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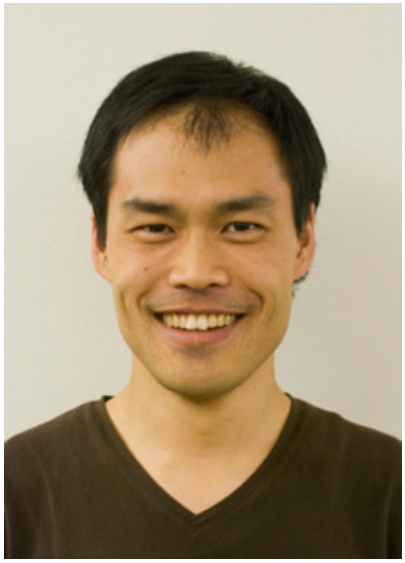

Wei Ji Ma, PhD

Associate Professor of Neural Science & Psychology, New York University

Ma Lab | New York University
Meyer Hall | 4 Washington Place | New York, NY 10003

The talk will consist of two parts: a scientific part and a *Growing up in Science* part.

Models of "simple" visual search
Visual search is an important task in daily life and arguably has been across evolution. Celebrated models of visual search include those of Anne Treisman and Jeremy Wolfe. In a lesser-known approach, spearheaded by the likes of John Palmer, Preeti Verghese, and Miguel Eckstein, stimuli are kept as simple as possible and search displays are brought under tight experimental control. While this reductionist approach lacks in naturalness, it has the advantage of allowing for precise mathematical models in the tradition of signal detection theory, which can be used to disentangle encoding and decision stages. I will describe a series of studies from my lab in which we use this approach to examine: 1) set size effects on encoding precision; 2) the optimality or suboptimality of decision rules. I hope to convince you that such combinations of a simplified experimental paradigm and rigorous modeling fill an important niche in the study of visual search.

Growing up in science: Wei Ji Ma's unofficial story
More information about the "Growing up in science" mentorship concept: www.growingupinscience.com

Official story
Weiji received his Ph.D. in Physics from the University of Groningen, the Netherlands. He went on to do postdocs in computational neuroscience with Christof Koch at Caltech and with Alex Pouget at the University of Rochester. He was Assistant Professor of Neuroscience at Baylor College of Medicine from 2008 to 2013, and has been Associate Professor of Neural Science and Psychology at New York University since. His research focuses on perceptual and cognitive decision-making under uncertainty.

Unofficial story
Weiji is a third-generation Dutch whose single mom vacillated between Chinese tiger parenting and Dutch irreverence. Weiji had a bizarre childhood, graduating from high school at age 14 and from college at 17, along the way picking up media appearances, deficits in social skills, and an inflated self-image. His confidence came crashing down in his PhD, which was initially misguided (bad advisor) and eventually just too hard (string theory). He was leaning heavily on a fellow grad student and his PhD never felt like his own. Weiji was also easily distracted, spending more time being active in organizations and playing online chess than doing research. Making it to faculty seemed like a distant dream. He considered alternative careers, including business consulting, but decided to give science one more chance. Starting as a postdoc offered new opportunities for delusions of grandeur: he thought he would solve consciousness using statistical physics. Back on Earth, Weiji published only one book chapter with Christof Koch, and in 2004, Christof had no choice but to kick him out of his lab. Only in his second postdoc, under Alex Pouget's whip, did he start to get his act together, but this was also a time when, working besides a talented fellow postdoc, impostor complex hit hard. Weiji got his faculty job thanks to just enough people seeing promise in the absence of accomplishments. His procrastination is still alive and kicking to this day, but since his students and postdocs now do the actual work, he can get away with it.

Eye opening discoveries

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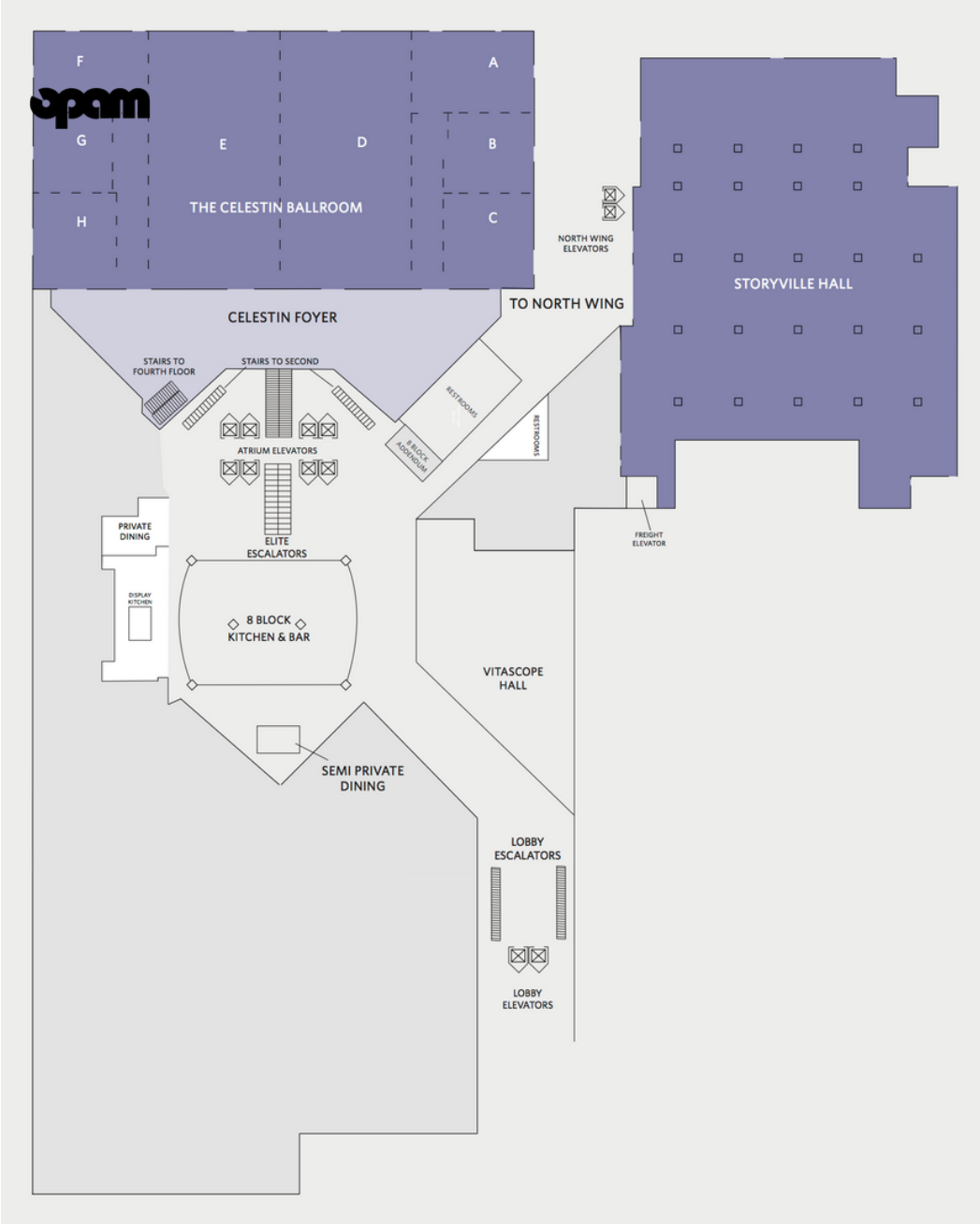

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Hotel Map: Poster Sessions

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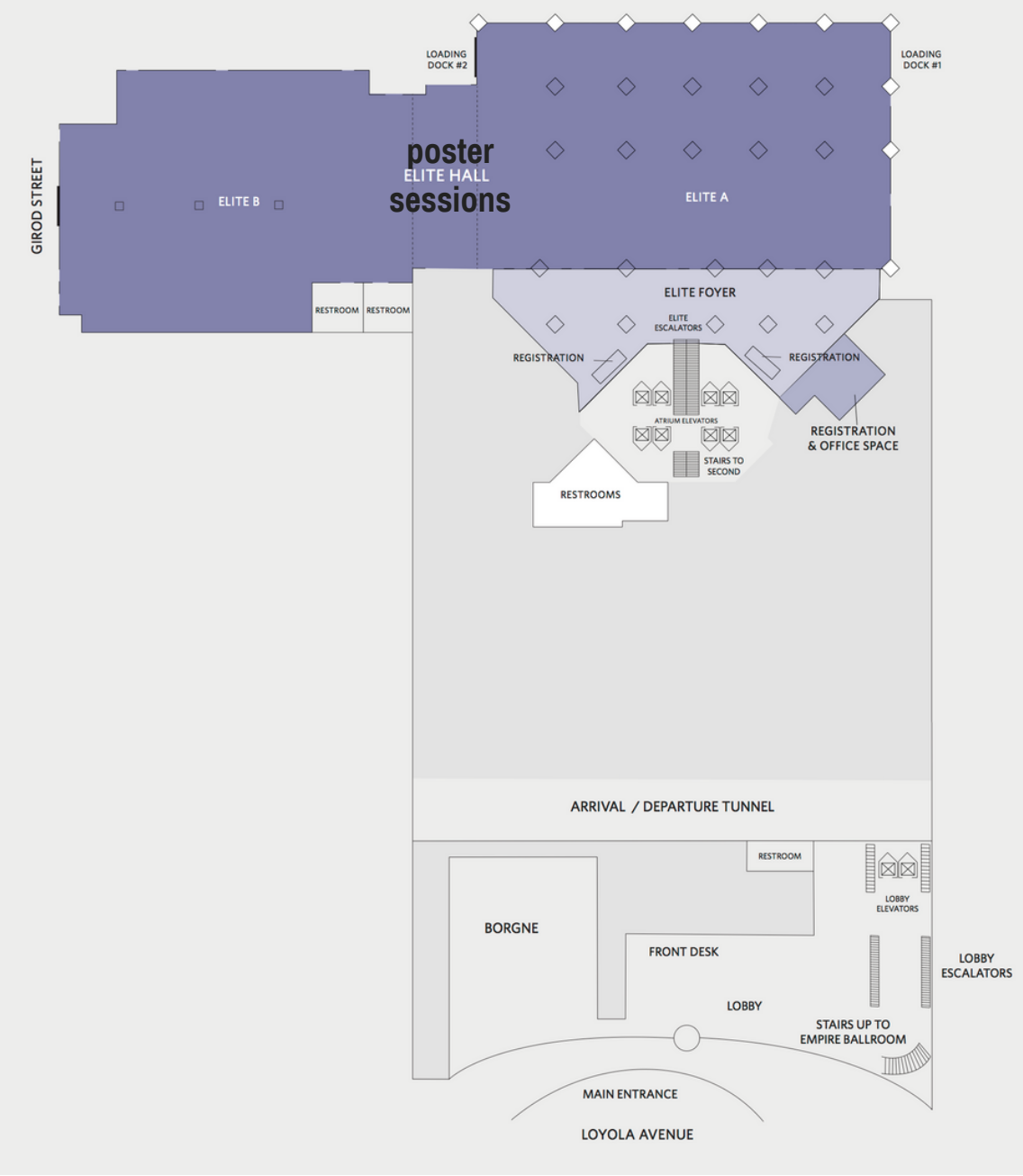

