeling 2</i> Boston University, post-graduate course	2008
Substitute Tutor <i>Human Nervous System and Behavior,</i> Harvard Medical School, post-graduate course	2006
Guest Lecturer <i>PS222 – Perception and Behavior,</i> Boston University, undergraduate course	2006
Lecturer / Instructor / Administration <i>Psych 475 - Experimental Methods: Learning and Perception</i> University of Massachusetts, Boston, undergraduate course	2005
Guest Lecturer <i>CN730 – Models of Visual Perception,</i> Boston University, post-graduate course	2005
Teaching Fellow <i>Neurophysiology of Visual Perception,</i> Harvard Medical School, undergraduate course	2004-2006

Tutor	2004
<i>Human Nervous System and Behavior,</i> Harvard Medical School, post-graduate course	
Guest Lecturer	2003
<i>CN810 –Topics in CNS: Vision in Man, Monkey, and Machine,</i> Boston University, post-graduate course	
Teaching Fellow	2001
<i>CN530 – Neural and Computational Models of Vision,</i> Boston University, post-graduate course	

Students / Research Assistants Mentored

Ian Cinnamon (high school student)	2009
Ayman Jarbaren (high school student)	2009
Michael Cohen (postgraduate research assistant)	2008-2009
Hersh Sagreiya (undergraduate honors student),	2006-2007
Cheng-Cheng Zheng (postgraduate student)	2006
Dwight Curtis (high school student)	2006

Service

Organization of the Visual Attention Lab Continuing Education Seminar Series	2007-2009
Maintenance of the Visual Attention Lab computer systems	2007-Present
Online editor for ViperLib http://viperlibnew.york.ac.uk/ (A free web resource for lecturers that teach visual perception)	2009

Ad hoc reviewer for: *Cambridge University Press, Brain Research, Cognitive Science Society (10 conference papers), Encyclopedia for Consciousness (Elsevier), Journal of Neurophysiology, Journal of Neuroscience, Journal of the Optical Society of America (twice), Information Fusion, Neural Networks, Neuron, Perception (3 times), Perception and Psychophysics (twice), Spatial Vision, Vision Research (6 times), Wellcome Trust (UK)*

Past and Current Collaborators

Stuart Anstis, Stephen Grossberg, Todd Horowitz, David Hubel, Margaret Livingstone, Istvan Morocz, Peter Thompson, Jeremy Wolfe.

References

Prof. Stephen Grossberg was my PhD advisor and has access to my latest teaching evaluations. Prof. Margaret Livingstone was my postdoctoral advisor at Harvard Medical School and can comment on my mentoring abilities. Prof. Jeremy Wolfe and Prof. Todd Horowitz are my current postdoctoral advisors.

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Synopsis of Previous Work, Teaching and Service

Previous Work

To download my papers: http://search.bwh.harvard.edu/new/staff_files/howe_pubs/howe.html

1. Depth Perception: Computational Investigations

Computational models play a crucial role in vision research. They summarize what we know and suggest which experiments need to be performed. I constructed a model of depth and lightness perception that simulated, and thereby explained, twenty visual phenomena in terms of known neuroanatomy and neurophysiology (Grossberg and Howe, 2003; Figure 1). This formed the basis of my supervisor's subsequent work in visual perception and was the inspiration behind several of my subsequent psychophysical and neurophysiological investigations.

2. Depth Perception: Behavioral Investigations

Models need to be tested to reveal their flaws. I performed a psychophysical investigation to test a prediction of the above model. I showed that the model's prediction that under certain conditions opposite-luminance stereograms should produce stereo-depth was correct (Howe and Watanabe, 2003; Figure 2). This finding proved to be important in my subsequent neurophysiological study into depth perception.