Program

7:15am-8:00am Registration | Rooms Celestin F & G

7:45am-8:00am Opening Remarks

8:00am-9:00am Talk Session 1

8:00am-8:15am **Meaning guides attention during scene viewing even when it is irrelevant**
Candace E. Peacock, Taylor R. Hayes, & John M. Henderson

8:15am-8:30am **HAICT: A novel methodology for testing human-AI collaborations**
Makaela S. Nartker & Jeremy M. Wolfe

8:30am-8:45am **Seeing like a machine: Can humans "crack" adversarial images?**
Zhenglong Zhou & Chaz Firestone

8:45am-9:00am **Scene-context interference during multiple object search**
Karolina Joanna Krzys, Ellen O'Donoghue, & Monica Castelhano

9:00am-9:15am Quick Break

9:15am-10:15am Talk Session 2

9:15am-9:30am **Attentional capture alters feature perception**
Jiageng Chen, Andrew Leber, & Julie D. Golomb

9:30am-9:45am **Neural correlates of attentional capture driven by social reward**
Andy Jeesu Kim & Brian A. Anderson

9:45am-10:00am **The role of cognitive effort minimization in voluntary attention control**
Joseph R. Pauszek & Bradley S. Gibson

10:00am-10:15am **Effect of trial-invariant conjoint spatial-temporal knowledge of target appearance on voluntary spatial and temporal cueing effects**
Colin S. Flowers, Roman Palitsky, Mary A. Peterson, & Daniel Sullivan

10:15am-10:30am Quick Break

10:30am-11:30am Poster Session 1

11:30am-12:15pm Lunch Break

12:15pm-1:15pm Poster Session 2

1:15pm-1:30pm Quick Break

1:30pm-2:30pm Talk Session 3

1:30pm-1:45pm **Behavioral evidence for a shared representation between visual working memory (VWM) and perception**
Chunyue Teng & Dwight J. Kravitz

1:45pm-2:00pm **Not yet relevant is different from no longer relevant: The representational (dis)similarities of currently relevant, prospectively relevant, and dropped memories**
Katya Olmos-Solis, Anouk M. van Loon, & Christian N. L. Olivers

2:00pm-2:15pm **Get the picture? Goodness of image organization contributes to image memorability**
Lore Goetschalckx, Pieter Moors, Steven Vanmarcke, & John Wagemans

2:15pm-2:30pm **The massive impact of carryover effects: Behavior is dramatically and systematically shaped by prior trials**
Michelle R. Kramer, Patrick H. Cox, Stephen R. Mitroff, & Dwight J. Kravitz

2:30pm-2:45pm Quick Break

2:45pm-3:45pm Talk Session 4

2:45pm-3:00pm **Updating perception and action across real-world viewpoint changes**
Andrew Clement & James R. Brockmole

3:00pm-3:15pm **Learning a visuomotor rotation enhances mental rotation**
Jianfei Guo & Joo-Hyun Song

3:15pm-3:30pm **Intuitive physics in multiple object tracking**
Jonas Sin-Heng Lau & Timothy F. Brady

3:30pm-3:45pm **Seeing what's possible: Disconnected visual 'parts' are confused for their potential 'wholes'**
Chenxiao Guan & Chaz Firestone

3:45pm-4:00pm Quick Break

4:00pm-4:55pm Keynote | Wei Ji Ma

4:55pm-5:00pm Closing Remarks

2018 Travel Awards

Ashley DiPuma	Florida Atlantic University
Chenxiao Guan	Johns Hopkins University
Jiageng Chen	The Ohio State University
Michelle Kramer	The George Washington University
Tomer Sahar	Tel-Aviv University

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Poster Session 1

1 **Multisensory integration: How the auditory and visual systems interact** | Jaimie Marie C. Jasina, & Katherine Moore

3 **Gender differences in individual alpha frequency within a working memory paradigm** | Tara R. Ghazi & Susan M. Courtney

5 **Examining the instability of the Necker cube** | Chris Koch

7 **Within-person variability and feedback affect the magnitude of the low prevalence effect in a photo identification task** | Dawn R. Weatherford, Jasmyne Thomas, & Devin M. Roberson

9 **Modulation of implicit bias by affective priming** | Hansol Rheem & D. Vaughn Becker

11 **Retroactive stunting of contextual cueing** | Lisa M. Heisterberg & Andrew B. Leber

13 **Grapheme-texture association accompanying grapheme-color synesthesia** | Kyuto Uno & Kazuhiko Yokosawa

15 **Perceptual organization in Parkinson's disease: A behavioral investigation of basal ganglia dysfunction** | Padmapriya Muralidharan & Anthony Cate

17 **Statistical regularities during object encoding distort long-term memory** | Paul S. Scotti, Yoolim Hong, Julie D. Golomb, & Andrew B. Leber

19 **As unique as a snowflake: Utilising statistical learning of rare, diagnostic features in a match-making task** | Bethany Growns & Kristy A. Martire

21 **The road to long-term memory: Top-down attention is more effective than bottom-up attention for forming long-term memories** | Edyta Monika Sasin & Daryl Fougnie

23 **Modeling of essential node coalitions: A membrane theory of attention** | Eben Wallace Daggett

25 **Flexible attentional prioritization of working memory representations** | Paige Pytel & Edward F. Ester

27 **Characterization of individual aging effects on white matter microstructural integrity and dynamic network connectivity underlying attention control: A combined EEG and DTI study** | Thomas Thierry Hinault, Travis Kroeker, Eda Incekara, Arnold Bakker, & Alain Dagher

29 **Contextually cued visual sequences of attention** | William Narhi, Brett Bahle, & Andrew Hollingworth

31 **Capacity of visual working memory during visual search** | Michael J. King & Brooke N. Macnamara

33 **Developing an OATS (Operationalized attentional task set): When do individuals refine their list of targets while performing a task?** | Ryan E. O'Donnell & Brad Wyble

35 **Investigating the benefit of scene context on the parafoveal processing of object** | Ryo Tachibana & Monica Castelhano

37 **A binding illusion of ambiguous color location between two locations** | Cristina R. Ceja & Steven L. Franconeri

39 **Electrophysiological correlates of searching through memory during hybrid visual search** | Lauren H. Williams, Iris Wiegand, Jeremy M. Wolfe, & Trafton Drew

41 **Attentional requirements modulate the effect of multiple targets during pop-out visual search** | James P. Wilmott & Joo-Hyun Song

Poster Session 1

43 **Distribution of spatial attention under varying task loads** | SuHyeon Jo, Eunhee Bae, & Sukwon Han

45 **Psychological scaling reveals a single parameter framework for visual working memory** | Mark W. Schurgin, John T. Wixted, & Timothy F. Brady

47 **The Wandering Eye: A tool to detect the onset and duration of mind wandering objectively and in real time** | Geoffrey William Harrison, Phillip Aucoin, Eden Shaul, Jordan Poppenk, & Daryl E. Wilson

49 **Finding odd one out scene? Use of deep features as a similarity measure** | Filip Dechterenko, Jiri Stipl, & Jiri Lukavsky

51 **Why seeing the floor matters: How the nearby ground plane effects distance perception** | Isabel Griffith, John Philbeck, Lindsay Houck, & Tom Malik

53 **Getting a clue: Professional and naïve searchers in an open terrain environment** | Rebecca A. Penn & Michael Hout

55 **Summarizing scatterplots: Impact of outliers on trend-line estimates** | Emre Oral & Aysecan Boduroglu

57 **Executive control of attention promotes resistance to distractor interference in visual search** | Melany W. Love, Jennifer Johnson, & David A. Washburn

59 **Using Hidden Markov Modelling to assess the cognitive states of procedural memory** | Michael Dubois, Amy S. Finn, Michael L. Mack, & Ian Mahoney

63 **Modeling Posner's validity effect reveals fewer guesses, but not enhanced precision** | Tomer Sahar, Dominique Lamy, & Tal Makovski

65 **The role of intertrial priming in hybrid search tasks** | Adam C. Vilanova-Goldstein & Carly Leonard

67 **The congruency sequence effect between two stimulus-based conflict tasks** | Yeeun Kim & Yang Seok Cho

69 **Gender differences in lethal force decision-making** | Mackenzie R. Riggenbach, Kara J. Blacker, Kyle A. Pettijohn, & Adam T. Biggs

71 **Correlation between impairment in emotional integration and discrimination of ambiguous visual-auditory stimuli and presence of autistic traits** | Kenton H. MacDowell & Steven L. Bressler

73 **The role of response mode in the congruency sequence effect** | Juyoung Park & Yang Seok Cho

2 **It's all a blur: Partial visual information triggers logarithmic decision times during object recognition** | Jessica Madrid, Rebecca Penn, Bryan White, Alexis Torres, & Michael C. Hout

4 **The role of right temporo-parietal junction in stimulus evaluation and perceptual decision-making** | Eunhee Bae, Suhyeon Jo, & Sukwon Han

6 **Knowing not: Similarities (and dissimilarities) between rejecting and remembering** | Daniella K. Cash & Megan H. Papesh

8 **The role of physical salience capture in emotion induced blindness** | Gus Baker, James Hoffman, & Teresa Turco

10 **Resting EEG in alpha and beta bands predicts individual differences in global/local processing** | Brent Pitchford & Karen M. Arnell

12 **Fixation duration and recognition: The peculiar case of posterior cortical atrophy patients** | Tal Nahari, Nitzan Guy, Noa Raz, Netta Levin, & Yoni Pertzov

14 **Neural correlates of attentional bias following aversive conditioning: Evidence for valence-independent mechanisms of priority** | Haena Kim, Namrata Nanavaty, Vani A. Mathur, & Brian A. Anderson

16 **A horizontal advantage for attention: Enhanced performance for targets located horizontally to an exogenous cue** | Pei-Ling Yang, John Clevenger, & Diane Beck

18 **Simultaneous prioritization of multiple working memory representations** | Ashley DiPuma & Edward F. Ester

20 **Perceptual interactions between face identity and emotional expression in depression** | Fabian A. Soto, Rochelle A. Stewart, & Christopher G. Beevers

22 **Depth preferences for 3D stimuli in category-selective visual areas** | Samoni Nag, Daniel Berman, & Julie D. Golomb

24 **Increasing item precision in visual working memory is insufficient to grant template status** | Blaire Dube & Naseem Al-Aidroos

26 **Selection history in context: Evidence for the role of reinforcement learning in biasing attention** | Mark K. Britton & Brian A. Anderson

28 **Effects of reading difficulty on different stages of mind wandering** | Meera Zukosky & Ranxiao Frances Wang

30 **Cross-modal entrainment in the alpha-band: Effects of 8-12 Hz rhythmic auditory stimulation on visual perception** | Emily C. Cunningham, Ranxiao F. Wang, & Diane M. Beck

32 **Parafoveal processing of inflectional morphology in Russian native speakers and English-L1/Russian-L2 learners** | Anastasia A. Stoops, Kiel Christianson, & Tania Ionin

34 **Memory for emotional faces depending on cognitive control demands and task-relevance** | Hyejin Jade Lee & Yang Seok Cho

36 **Imagination enhances helping intention: The role of helping efficacy** | Ryuji Oguni, Masanori Kobayashi, & Keiko Otake

Poster Session 2

38 **Effects of feature cues and target salience on eye movements in singleton search** | Tammy A. Nguyen & Carly J. Leonard

40 **±300ms is critical for keeping natural first person view in HMD** | Takuya Nakayama & Takako Yoshida

42 **Mapping the behavioral similarity space of targets and distractors in complex visual search** | Patrick H. Cox, Stephen R. Mitroff, & Dwight J. Kravitz

44 **Increasing attention to behaviorally relevant items facilitates incidental relational memory** | Hamid B. Turker & Khena M. Swallow

46 **Eye movements provide insight into the influence of semantic information on visual search** | Taylor D. Dague, Kenith Sobel, Savannah Bell, Christian Hopkins, & Amrita Puri

48 **Feature vs. identity: Directed forgetting in visual working memory** | Katherine C. Moen, Juan D. Guevara Pinto, Megan H. Papesh, & Melissa R. Beck

50 **Inattentional blindness through multiple object tracking: The role of item novelty and attentional load** | Michaela Porubanova & Maria Kuvaldina

52 **Placeholders, ageing, and the spatial spread of attention** | Rebecca K. Lawrence, Mark Edwards, & Stephanie C. Goodhew

54 **Grouping and objecthood effects in the Ebbinghaus illusion** | Einat Rashal, Aline F. Cretenoud, & Michael H. Herzog

56 **Is it possible to identify an item without being able to localize it?** | Shekoofeh Hedayati Zafarghandi & Brad Wyble

58 **With or without the probability: The description-experience gap in visual search performance** | Hanshu Zhang & Joseph W. Houpt

60 **The binding of object features and locations in visual working memory** | Conne A. George & Michael S. Pratte

62 **What causes the dip in the rotation function for recognizing objects?** | Charles Josef Peasley & Eric Cooper

64 **Emphasizing the horizontal meridian eliminates the object-based attention shift direction anisotropy** | Adam J. Barnas & Adam S. Greenberg

66 **What type of eye movement can act as a clue to perceive live-ness? A dual-simultaneous eye-tracking study** | Haruka Nakamura & Takako Yoshida

68 **Training reduces categorical errors while drawing** | Larissa Arnold & Eric Cooper

70 **Association-change restores feature-based contextual cueing** | Sunghyun Kim & Melissa R. Beck

72 **Spotting rare targets makes your brain “blink” harder** | Jua D. Guevara Pinto & Megan H. Papesh

74 **Memory for distractors during hybrid search: The effect of target template specificity** | Stephanie M. Saltzmann, & Melissa R. Beck

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Talk Session Abstracts

Talk Session 1:

Meaning guides attention during scene viewing even when it is irrelevant | Candace E. Peacock, Taylor R. Hayes, & John M. Henderson
What are the roles of low-level image salience and high-level semantic meaning on attentional prioritization during real-world scene viewing? We examined this question using two tasks in which meaning was irrelevant and saliency was relevant: a brightness rating task and a brightness search task. Meaning was represented by meaning maps that captured the spatial distribution of semantic features and was contrasted with saliency maps that captured the spatial distribution of low-level features. Our findings suggest that even in tasks for which meaning is irrelevant and saliency is relevant, attention prioritizes meaningful scene regions over salient regions.

HAICT: A novel methodology for testing human-AI collaborations | Makaela S. Nartker & Jeremy M. Wolfe
Artificial intelligence algorithms show near-human performance on many medical image perception tasks. However, combination of AI and human has not improved performance as much as theory would predict. Maybe AI is presenting information in a non-optimal way. Maybe what works for one task, fails for another. This is hard to test in clinical settings. We have developed a lab-based method for efficiently testing different human-AI collaborations. It is fast and, importantly, it allows for testing with non-experts. Multiple human-AI interactions can be rapidly prototyped to determine the best method for specific clinical tasks.

Seeing like a machine: Can humans "crack" adversarial images? | Zhenglong Zhou & Chaz Firestone
Human vision is increasingly well-approximated by cutting-edge Convolutional Neural Networks. However, such models are "fooled" by so-called adversarial examples — carefully-crafted images that appear as nonsense to humans but as objects to CNNs. Surprisingly, however, little work has investigated human performance on such stimuli; could humans "crack" adversarial images by predicting the machine's classifications? In four experiments on three prominent adversarial imagesets, subjects reliably identified the machine's chosen label over relevant foils — even for images previously considered "totally unrecognizable to human eyes". Computer object-representation may resemble a human's more than recent challenges suggest.

Scene-context interference during multiple object search | Karolina Joanna Krzys, Ellen O'Donoghue, & Monica Castelhano
Scene context constrains deployment of attention to scene regions with the highest expectancy of target location. In the current study, we examined whether targets co-occurrence within one contextual region affects the efficiency of simultaneous search for two targets. Participants searched for two targets that were either expected within the same scene region or in two different scene regions. We found a significant interaction of target placements with the search phase. We propose that the rejection criterium affects spatial constrains of the task requirements.

Talk Session 2:

Attentional capture alters feature perception | Jiageng Chen, Andrew Leber, & Julie D. Golomb
We live in a dynamic, distracting world. When salient distractors capture attention, what are the consequences for perception? Does capture alter target representations? If so, are we aware of such errors? Using a novel behavioral measure, we discovered two types of feature-binding errors: 1) When attention is strongly captured, subjects commit swapping errors (misreporting the distractor color), which remarkably seem to occur without awareness. 2) When subjects successfully resist capture, they tend to exhibit repulsion (perceptual distortion away from the distractor color). Thus, capture not only induces a spatial shift of attention, it alters feature perception in striking ways.

Neural correlates of attentional capture driven by social reward | Andy Jeesu Kim & Brian A. Anderson
Stimuli previously associated with monetary reward and positive social feedback capture attention. It is unknown whether the facilitation of attention by different types of reward relies on similar or dissociable neural systems. We examined the neural correlates of attention to stimuli previously associated with social reward. The results reveal learning-dependent priority signals in the contralateral visual cortex and caudate tail, mirroring studies using monetary reward, in addition to the right middle frontal gyrus (MFG). Our findings support a common neural mechanism for directing attention to valuable stimuli and suggests a value-based priority signal particular to social utility.

The role of cognitive effort minimization in voluntary attention control | Joseph R. Pauszek & Bradley S. Gibson
The present work examined the Least Costs Hypothesis (LCH) of voluntary symbolic attention control, which predicts that observers will engage voluntary control processes to guide attention when the cost of this guidance is less than the cost of random guidance. In a novel demand-selection paradigm, observers were instructed to freely choose between performing a visual search task with or without a 70%-valid spatial cue. Consistent with the LCH, two studies showed that observers rarely chose to search with the aid of the spatial cue, thus highlighting the important role of effort minimization in theories of voluntary attention control.

Effect of trial-invariant conjoint spatial-temporal knowledge of target appearance on voluntary spatial and temporal cueing effects | Colin S. Flowers, Roman Palitsky, Mary A. Peterson, & Daniel Sullivan
Symbolic cues can simultaneously cue targets' locations and onset times (Weinbach, et al. 2015). Do symbolic cues indicating likely target locations and onset times on individual trials speed detection when subjects have prior information that the target will usually appear at a short onset time in one location and at a long onset time in the other location (independent validity of symbolic cues and prior information = 75%)? RTs were faster on valid than invalid trials of all types (ps < .05). Also, valid spatial cues combined with valid prior information to produce the fastest RTs on short onset trials.