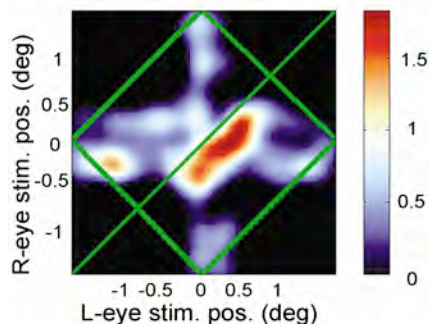


Figure 3. A figure from Howe and Livingstone (2006) that shows the response of a cell in the macaque primary visual cortex as a function of the position of the stimulus in the left- and right-eye receptive fields. The elongation of the area of high activity along the green diagonal indicates that this cell was sensitive to stereo disparity.

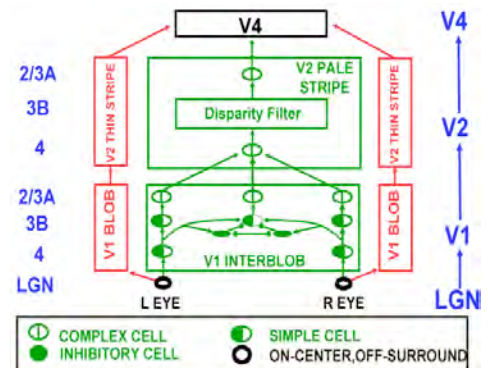


Figure 1. The model of Grossberg and Howe (2003). It was able to correctly simulate 20 visual phenomena based on known brain neurophysiology.

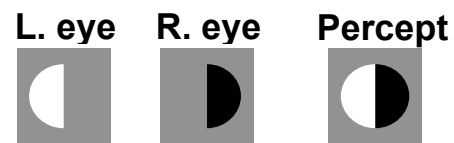


Figure 2. A stereogram used by Howe and Watanabe (2003) to test a prediction of the Grossberg and Howe (2003) model.

3. Depth Perception: Neurophysiology

I have recorded extracellularly from neurons in the primary visual cortex of macaque monkeys. Such cells have very small receptive fields, so sometimes generate spurious depth signals, an issue known as the stereo aperture problem. I investigated how subsequent stages of the visual system could ignore these spurious depth signals and so create a valid depth percept (Howe and Livingstone, 2006; Figure 3). Our finding proved to be compatible with previous work on the motion aperture problem suggesting that similar principles might be generally applicable throughout the visual system, wherever an "aperture problem" occurs.

4. Lightness Perception: Behavioral Investigations

Lightness perception is a fundamental aspect of vision. Previously, it was thought that either T-junctions or coplanarity were the major determinants of lightness. I showed that their importance had been exaggerated (Howe, 2001; Howe 2005; Howe, 2006; Figures 4 & 5). When subsequently investigating the double anchoring theory of lightness perception, I proved that, contrary to this theory, perceptual grouping does not always determine an object's lightness (Howe et al., 2007). It seems that lightness is determined by a number of different, and sometimes conflicting, principles, so it cannot be explained by a single, unified grand theory as has been the implicit assumption of many previous investigations. If true, this would require a paradigm shift in our thinking of how lightness research should be conducted.

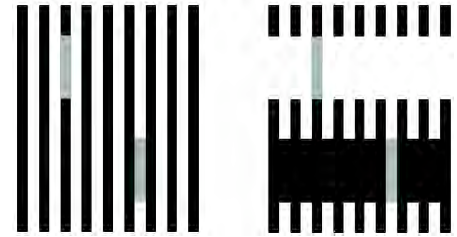


Figure 4. Stimuli used by Howe (2001) to demonstrate the inadequacy of various T-junction accounts of lightness perception.



Figure 5. Stimuli used by Howe (2006) to test the coplanar ratio hypothesis of lightness perception.

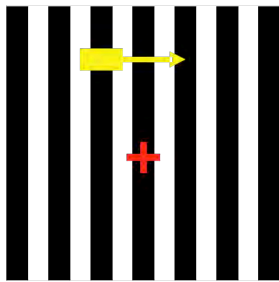


Figure 6. The Footsteps Illusion stimulus used by Howe et al. (2006). Although the yellow bar moves at a constant rate, observers may perceive it to repeatedly stop moving.