Talk Session 3:

Behavioral evidence for a shared representation between visual working memory (VWM) and perception | Chunyue Teng & Dwight J. Kravitz
The sensory recruitment account (D'Esposito & Postle, 2015) posited a shared representation between VWM and perception within the posterior visual areas. Given the hypothesized neuronal overlap, we predicted that interference between these processes should be bidirectional and well predicted by known tuning curves properties. In six experiments, we show, for color and orientation, that similarity between VWM content and perceived stimuli modulated attentional capture and VWM interference in a manner consistent with known tuning curves. Further, holding an item in VWM directly alters perception, evidenced by changes in discrimination thresholds. These results provide direct support for the sensory recruitment account.

Not yet relevant is different from no longer relevant: The representational (dis)similarities of currently relevant, prospectively relevant, and dropped memories | Katya Olmos-Solis, Anouk M. van Loon, & Christian N. L. Olivers
Previous research showed that prospectively and currently relevant representations are dissociated in working memory. We investigated whether postponing information for a later task is like dropping it from memory. Participants memorized an image as the potential target for one of two search tasks. A cue indicated if the image was target in the first search (current relevance), the second search (prospective relevance), or if it was no longer relevant (dropped). We found that prospectively relevant targets could be decoded during the first search, and their representations were anti-correlated with that of currently relevant objects, whereas dropped targets did not.

Get the picture? Goodness of image organization contributes to image memorability | Lore Goetschalckx, Pieter Moors, Steven Vanmarcke, & John Wagemans
What drives differences in image memorability? Here, we hypothesized that goodness of image organization contributes to memorability. Good organizations have been associated with fast processing and robustness against transformation. To test our hypothesis, Study 1 focused on fast processing, predicting that memorable images are easier to categorize rapidly. Study 2 predicted that they survive shrinking better. Images were assigned a categorizability and shrinkability score based on a rapid-scene categorization task and a thumbnail search task, respectively. In line with our hypothesis, categorizability and shrinkability correlated positively with memorability, after controlling for distinctiveness.

The massive impact of carryover effects: Behavior is dramatically and systematically shaped by prior trials | Michelle R. Kramer, Patrick H. Cox, Stephen R. Mitroff, & Dwight J. Kravitz
Cognitive psychologists counterbalance/randomize trial order to avoid systematic sequence effects, but this does not remove the noise. Using two massive independent datasets we show that prior experience—specifically, the absolute number and relative proportion of prior trials that match or do not match the current trial type—dramatically influences performance on the current trial, even across an interfering task. Remarkably, this influence manifests as a power curve—the equation underlying t-tests. Thus, the optimization of behavior is proportional to statistical evidence—the impact of which can be anticipated and removed, increasing power to detect real differences between conditions.

Talk Session 4:

Updating perception and action across real-world viewpoint changes | Andrew Clement & James R. Brockmole
Growing evidence suggests that performing actions can distort our visual perception. We tested whether these distortions persist when observers move to new viewpoints. Participants viewed an object that was projected onto a table, then reached for it with their index finger or a reach-extending tool. Participants remained stationary or moved to a new viewpoint, then estimated the object's distance. When participants remained stationary, reaching with a tool led them to report shorter distance estimates. However, when participants moved to a new viewpoint, these distortions were eliminated. Thus, visual perception is continuously updated as observers move throughout the environment.

Learning a visuomotor rotation enhances mental rotation | Jianfei Guo & Joo-Hyun Song
How does physical manipulation of actual objects affect mental manipulation of imaged objects? While recent evidence demonstrates that manual and mental manipulation of objects share common processing constraints and neural correlates, fewer studies show direct impact of improvement in one process on the other. Here, we examined whether learning a rotation of real-time visual feedback of the hand movement facilitates mental rotation. We found that learning a visuomotor rotation, but not actions without the rotation component, facilitated response time of subsequent mental rotation. This suggests that visuomotor learning can be transferred to enhance mental processing of relevant component.

Intuitive physics in multiple object tracking | Jonas Sin-Heng Lau & Timothy F. Brady
We investigated whether visual tracking mechanisms utilize knowledge about how objects move in the world ('intuitive physics'). In two experiments, participants were asked to track multiple objects that either did or did not obey the physics of how objects interact. We found an advantage for tracking with realistic physics. In particular, participants were more accurate when objects bounce off each other at proper angles and when objects vary in speed, independent of a variety of low-level factors (like object spacing) that would be expected to affect object tracking. We conclude that participants utilize intuitive physics in multiple object tracking.

Seeing what's possible: Disconnected visual 'parts' are confused for their potential 'wholes' | Chenxiao Guan & Chaz Firestone
When assembling furniture or completing a jigsaw puzzle, we appreciate not only the particular shapes of individual objects, but also their potential to *combine* into new objects. How does the mind extract this property? In 5 experiments inspired by Tetris, subjects had to respond to a particular target within a stream of "tetrominoes"; however, subjects false-alarmed more often to pairs of tetrominoes that could create their target than to tetromino-pairs that couldn't—essentially confusing 'potential' objects for real ones. We suggest that the mind automatically represents not only what objects *are*, but also what they *could become*.

Poster Session Abstracts

Poster Session 1:

1 **Multisensory integration: How the auditory and visual systems interact** | Jaimie Marie C. Jasina & Katherine Moore
How is visual search for faces affected by related, but irrelevant auditory information? Participants searched a six-face array for a male and female face targets while a male or female voice played simultaneous with the search array. The voice could match or mismatch the face on gender and location (left vs. right). Gender congruency had a greater impact on search than did location congruency. In fact, participants were faster when voice cues came from both directions than from the congruent side of the display. These results and others from the two-experiment investigation advance our understanding of multisensory processing.

3 **Gender differences in individual alpha frequency within a working memory paradigm** | Tara R. Ghazi & Susan M. Courtney
Peak power localized within the alpha frequency range in EEG [Individual Alpha Frequency (IAF)], and its relationship to cognitive performance, differ between people in ways not fully understood. Utilizing a working memory paradigm with two different information type and two load conditions, we compared IAF from anterior and posterior brain regions and behavioral performance between participants grouped by gender. We found gender differences in IAF individual variability and in its correlation with performance, dependent on condition, but not in behavioral performance itself. Gender, we conclude, is an important factor in understanding individual differences in the neural systems underlying working memory.

5 **Examining the instability of the Necker cube** | Chris Koch
Temporal processing is an important dimension influencing the rate at which bistable images change (Wemery et al., 2015; Atmanspacher and Filk, 2013). This study was conducted to determine if space is another contributing factor to the perception of bistable images. Subjects were shown three versions of the Necker cube including a cube and two prisms with the length of one side either 1.5 or 2 times the length of the cube. Results show that increasing the length of one side increases the stability of the image. A similar finding was found with incomplete and illusory images.

7 **Within-person variability and feedback affect the magnitude of the low prevalence effect in a photo identification task** | Dawn R. Weatherford, Jasmyne Thomas, & Devin M. Roberson
Individuals rarely present another person's ID as their own, which increases the likelihood of committing a mismatch error. Three experiments explored how within-person variability and feedback affect failure to detect an ID mismatch. Using a 1-6 scale, participants compared a target face to an ID card under either high, medium, or low mismatch prevalence. Unsurprisingly, low mismatch prevalence increased mismatch errors. Further, feedback facilitated performance on whichever trial type (match or mismatch) was high frequency at the expense of performance on low-frequency trial types. ROC curves further elucidated how the LPE affects discriminability and criterion.

9 **Modulation of implicit bias by affective priming** | Hansol Rheem & D. Vaughn Becker
People differ along multiple dimensions (e.g. race, gender) that are automatically recognized by others and can give rise to stereotypic associations. Features of the environment also elicit emotional reactions that can influence performance. However, little work has investigated how social categories and environmental cues interact. In the current study participants viewed faces of ingroup or outgroup men and women presented concurrently with a pleasant or unpleasant sound. A target word followed each face, and participants had to categorize the word's valence as pleasant or unpleasant. The results indicated that implicit bias effects are modulated by affective priming.

11 **Retroactive stunting of contextual cueing** | Lisa M. Heisterberg & Andrew B. Leber
Humans routinely exploit regularities in the environment to facilitate visual search, but what if consolidation of the encoded context is perturbed? Participants completed a variation of the contextual cueing procedure (Chun & Jiang, 1998), searching for a T among Ls, in displays comprised of repeated and random arrangements. Critically, some of the repeated displays were immediately followed by a secondary task judging simple math statements. Results indicated that learning of repeated contexts – i.e., the contextual cueing effect – was stunted when followed by the secondary task. These findings underscore the role of consolidation in the implicit learning of visual regularities.

13 **Grapheme-texture association accompanying grapheme-color synesthesia** | Kyuto Uno & Kazuhiko Yokosawa
Grapheme-color synesthesia is a condition in which visual letters or characters induce a specific color sensation. Our study focused on the synesthetic experience of texture that accompanies to synesthetic colors. We asked synesthetes to choose both a synesthetic color and a synesthetic textural image for each Japanese character. Results revealed that the same texture categories tend to be chosen when characters represent the same syllables or consonants. These effects of sound on synesthetic experience of texture are consistent with those on synesthetic color, indicating colors and texture are elicited by the same information of grapheme.

15 **Perceptual organization in Parkinson's disease: A behavioral investigation of basal ganglia dysfunction** | Padmapriya Muralidharan & Anthony Cate
The hypothesis that BG mediate mid-level processes relevant to perceptual representations of objects composed of distinct parts was tested. A behavioral study with Parkinson's Disease patients and age-matched controls (N=14*) using custom computerized behavioral tests that assessed shape, figure—ground and global-local processes were conducted after a preliminary study using the Leuven Perceptual Organization Screening Test (L-POST) was done. The latter showed that controls performed below the L-POST normative range on the embedded figures subtest. PD patients in our sample did not show significant impairment on the behavioral tasks.

17 **Statistical regularities during object encoding distort long-term memory** | Paul S. Scotti, Yoolim Hong, Julie D. Golomb, & Andrew B. Leber
Humans use environmental regularities to facilitate learning, often without awareness or intent. How might such regularities distort long-term memory? Here, participants studied/reported the colors of 360 objects in a long-term memory paradigm, unaware of certain colors sampled more frequently overall. For objects sampled outside this frequent color range, memory errors were systematically biased around the average color (summary statistic), indicative of biased guessing or false memory. In addition to these crude errors centered on a certain feature, post-hoc analyses suggested subtle attraction/repulsion effects. Together, these results help translate relational mechanisms observed in working memory over to long-term memory.

19 **As unique as a snowflake: Utilising statistical learning of rare, diagnostic features in a match-making task** | Bethany Growns & Kristy A. Martire
Statistical learning is our innate ability to extract regularities from the environment. Here we investigate whether statistical learning occurs after exposure to complex stimuli and whether this learning can be utilised in decision-making, specifically in matching task. Participants were exposed to 120 complex exemplars, after which we assessed their statistical learning and matching performance. In Experiment 1, participants misunderstood the diagnosticity of frequency information and indicated that two patterns sharing a common feature we more likely to match than those sharing a rare feature. In Experiment 2, we corrected this misunderstanding through training. Results will be discussed.

21 **The road to long-term memory: Top-down attention is more effective than bottom-up attention for forming long-term memories** | Edyta Monika Sasin & Daryl Fougnie
What role does attention play in how well something is encoding in long-term memory? Here, we measured implicit memory of distractors during visual search, comparing items that grabbed attention either because they matched a target feature (top-down attention) or because they were perceptually distracting (bottom-up attention). Both types of distractors were equally salient (produced equivalent attentional capture), yet target related distractors were remembered better than salient distractors and were remembered equally as well as targets. These results suggest that top-down attention is more effective in promoting the formation of memory traces than bottom-up attention.

23 **Modeling of essential node coalitions: A membrane theory of attention** | Eben Wallace Daggett
As of yet, no well-accepted theory unifies spatial and temporal dynamics of selective attention. In this study, a model was created that integrates three supported theories of attention, produces human-like outputs in both spatial and temporal tasks under a constant parameter set, and utilizes Crick and Koch's Framework for Consciousness as a unifying concept. The resulting model suggests that attention acts metaphorically as a selectively permeable membrane, sculpting the enormous amount of sensory data detected into a strategically limited representation of an agent's environment, rather than as a mechanism for directing limited processing resources.

25 **Flexible attentional prioritization of working memory representations** | Paige Pytel & Edward F. Ester
Recent evidence (Ester, Nouri, & Rodriguez, submitted) suggests that retrospective cues mitigate information loss during working memory (WM) storage by protecting representations of a cued item from degradation and facilitating the removal of uncued items from WM. Here, we examined whether these processes are under voluntary control by quantifying the precision of time-resolved spatial WM representations while manipulating the reliability of a retrospective memory cue. Reconstructed representations of uncued locations were stronger for less reliable cues, suggesting that the removal of uncued information from WM is a voluntary process.

27 **Characterization of individual aging effects on white matter microstructural integrity and dynamic network connectivity underlying attention control: A combined EEG and DTI study** | Thomas Thierry Hinault, Travis Kroeker, Eda Incekara, Arnold Bakker, & Alain Dagher
This study aimed to better understand individual aging effects on dynamic network connectivity of cognitive control, and how it is underpinned by white matter integrity. We analyzed DTI and EEG data in young and older adults while participants had to inhibit irrelevant arithmetic knowledge (e.g., determine that 8x4=12 is false). Results revealed how the variability of white matter alterations was related to aging effects on EEG functional networks, alpha/gamma phase-amplitude coupling, and behavioral performance. These findings improve our understanding of the association between age-related decline in cognitive control and functional and structural network integrity.

29 **Contextually cued visual sequences of attention** | William Narhi, Brett Bahle, & Andrew Hollingworth
Contextual cueing and visual sequence learning are two well-established phenomena within statistical learning. The current experiments sought to combine these phenomena to observe whether a sequence of behaviors can be contextually cued. To do this, we designed a task which required fixating multiple locations on every trial in a particular order. Some displays were repeated, allowing for statistical regularities to be learned and used to guide attention. The results demonstrated that a visual sequence of eye movements could be contextually cued. These findings expand the domains under which contextual cueing and sequence learning apply to real-world behavior.

31 **Capacity of visual working memory during visual search** | Michael J. King & Brooke N. Macnamara
How many items can we store in visual working memory (VWM) while simultaneously conducting a visual search? Previous research has proposed that only one visual working memory representation can be activated to influence attention directly, whereas other VWM representations are accessory items which have little influence on visual selection. However recent findings have suggested otherwise, that two visual working memory representations can capture attention and interfere with concurrent visual search (Chen and Du, 2017). We conducted an experiment to reproduce these findings, and extend the results to test further what the capacity of visual working memory is under attentional demands.

33 **Developing an OATS (Operationalized attentional task set): When do individuals refine their list of targets while performing a task?** | Ryan E. O'Donnell & Brad Wyble
When given a task to perform, how do individuals go about completing it? For example, if told to locate a letter surrounded by digit distractors, do participants follow the instructions completely, utilizing the instructional task set (ITS) given? Alternatively, do they refine their task set as the experiment unfolds, reducing it to include only the subset of letters they have actually seen, within what we call the operationalized attentional task set (OATS)? In a series of RT experiments, we show that the benefit of using an OATS over an ITS depends on the size of the categorical subset used.

35 **Investigating the benefit of scene context on the parafoveal processing of object** | Ryo Tachibana & Monica Castelhano
Studies have shown that parafoveal processing facilitates recognition processing of objects when viewed in a scene context. However, it remains unclear whether prior knowledge of scene context affects parafoveal processing. We examined prior knowledge of scene context using the Dot-Boundary paradigm. Surprisingly, there was no advantage to having a short (50ms) or long scene preview (250ms) prior to processing the target. Consistent with previous studies, we found that processing was facilitated with an identical preview of the object. This finding suggests that while the preview of identical object enhances the parafoveal processing, scene context played a smaller roll.

37 **A binding illusion of ambiguous color location between two locations** | Cristina R. Ceja & Steven L. Franconeri
Attention is required for integrating some combinations of object features, such as color and spatial location (Luck & Beach, 1998). When attention is diverted or overloaded, features can be incorrectly bound, forming illusory conjunctions of features (Treisman & Schmidt, 1982). Here we present a new, robust illusory conjunction illusion. Even with simple stimulus displays, although participants were able to accurately perceive the color feature of objects in their respective visual hemifields under divided attention, they systematically failed to bind those colors to their proper locations within those hemifields.

39 **Electrophysiological correlates of searching through memory during hybrid visual search** | Lauren H. Williams, Iris Wiegand, Jeremy M. Wolfe, & Trafton Drew
In hybrid search tasks, observers search through space for multiple items held in memory (e.g., a list of food items at the grocery store). The goal of our study was to identify the electrophysiological correlates of searching through memory during hybrid search. Participants searched for 2, 4, 16, or 64 memorized items in a lateralized search array. Electrophysiological markers of attention (N2pc), working memory (CDA), and long term memory (FN400, LPC, old-new effects) were modulated by memory set size. These findings will be discussed in the context of existing models of hybrid search (Cunningham & Wolfe, 2014; Wolfe, 2012).

41 **Attentional requirements modulate the effect of multiple targets during pop-out visual search** | James P. Wilmott & Joo-Hyun Song
When searching for a pop-out target, attention is allocated according to task demands. Detecting a target presence suffices with a broad scope of attention, while discriminating a target feature requires a focused scope. We investigated whether attentional requirements modulate the impact that multiple pop-out targets have on search efficiency. When detecting at least one target's presence, multiple targets facilitated reaction time (RT). Conversely, when discriminating a target feature multiple target effects were modulated by target similarity: identical targets facilitated RT, while dissimilar targets slowed RT. We conclude that task attentional requirements modulate the processing of multiple targets.

43 **Distribution of spatial attention under varying task loads** | SuHyeon Jo, Eunhee Bae, & Sukwon Han
While performing a goal-directed task, people are often subject to interference exerted by task-irrelevant distractors. This might be because top-down inhibition did not successfully filtered out distractors. We examined whether the degree of top-down inhibition determines the magnitude of distractor interference. While we found strong distractor interference when the task load was low, with no interference when the task load increased or distractors were diluted. However, the degree of top-down inhibition did not differ. These findings corroborate the extant theories of attentional control emphasizing the role of perceptual load or diluters to override distractor interference.

45 **Psychological scaling reveals a single parameter framework for visual working memory** | Mark W. Schurgin, John T. Wixted, & Timothy F. Brady
An important but largely overlooked consideration in visual working memory is the relationship between the physical properties of stimuli used and the psychological confusability of these items, which can be measured in a perceptual task. Here, we show that this relationship is highly non-linear. Taking into account this non-linear relationship leads to a novel and parsimonious conceptualization of visual working memory. This signal-detection-based account greatly simplifies the models needed to account for memory performance, allows generalization to new stimulus spaces, and provides a mapping between different working memory tasks previously thought to measure distinct qualities.

47 **The Wandering Eye: A tool to detect the onset and duration of mind wandering objectively and in real time** | Geoffrey William Harrison, Phillip Aucoin, Eden Shaul, Jordan Poppenk, & Daryl E. Wilson
Existing paradigms used to assess mind-wandering (MW) are limited by coarse temporal resolution and reliance on introspective report. We present a novel method using eye-tracking that tracks MW objectively at a high temporal resolution in real time. Using a test-rest design, this methodology revealed that the durations of MW episodes are highly variable and idiosyncratic, many episodes go unreported, and that these metrics have high test-retest reliability ($r = .75$). These findings caution against the use of existing methods for understanding the impact of MW on task performance.