5. Motion Perception: Behavioral Investigations

The Footsteps Illusion (Figure 6) demonstrates the dramatic effect a background can have on the perceived speed of an object. This can be important in situations where a person needs to accurately estimate the speed on an object (e.g. when driving). In this illusion, a yellow bar moves over a black and white background. Although the yellow bar moves at a constant rate, most subjects perceive it to come to a complete standstill when it reaches a white stripe. In the past, this illusion has been explained in terms of the variations in contrast at the leading and trailing edges of the yellow bar. I demonstrated that this explanation was incomplete and the illusion is mainly caused by a competition between the vertical and horizontal edges of the moving bar (Howe et al., 2006).

6. The Hermann Grid Illusion

In the Hermann grid illusion (Figure 7), illusory dark gray smudges are seen at the intersections of the grid (when viewed under the appropriate conditions). The illusion has been extensively studied because it thought to directly reflect the functioning of the early visual system. Often, its strength is measured by placing a disk at an intersection and measuring the luminance of the disk required to nullify the corresponding illusory dark gray smudge. I showed that this technique is invalid because this manipulation creates an entirely different illusion, which I called the blanking illusion. The latter can be explained by Weber's law and collinear facilitation (Howe and Livingstone, 2007).

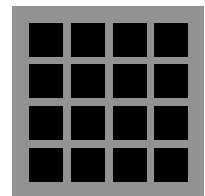
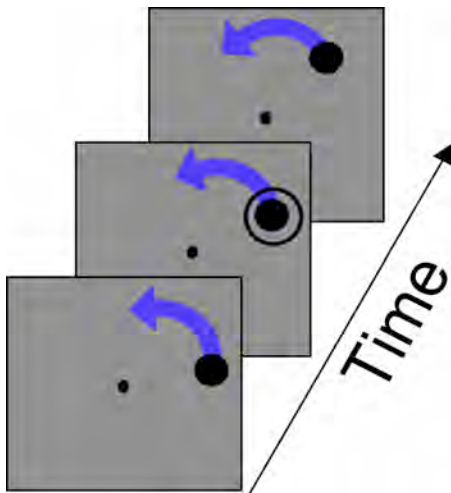


Figure 7. The Hermann grid illusion. Illusory dark smudges are seen at the gray intersections



7. The Flash-Lag Effect

A stationary ring flashed over a moving dot will appear behind the moving dot, an illusion known as the flash-lag effect. This illusion is of interest because it shows how the brain compensates for the delays inherent in neural processing. By investigating how the visual system handles transient signals, I demonstrated that the commonly accepted explanation for this illusion requires a substantial modification (Howe et al., 2008).

Figure 7. The flash-lag effect. If a stationary ring is flashed over a moving dot it will appear to lag the moving dot. This illusion is thought to demonstrate how humans compensate for the delays inherent in neural processing.

8. fMRI Investigation into Sustained Attention

Multiple Object Tracking (MOT) is of interest because it allows us to study sustained attention. Previous fMRI studies identified the brain areas involved in MOT by comparing the brain activity when the subject tracked multiple objects to the brain activity when the subject passively viewed the same stimulus. However, when one tracks objects one must also attend to them, but when passively viewing a scene one neither attends nor tracks the objects. Consequently, these previous studies could not determine whether the reported brain areas were responsible for attending to the objects or for tracking the objects. By using a baseline condition that involved attention, I was able to avoid this confound and show that the areas responsible for tracking were fewer than previously thought (Howe et al., 2009). This finding allowed me to create a tentative neural model of MOT that I will use as the basis for future fMRI investigation into sustained attention.

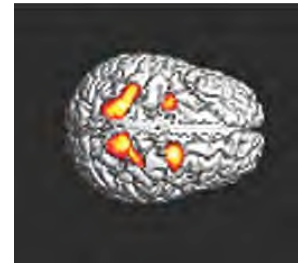
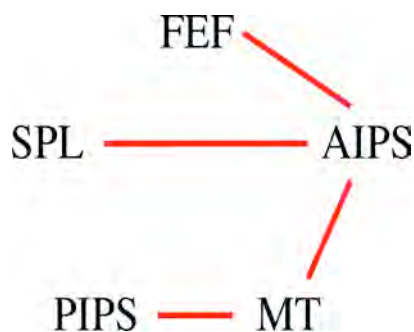


Figure 8. An fMRI scan revealing some of the brain areas active when an observer tracks multiple objects.