Poster Session Abstracts

49 **Finding odd one out scene? Use of deep features as a similarity measure** | Filip Dechterenko, Jiri Stipl, & Jiri Lukavsky
In our study, we tested the participant's ability to detect scene, that is visually dissimilar from the others. Visual similarity was measured via L2 distances between activation of neurons in pretrained CNN. Twelve participant were shown with a 3x3 grid of scenes, in which distance of the one image was varied. Results showed that identification accuracy significantly increased with the increasing distance (GLMER: chi2(1) = 21.73, $p < .001$) from chance level for the second quintile to 26% for the fourth quintile. Results show that CNN distances correlate with human decision about most different image.

51 **Why seeing the floor matters: How the nearby ground plane effects distance perception** | Isabel Griffith, John Philbeck, Lindsay Houck, & Tom Malik
Distance perception is influenced by environmental setting, but the specific features underlying this influence are still undetermined. Participants judged egocentric distances (2.5-7m) in two blocks of brief glimpse trials (75ms each). Between blocks, a longer glimpse was given (10s) in which the nearby ground plane was or was not occluded through a floor occluder or chinrest. Fully unrestricted vision during longer glimpses improved localization during subsequent brief glimpses but occluding the ground or using a chinrest minimized this benefit. This suggests that vision of the nearby ground plane plays a role in maximizing distance perception during brief glimpses.

53 **Getting a clue: Professional and naïve searchers in an open terrain environment** | Rebecca A. Penn & Michael Hout
We evaluated the effectiveness of search guidelines given to novice searchers in an open terrain environment. Naive participants received (or did not receive) verbal guidelines on how to search an outdoor courtyard for "clues." We also had a small sample of trained, search and rescue personnel, which we used for an expert-level baseline. Participants had 30 minutes to search for 60 objects (across four categories: peanuts, Legos, clothing, personal items). Objects were placed on grass, pavement, or above ground. We hypothesized that verbal search guidelines would improve performance, but our results show no marked differences across groups.

55 **Summarizing scatterplots: Impact of outliers on trend-line estimates** | Emre Oral & Aysecan Boduroglu
To investigate how viewers summarized scatterplots with outliers, we presented participants scatterplots that either had no outlier or an outlier presented along the x or y axis, or one that was an outlier on both axis. Comparison of drawn best-fits to the actual best-fit suggested that viewers were incorporating outliers to trend-lines, but were most erroneous for displays in which a point was an outlier on both dimensions. Thus, outliers do not seem to be discounted from trends. Statistics training reduced the overall error in estimates, but did not change the overall distribution of error across conditions.

57 **Executive control of attention promotes resistance to distractor interference in visual search** | Melany W. Love, Jennifer Johnson, & David A. Washburn
To examine how distractor interference during a visual search task related to performance in other attention measures, we conducted novel analyses on archival data from a seven-task attention battery administered to Air Force recruits (Washburn & Putney, 1999). We compared cross-task performance of recruits in extreme quartiles of the visual search task and found that the groups differed significantly ($p < 0.05$) in Stroop and Anti-Saccade measures only, suggesting that the executive control of attention is what distinguishes individuals who resist from those who are vulnerable to interference stemming from singleton nontarget distractors in visual search.

59 **Using Hidden Markov Modelling to assess the cognitive states of procedural memory** | Michael Dubois, Amy S. Finn, Michael L. Mack, & Ian Mahoney
Hidden Markov Modelling (HMM) is a tool which can be used to detect subtle differences in reaction time data that correspond to changes in cognitive states. Here we extend the use of HMM from declarative memory (DM) processes to assess such shifts in a procedural memory (PM) task. Our results indicate that adult participants' reaction time data are best fit using a 2-state model, which likely corresponds to the cognitive states of memory-retrieval and stimulus-response automaticity. These findings offer a unique framework for understanding differences the development of PM abilities.

63 **Modeling Posner's validity effect reveals fewer guesses, but not enhanced precision** | Tomer Sahar, Dominique Lamy, & Tal Makovski
This study examined the underlying components of Posner's validity effect using a mixture-modeling analysis that allows decomposing error distributions into guessing rates and precision errors. The data from four experiments replicated the classical validity effect, in that subjects were more accurate on valid than on invalid trials. Importantly, the results consistently revealed that valid cues mainly reduced the guessing rate, namely, participants were more likely to accurately detect and report validly cued targets. However, valid cues did not improve the precision of the perceived target. These results challenge the view that attention alters the appearance of a stimulus.

65 **The role of intertrial priming in hybrid search tasks** | Adam C. Vilanova-Goldstein & Carly Leonard
Hybrid search requires an interaction between memory and attentional guidance. Recently, there is a growing interest in the role that another type of memory, intertrial priming, plays in visual search. In our current study, we investigate how intertrial priming effects performance in hybrid search. The task design required participants to memorize a set of categories and then find a single image depicting an example of a memorized category in search displays of different set sizes. Repetition effects were observed on reaction time when specific images repeated across trials, suggesting that multiple types of memory are involved in hybrid search.

67 **The congruency sequence effect between two stimulus-based conflict tasks** | Yeeun Kim & Yang Seok Cho
It has been suggested that conflict in stimulus-based conflict tasks (e.g., Stroop and flanker-compatibility tasks) are resolved by facilitating the processing of task-relevant information. The present study examined the congruency sequence effect (CSE) between two stimulus-based conflict tasks having the same task-relevant and/or task-irrelevant stimulus dimensions. The CSE was obtained only when the two tasks shared both task-relevant and task-irrelevant dimensions. These findings suggest that both task-relevant and task-irrelevant features are important in determining the scope of control in stimulus-based conflict tasks.

69 **Gender differences in lethal force decision-making** | Mackenzie R. Riggenbach, Kara J. Blacker, Kyle A. Pettijohn, & Adam T. Biggs
The present study investigated gender differences in lethal force decision-making for both the gender of the shooter and the gender of the target by having participants complete a shooting-based go/no-go task. Participants fired a simulated Beretta M9 pistol at male and female images of hostiles and non-hostiles on an Indoor Simulated Marksmanship Trainer. Results indicated that participants respond faster to female targets compared to male targets. However, there were no differences in RT due to the gender of the shooter. The role of novelty and perceived threat as potential mechanisms for this effect are discussed.

71 **Correlation between impairment in emotional integration and discrimination of ambiguous visual-auditory stimuli and presence of autistic traits** | Kenton H. MacDowell & Steven L. Bressler
Daily social interactions require rapid categorization of the emotional states of others through visual-auditory integration of their affective expressions. It is well known such categorization is impaired in ASD, but the intersensory component is poorly characterized. Correlation of impairment in emotional disambiguation with ASD traits implicates shared cognitive mechanisms. We rapidly present vocal auditory cues and facial visual targets that are either congruous or incongruous in affective content. We vary ambiguity in the facial expressions to modulate cognitive load. We find accuracy varies with trait extent with coefficient -0.9214, ($n=14$, $R\text{-squared}=0.63$, $p=0.007$).

73 **The role of response mode in the congruency sequence effect** | Juyoung Park & Yang Seok Cho
The goal of this study was to examine whether the congruency sequence effect (CSE) is modulated by response mode. Each participant performed two color prime-probe tasks with bimanual keypress in some blocks and unimanual keypress in the other blocks in Experiment 1 and bimanual and unimanual aimed movements in Experiment 2. Although the modulation of the CSE by response mode was not found, a clear indication for the role of response mode in determining the scope of control was obtained in Experiment 2. These findings indicate that the nature of control differs with different task contexts.

Poster Session 2:

2 **It's all a blur: Partial visual information triggers logarithmic decision times during object recognition** | Jessica Madrid, Rebecca Penn, Bryan White, Alexis Torres, & Michael C. Hout
Previous research suggests that partial visual information allows observers to systematically narrow down the number of candidate representations that must be considered during object recognition. No one has yet examined if a logarithmic relationship exists between reaction time and the number of target items in such a task. Observers memorized 1, 4, 8 or 16 target pictures and identified them among distractors; pictures were shown at four levels of blur. Reaction times increased logarithmically with the number of items in the target set, even when the images were blurry, indicating that global features are sufficient to trigger top-down processing.

4 **The role of right temporo-parietal junction in stimulus evaluation and perceptual decision-making** | Eunhee Bae, Suhyeon Jo, & Sukwon Han
The present study aims at clarifying the functional role of the temporo-parietal junction (TPJ). We hypothesized that TPJ plays a role in stimulus evaluation via matching external sensory inputs with internal representations, rather than attentional reorienting. To test this, we required participants to encode a sample stimulus into working memory and indicate whether a later-presented probe, whose presentation was temporally extended, matches or mismatches the sample. We found that TPJ was activated in a sustained manner while the accumulation of sensory evidence and decision-making progresses, suggesting that a core cognitive operation associated with TPJ is stimulus evaluation.

6 **Knowing not: Similarities (and dissimilarities) between rejecting and remembering** | Daniella K. Cash & Megan H. Papesh
Remembering and forgetting have received decades of theorizing and empirical attention, but the cognitive processes engaged when people reject novel experiences has received comparatively less scrutiny. Across two experiments, we manipulated stimulus characteristics and response deadlines to compare their effects on remembering and rejecting. Words that were easiest to remember were also easiest to reject. Response deadlines, however, only affected remembering, suggesting an important difference in the time courses of remembering and rejecting. Whereas remembering may sometimes involve effortful retrieval, rejecting seems based on more rapid assessments of stimulus characteristics, rather than explorations of the contents of memory.

8 **The role of physical salience capture in emotion induced blindness** | Gus Baker, James Hoffman, & Teresa Turco
Emotion Induced Blindness (EIB) refers to automatic attention capture by task-irrelevant, negatively valanced emotional stimuli. EIB manifests as impaired awareness for target pictures that closely follow negative distractors in RSVP picture streams. Researchers assume that this emotional blink is due to the negative distractor automatically capturing attention. In this paper we consider an alternative: that it is the physical salience of the emotional distractor that is critical for attention capture which, in turn, is necessary for emotional effects in the blink. Results from this experiment suggest that without physical salience to capture attention, the EIB effect is dramatically reduced.