9. Development of novel fMRI data analysis techniques

Once one has used fMRI to identify which brain areas are active when an observer performs a given task, the next step is determine how these brain areas interact when the observer performs the task. I have recently developed a new fMRI data analysis technique that does this and calculates the effective connectivity of a given set of brain areas (Howe et al. submitted). This technique can be used in a wide variety of fMRI investigations regardless of their exact subject matter. In the future I intend to make the underlying computer code publicly available.

Figure 9. The connectivity structure recovered from the fMRI data. The brain areas are frontal eye fields (FEF), anterior intraparietal sulcus (AIPS), superior parietal lobule (SPL), posterior intraparietal sulcus (PIPS) and medial temporal area (MT).

10. Scotopic foveal afterimages

If, after being in the dark for many minutes, one views an extended surface in a dimly lit room, one fails to see any hint of the dark spot at the center of gaze that might be expected from the absence of rods in the fovea. This suggests that some sort of "filling-in" mechanism must operate by which the brightness of the surround propagates into the center. We found that if after viewing the surface for some seconds it is suddenly completely darkened one sees a relatively bright spot, about two degrees in size, at the point of fixation (Hubel, Howe, Duffy and Hernandez, 2009). The spot gradually fades over many seconds. If the surface is now restored to its original luminance a dark spot of similar size appears where one fixates, that again lasts for several seconds. It is hoped that by studying this phenomena we will gain insight into "filling-in", a phenomenon that appears to be ubiquitous in visual perception.

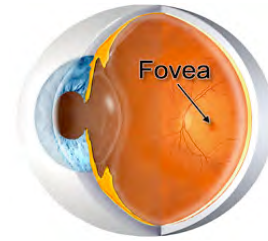


Figure 10. Rods are photoreceptors used by the visual system to see in low illumination levels. In the fovea there are very few rods, so one would expect that, in low illumination levels, there would be a blind spot at the point of fixation. Surprisingly, this blind spot is often "filled-in".

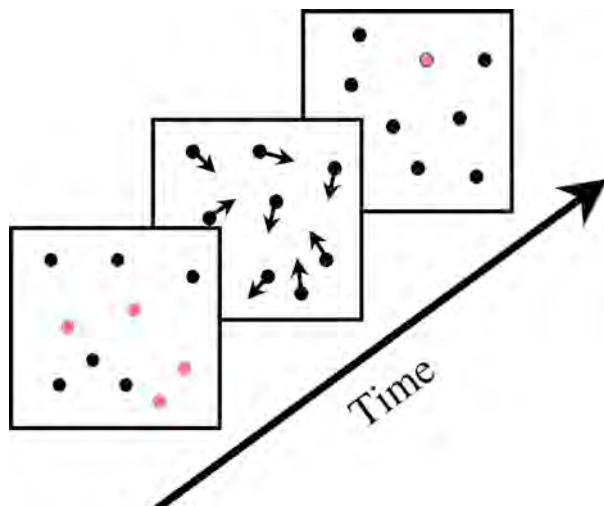


Figure 11. A typical multiple object tracking experiment. At the start of the trial 4 of the 10 disks turn red to indicate that they are targets to be tracked. The disks then all become the same color and move about the display for several seconds. At end of the trial the disks freeze and the observer indicates which were the targets.

11. Multiple object tracking: serial or parallel?

In a world without moving objects, attention could simply be directed to locations. However, because objects do move, they first have to be tracked before they can be attended. Tracking is thus a fundamental attentional operation and, to some extent, the limits of object-based attention are determined by the limits of tracking. Humans can track multiple moving objects. Is this accomplished by attending to each object in turn (the serial model) or do we attend to all the objects simultaneously (the parallel model). In our displays, the objects moved either sequentially or simultaneously. The serial model predicts that tracking performance should be greatest in the first condition. Conversely, a parallel model predicts equal performance in the two conditions. Our data was consistent only with a parallel model (Howe et al., submitted, 2 papers).

11. The coordinate systems used in object tracking

Here we ask which coordinate system is used to track objects, retinal (retinotopic), scene-centered (allocentric), or both. While maintaining gaze on a fixation cross, observers tracked three of six disks, which were confined to move within an imaginary square. Relative to the imaginary square, the disks all moved at the same speed. By moving either the imaginary square (and thus the disks contained within), the fixation cross, or both, we could increase the disk speed in one coordinate system while leaving it unchanged in the other. Increasing the disks' speeds in either coordinate system reduced tracking ability by an equal amount. These data support the hypothesis that humans track objects *simultaneously* in both

retinotopic and allocentric coordinates (Howe et al., submitted). This finding imposes a strong constraint on models of multiple object tracking.

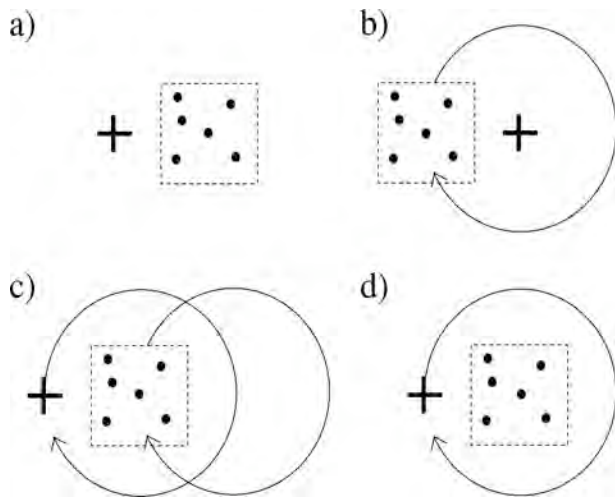


Figure 12. The four stimulus conditions used in the experiment. In all cases the disks were confined to move within an imaginary square. Either the fixation cross, the imaginary square or both would move, thereby causing each disk to have a different speed in the retinotopic and allocentric coordinate systems.

Teaching

I love to teach and have always sought opportunities to teach beyond what was expected of me. For example, during the second year of my postdoc, I volunteered to teach a course at the University of Massachusetts, Boston, even though, due to visa regulations, I could not accept any payment.

Teaching philosophy

The most important part of teaching is being enthusiastic and in this regard I have no difficulties. But what counts is not what I have told the students, but what they actually remember. I have found three techniques to be especially effective in teaching. First, I always make available copies of my PowerPoint slides before the start of each lecture. This ensures that the students' lecture notes will be accurate and gives the students time to pay attention to what I am saying, instead of merely copying down my PowerPoint slides. Second, I repeatedly quiz the students during the lecture. Every 25 minutes or so, I have the students work through, in writing, a simple question directly related to the material just covered in the lecture. Having given them 3-4 minutes to write down their answer, I then write out the answer on the whiteboard and, by observing the reactions of the students, I can see if they have understood the material. This gives me the chance to clear up any confusions before they create further problems. Although questioning the students does take up valuable lecture time, in the long run it makes for faster progress. Third, I ensure that the students are quizzed on each major concept at least three times: once during the lecture in which the concept is first presented (as described above), once in a homework assignment and once in an in-class examination.

Courses that I can teach

I have taught courses on Research Methods and Cognitive and Neural Modeling. I would be delighted to teach a course on any of my research interests such as Perception, Vision, and Attention. Due to my background in mathematics and physics, I would be able to teach a course on Statistics. Because of my research in this area and my general familiarity with the subject matter, I could teach a course on Neuroscience or Cognitive Science. Of course, I would also be happy to teach Introduction to Psychology or other course as required.

Mentoring

I have mentored 6 students, 4 of which obtained an authorship on at least one journal article. I list these publications below, with the names of my students underlined. My research area is well suited for student collaborations. The students only have to acquire a rudimentary knowledge of the MATLAB® programming language before they can fully participate in my research. Once they have assisted in running an experiment, I find that they can often devise interesting extensions. For example, the work on the footsteps illusion was initiated by Hersh Sagreiya and formed the basis of his honors thesis at Harvard University.