10 **Resting EEG in alpha and beta bands predicts individual differences in global/local processing** | Brent Pitchford & Karen M. Arnell
Individuals can perceive visual stimuli at a broad, global level (the forest) or a more detailed, local level (the trees). There are reliable individual differences in the tendency to have a global or local processing bias. Here we examine whether individual differences in EEG power at rest, specifically alpha, beta and theta oscillations, can predict individual differences in Navon letter task performance. As predicted, greater alpha power and decreased beta power, but not theta power, at rest was associated with greater attentional breadth, suggesting that neuropsychological measures of engagement during a non-goal-directed task predicted subsequent global/local processing.

12 **Fixation duration and recognition: The peculiar case of posterior cortical atrophy patients** | Tal Nahari, Nitzan Guy, Noa Raz, Netta Levin, & Yoni Pertzov
Eye movements have been found to reflect the way we collect and process information from the environment. Specifically, fixation duration (the period in which gaze is relatively stable between saccades) was found to be longer when observing familiar stimuli. We hypothesized that fixations are elongated due to recognition processes and tested a cohort of Posterior Cortical Atrophy patients (PCA; a type of dementia that begins with atrophy in Occipital and Parietal cortex) with several object recognition tasks. Longer fixations were observed when patients fixated on objects they recognized. We conclude that fixations are prolonged due to object recognition processes.

14 **Neural correlates of attentional bias following aversive conditioning: Evidence for valence-independent mechanisms of priority** | Haena Kim, Namrata Nanavaty, Vani A. Mathur, & Brian A. Anderson
Stimuli previously associated with threat capture attention. Here, we examined the neural mechanisms of attentional capture by an aversively conditioned stimulus. Participants first learned to associate a colour with aversive heat stimulation. Then, they searched for a shape-defined target while colour was task-irrelevant; occasionally, a distractor appeared in the heat-associated colour. The caudate tail and substantia nigra, in addition to other brain regions previously linked to reward-related attentional priority, responded preferentially to these aversive distractors. The findings suggest that a common, valence-independent neural network underlies the influence of selection history on attention.

16 **A horizontal advantage for attention: Enhanced performance for targets located horizontally to an exogenous cue** | Pei-Ling Yang, John Clevenger, & Diane Beck
We found that a previously reported horizontal advantage for attention does not depend on the known horizontal/vertical meridian asymmetry, and instead must reflect a new asymmetry in spatial attention. Specifically, we saw an advantage for targets appear horizontal (as opposed to vertical) to an exogenous cue. We also asked whether the superior colliculus (SC), a subcortical structure implicated in attention, mediates these effects, by taking advantage of the known nasal-temporal hemifield asymmetry in the SC. We replicated the horizontal advantage, but no temporal-nasal asymmetry was observed, suggesting that this advantage does not depend on the superior colliculus.

18 **Simultaneous prioritization of multiple working memory representations** | Ashley DiPuma & Edward F. Ester
Working memory (WM) performance can be enhanced by a retrospective cue indicating which of a set of items will be tested. However, it is unclear whether retrospective cue benefits can extend to multiple WM representations. We tested this possibility by retrospectively cueing participants to multiple remembered orientations and quantifying the frequency of cued-and-probed, cued-but-unprobed, and uncued-and-unprobed item reports. Participants reported cued-but-unprobed items twice as frequently as uncued-and-unprobed items, consistent with a prioritization of the cued-but-unprobed item.

20 **Perceptual interactions between face identity and emotional expression in depression** | Fabian A. Soto, Rochelle A. Stewart, & Christopher G. Beevers
Depression is accompanied by biases in the processing of face emotion. Here, we used general recognition theory to study whether depression also produces an impairment in the perceptual separability of emotional expression from identity, and vice-versa. A group of participants meeting criteria for Major Depression Disorder (MDD) and a group of healthy controls identified faces varying in two emotional expressions (neutral vs. sad, or neutral vs. happy) and two identities. The groups differed in the sadness identification task, with controls showing perceptual separability and MDD participants showing violations of perceptual separability, but showed otherwise similar processing of face information.

22 **Depth preferences for 3D stimuli in category-selective visual areas** | Samoni Nag, Daniel Berman, & Julie D. Golomb
The human brain consists of several functionally distinct regions that play different roles in visual object recognition. Here we ask whether category-selective regions, that are selectively tuned to specific categories, also exhibit sensitivity to depth information. In a blocked fMRI task, subjects viewed stimuli that appeared at "near", "middle", and "far" depth planes. Comparisons of mean response magnitudes reveal that face, object, and motion areas exhibit a near-depth preference whereas scene areas exhibit preferences for both near and far depths (compared to middle). These findings shed light on how category-selective areas of cortex incorporate and process depth.

24 **Increasing item precision in visual working memory is insufficient to grant template status** | Blaire Dube & Naseem Al-Aidroos
Does enhancing precision of an item in visual working memory (VWM) also lead that item to uniquely bias attention during visual search? Participants remembered the colours of two squares—one cued with 80% validity—for a memory test. A proportion of trials ended in a visual search in which the colour of a singleton distractor could match the cued or the non-cued item. Despite enhanced precision of the cued relative to the non-cued representation in VWM, the biases that they exerted over attention during search did not differ. Thus, enhancing precision in VWM does not drive attentional capture.

Poster Session Abstracts

26 **Selection history in context: Evidence for the role of reinforcement learning in biasing attention** | Mark K. Britton & Brian A. Anderson
Attention is biased toward learned predictors of reward. The effects of reward history on attention allocation are context-specific: reward-associated stimulus features capture attention only in their original context. In the absence of reward, selection history can also bias attention, such that formerly target-associated features are prioritized. The contextual specificity of selection history-dependent attention has not been examined. We demonstrate that the effects of repetitive selection on attention are not context-specific: prior target features capture attention regardless of context. Our findings suggest that reward history and selection history influence attention via distinct learning mechanisms.

28 **Effects of reading difficulty on different stages of mind wandering** | Meera Zukosky & Ranxiao Frances Wang
To better understand the initiation and maintenance of mind-wandering, we used a new approach to estimate the two stages of focus-MW episodes (time of focus and time of mind-wandering) by combining the traditional self- and probe-caught methods while participants read easy and difficult reading passages. Results showed longer time of focus in the easy readings compared to the hard readings, but no difference in time of mind-wandering, suggesting that individuals were able to focus longer on the easy readings, but once mind wandering occurs, it lasts a comparable amount of time regardless of reading difficulty.

30 **Cross-modal entrainment in the alpha-band: effects of 8-12 Hz rhythmic auditory stimulation on visual perception** | Emily C. Cunningham, Ranxiao F. Wang, & Diane M. Beck
Visual entrainment in the alpha range can induce oscillations in detection performance in-phase with stimulation. It has recently been suggested that passive listening to an auditory rhythm may also be sufficient to entrain alpha oscillations. If so, rhythmic 8-12Hz auditory stimulation should result in periodic fluctuations in visual sensitivity. Across five experiments, participants detected backward-masked targets preceded by either rhythmic auditory or control stimulation. Rhythmic stimulation did not induce predicted oscillations in visual detection in any experiment. Lack of entrainment does not appear attributable to properties of the entrainers, since unimodal entrainment was observed with identical stimuli.

32 **Parafoveal processing of inflectional morphology in Russian native speakers and English-L1/Russian-L2 learners** | Anastasia A. Stoops, Kiel Christianson, & Tania Ionin
Parafoveal processing of Russian case-marking was tested in native (NS) and L1-English/L2-Russian speakers (L2-learners) via a boundary-change paradigm. NS: identical preview benefit for first-pass measures (SF/GD/GPT) and preview cost for the morphologically related for GPT. L2-learners: identical preview benefit and morphologically related preview cost in regressions out of the target word. This is the first demonstration that L2-learners process morphology of upcoming words in their non-native language. Additionally, first-pass effects observed in NS challenge the post-lexical focus of the parafoveal processing mechanism recently proposed.

34 **Memory for emotional faces depending on cognitive control demands and task-relevance** | Hyejin Jade Lee & Yang Seok Cho
Task switching increases cognitive control demands and thus impairs memory selectivity for task-relevant information. This study examined how emotion modulates the interactive relation between cognitive control and memory. Participants were instructed to switch between gender and facial expression discrimination tasks. Results from a surprise recognition task showed that memory selectivity decreased for angry but increased for neutral faces. Findings suggest that participants were worse in controlling which information is task-relevant when angry faces were shown, and this difficulty was reflected in higher overall performance for angry faces which is consistent with prior findings that conflict increases memory encoding.

36 **Imagination enhances helping intention: The role of helping efficacy** | Ryuji Oguni, Masanori Kobayashi, & Keiko Otake
We investigated the effects of imagining helping behavior on efficacy and intention for helping. Participants were asked to imagine and remember helping behavior, and to make a headline, in response to sentences describing a person in need. Then, participants rated their efficacy and intention for helping in that situation. The results showed that helping efficacy and intention in imagine condition were significantly higher than that in remember condition and in headline condition, respectively. Helping efficacy mediated the relation between subjective vividness of scene imagery and helping intention. Thus, helping efficacy might play an important role on imaging-enhanced helping intention.

38 **Effects of feature cues and target salience on eye movements in singleton search** | Tammy A. Nguyen & Carly J. Leonard
Previous studies have analyzed the role that various factors such as feature cues, salience, and intertrial priming play in attentional allocation (e.g., Leonard & Egeth, 2008). Our study utilizes a similar trial-by-trial cueing design to examine how eye movement patterns are affected by the attentional guidance factors of target salience and feature cueing. In the presence of a specific feature cue, target fixation likelihood was improved and saccadic latency quickened. As in previous research, these effects differed depending on set size. These results provide additional insight into how salience and feature guidance interact to influence eye movement decisions.