Journal articles written with students (students are underlined)

- 1) Howe PD, Cohen MA, Pinto Y, Horowitz TS. (submitted). Eight objects can be tracked in parallel.
- 2) Howe PD, Cohen MA, Pinto Y, Horowitz TS. (submitted). Distinguishing between parallel and serial accounts of multiple object tracking.
- 3) Howe PD, Sagreiya H, Curtis DL, Zheng CC, Livingstone MS. (2008). The double-anchoring theory of lightness perception: A comment on Bressan (2006). *Psychological Review*, 114(4), 1105-1110. Commentary with original data.
- 4) Howe PD, Thompson PG, Anstis SM, Sagreiya H, Livingstone MS. (2006). Explaining the Footsteps, Bellydancer, Wenceslas and Kickback Illusions. *Journal of Vision*, 6, 12(5), 1396-1405.

Conference presentations with students

- 1) Horowitz TS, Cohen MA, Howe PD (2009). Do multiple object tracking and letter identification use the same visual attention resource? *Journal of Vision*, 9(8), 247.
- 2) Howe PD, Cohen MA, Pinto Y, Horowitz TS, (2009). Distinguishing between parallel and serial accounts of multiple object tracking. *Journal of Vision*, 9(8), 239.
- 3) Cohen MA, Howe PD, Horowitz TS, Wolfe JM(2008). Support for a postdictive account of the flash-lag effect. *Vision Sciences Society*, 159
- 4) Howe PD, Thompson PG, Anstis SM, Sagreiya H, Livingstone MS. (2007). Explaining the Footsteps, Bellydancer, Wenceslas and Kickback Illusions. *Vision Sciences Society*, 1082
- 5) Sagreiya H, Howe, PD & Livingstone, M.S. (2006). The footsteps illusion is caused by motion capture. *Tenth International Conference on Cognitive and Neural Systems*.

Class Evaluation

I have taught two classes, one at the University of Massachusetts and the other at Boston University. Both were well received and in each case I was asked back to teach the class the following year. Here is the evaluation for the most recent one, CN520: Principles and Methods of Cognitive and Neural Modeling 2. Spring 2008, Boston University.

The lecture notes, syllabus and additional information are available on the course website:
<http://www.bucn520.com/>

Email address / user name: CN520 (all in uppercase)
 Password: student (all in lowercase)

Copies of the original student comments and evaluations are available from the departmental secretary Robin Amos, ramos@cns.bu.edu. All evaluations were anonymous and on a scale of 1 (poor) - 5 (excellent) unless otherwise stated.

Course Evaluation

1. Relevance of assigned readings	4.8
2. Difficulty of course [(1) easy to (5) difficult]	3.7
3. Workload in course [(1) light to (5) heavy]	3.5
4. Criterion 4 not applicable to this course	
5. Criterion 5 not applicable to this course	
6. Usefulness of assignments and papers	5.0
7. Overall course rating	4.8

Faculty Evaluation

8. Effectiveness in explaining concepts	4.8
9. Ability to stimulate interest in subject	4.2
10. Encouragement of class participation	4.7
11. Fairness in grading	4.7
12. Promptness in returning assignments	4.7
13. Quality of feedback to students	4.7
14. Availability outside of class	4.2
15. Overall rating of instructor	4.7

Service

Online editor for ViperLib http://viperlibnew.york.ac.uk/ (A free web resource for lecturers that teach visual perception)	2009-Present
Maintenance of the Visual Attention Lab computer systems	2007-Present
Mentored 6 student research projects	2007-2009
Organization of the Visual Attention Lab Continuing Education Seminar Series	2007-2009
Organized and administered the course CN520, University of Boston, Boston	2008
As co-PI, administered grant ARO 46961-LS	2005-2008
Organization of a high school visit (Designed to encourage minorities to apply to university)	2007
Organized and administered the course Psych 475, University of Massachusetts, Boston	2005