40 **±300ms is critical for keeping natural first person view in HMD** | Takuya Nakayama & Takako Yoshida
In virtual reality environments using head mounted displays (HMDs), spatio-temporal mismatch between head movement and visual image can lead to a collapse of visual stability and an unnatural first person view. The current study manipulated HMD image timing approximately ± 500ms relative to actual head turn, and examined subjective feelings about visual stability and sense of agency. Results showed that ±300ms was the critical temporal window to maintain these two sensations. This suggests that in multimodal integration of head proprioception, vestibular and visual image displacement may be based on temporal proximity, regardless of temporal order or causality.

42 **Mapping the behavioral similarity space of targets and distractors in complex visual search** | Patrick H. Cox, Stephen R. Mitroff, & Dwight J. Kravitz
Real-world visual searches often involve a wide range of targets amongst a heterogeneous set of distractors. To fully understand the nature of, and influences on, such searches, it is necessary to precisely measure the impact of similarity among a large set of distractors and targets on search performance. Here, we used a massive dataset to quantify the behavioral impact of each of large number of heterogeneous distractors on search for ~100 different targets. This approach provides insights into the effects of target-distractor and distractor-distractor similarity along a number of dimensions (color, category, frequency, etc.) on visual search.

44 **Increasing attention to behaviorally relevant items facilitates incidental relational memory** | Hamid B. Turker & Khena M. Swallow
Attending to a target for one task sometimes facilitates the encoding of a concurrently presented, unrelated scene. It is unclear whether this effect includes other information about the event, or is limited to the scene. Three experiments investigated incidental relational memory for a scene and the detection task item it appeared with during encoding. Across all experiments, memory for task-relevant or task-irrelevant features of items that appeared with a scene was enhanced if those items were targets. This suggests that the appearance of a target for one task can sometimes boost memory for multiple aspects of an event.

46 **Eye movements provide insight into the influence of semantic information on visual search** | Taylor D. Dague, Kenith Sobel, Savannah Bell, Christian Hopkins, & Amrita Puri
Recent studies using alphanumeric targets suggest that semantic information can influence visual search, although it is unclear whether the interaction between semantic and perceptual attributes occurs at an early or late stage of processing. Here, we investigated the stage at which semantic (numerical size) and perceptual (physical size) information interact by tracking eye movements while participants searched for digits with incongruent or congruent numerical and physical sizes. Participants took longer to initially fixate incongruent compared to congruent targets, suggesting that semantic and perceptual information may be processed together early rather than interfering at a later decision stage.

48 **Feature vs. identity: Directed forgetting in visual working memory** | Katherine C. Moen, Juan D. Guevara Pinto, Megan H. Papesh, & Melissa R. Beck
The goal of the current study was to determine how the type of information encoded in VWM impacts directed forgetting. Feature and identity changes, as well as stimuli complexity, were manipulated across three experiments. Experiment 1 compared performance for colored squares (feature change) and real-world objects (identity change). Experiment 2 expanded on Experiment 1, by using identity changes for abstract shapes and objects. Experiment 3 utilized only abstract shapes and compared feature and identity changes. Overall, results suggest that when information requires more VWM resources (e.g., item identity), it is more difficult to forget that information.

50 **Inattentional blindness through multiple object tracking: The role of item novelty and attentional load** | Michaela Porubanova & Maria Kuvaldina
The inability to notice unexpected changes in an attentionally taxing task is known as inattentional blindness. Here we report on three experiments, in which participants engaged in multiple object task and on some trials an unexpected stimulus appeared. The stimulus characteristics were manipulated (target-congruent, distractor-congruent, or novel stimulus could appear) as well as task load. We show that novel unexpected stimulus is more likely to be detected in low load conditions. In high load, the recognition of the novel unexpected item is worse or equal to the target-congruent item but never worse than a distractor item.

52 **Placeholders, ageing, and the spatial spread of attention** | Rebecca K. Lawrence, Mark Edwards, & Stephanie C. Goodhew
The current study examined if ageing influences spatial attention spread using an inhibition of return (IOR) task. Past research has found little effect of age on the spread of attention. However, this work employed placeholders, which can limit the area over which attention is distributed. This lowers the possibility of detecting potentially subtle age changes in attention. Therefore, we tested whether age influences the spread of attention when placeholders were either included or excluded during an IOR task. No age differences were found when placeholders were included. However, when placeholders were removed, older age predicted a restricted attentional spread.

54 **Grouping and objecthood effects in the Ebbinghaus illusion** | Einat Rashal, Aline F. Cretenoud, & Michael H. Herzog
The Ebbinghaus illusion is argued to be a product of low-level contour interactions or higher cognitive size contrast process. We examined the effect of grouping processes on the illusion by manipulating the degree to which an object is a cohesive entity (i.e., objecthood), keeping the contours surrounding the target at a fixed ratio. Objecthood was manipulated by varying grouping strength between the segments composing the target or flanking objects. Our results show decreased illusion magnitude with decreasing grouping strength, but also a dependency on the grouping principles involved. The results support a higher-level account of the illusion.

56 **Is it possible to identify an item without being able to localize it?** | Shekoofeh Hedayati Zafarghandi & Brad Wyble
In this study, we investigated how location and the identity of complex, familiar items (e.g. letters) are bound during perception. Participants reported the location and identity of a letter (target) amongst digits (distractors) in each trial. Although the feature-integration theory mainly suggests that location information is inherent in the process of identifying a conjunction stimulus, our experiments revealed that identification can sometimes occur without a clear sense of the stimulus location for highly familiar stimuli. That is, in some trials, participants could report the identity of the letter, but also be unable to successfully localize it.

58 **With or without the probability: The description-experience gap in visual search performance** | Hanshu Zhang & Joseph W. Houpt
The likelihood of a target appearing in an image can significantly impact the time it takes to find it and the likelihood of finding it. This has implications in range of applied domains. While there is a growing body of research in this domain, research on how viewers acquire information on the target likelihood is limited. The decision-making literature suggests the way likelihood information is acquired affects how people use it. We examined the effect of different ways of presenting likelihood information on viewers' search performance and found that search termination was most clearly affected by information presentation type.

60 **The binding of object features and locations in visual working memory** | Conne A. George & Michael S. Pratte
It remains unclear whether working memory is comprised of bound objects or independent features. This debate usually involves visual features like color and orientation, but ignores the role of spatial location, which may be a critical feature of any object. We measured capacity for object colors, object locations, and for color-location conjunctions. We found that capacity is higher for features than feature-location conjunctions, suggesting that we can hold more colors than color-location conjunctions. This result implies that visual features can be stored in memory without necessarily being bound to their previous location.

62 **What causes the dip in the rotation function for recognizing objects?** | Charles Josef Peasley & Eric Cooper
Counter-intuitively, object recognition performance improves upon complete picture plane inversion. Recognition theories utilizing structural descriptions uniquely predict that rotation affects identification of certain objects differently. Upon inversion, the categorical relations between parts positioned to the "side-of" one another are restored. For objects with only "above-below" relations, inversion entirely reverses the spatial organization of parts. However, rotation functions for two object classes, those with only above-below and those with only side-of part relations, reveal no interaction between the spatial organization of parts and rotation's effect on recognition performance as the dip occurred in each case.

64 **Emphasizing the horizontal meridian eliminates the object-based attention shift direction anisotropy** | Adam J. Barnas & Adam S. Greenberg
Attention shifts across the meridians result in a Shift Direction Anisotropy (SDA). We investigated whether manipulating the perceptual visibility of the meridians impacts the SDA. Participants were presented with an 'L'-shaped object and target displays that crossed the meridians, which were emphasized with white visible lines, illusory contours, and visible lines of varying contrasts. Strong manipulations (i.e., a white line) of the horizontal meridian eliminated the SDA, whereas weaker manipulations had no effect. We theorize that an enhanced horizontal meridian serves to sequester attentional resources, reducing competition between targets on either side of the horizontal meridian.

66 **What type of eye movement can act as a clue to perceive live-ness? A dual-simultaneous eye-tracking study** | Haruka Nakamura & Takako Yoshida
This study aimed to investigate whether interactive videos and non-interactive videos make differences of observers' feeling and eye-movement interactions. We executed a simultaneous eye-tracking system, wherein a pair of participants faced via video-chat like display. The number of judgments the participants responded the stimuli as live video and the recurrence of their eye movements were higher in interactive videos than in non-interactive videos. This suggests there seems to be some interaction-pattern of eye movements to perceive the live-ness. However, further studies should investigate what type of eye movement can act as a clue.

68 **Training reduces categorical errors while drawing** | Larissa Arnold & Eric Cooper
Previous research suggests that, when drawing simple stimuli, novice artists make a predictable pattern of categorical errors. The current set of experiments examined whether there are differences in categorical errors between novices and experts and found that experts make less categorical errors than novices. In addition several training methods commonly used in art classes were evaluated for their effectiveness to reduce these types of errors for novice participants compared to a control training method and results indicated that explicit knowledge of the categorical and coordinate systems reduced overall errors, while the grid technique and sighting reduced categorical errors.

70 **Association-change restores feature-based contextual cueing** | Sunghyun Kim & Melissa R. Beck
It was investigated whether a context can guide attention to a specific color associated with a context: feature-based contextual cueing. Experiment 1 showed that participants learned the associations, but did not use them to form attentional control settings until a change in the associations occurred. In Experiment 2, when association-change was made more salient, the feature-based contextual cueing effect was observed earlier and lasted longer compared to Experiment 1. This study suggests that feature-based attentional control setting can be formed by a context and that a change in associations can reveal feature-based contextual cueing effects.

72 **Spotting rare targets makes your brain "blink" harder** | Jua D. Guevara Pinto & Megan H. Papesh
Successful stimulus processing involves attentional resources often linked to the locus coeruleus (LC) norepinephrine (NE) system, whose activity can be inferred from the dilation of the eyes' pupils. Following phasic LC activity, a brief refractory period serves to weaken post-stimulus processing, resulting in an attentional blink (AB, Nieuwenhuis et al., 2005). Using a multiple-target, serial search paradigm, we measured the size and duration of this blink when observers detected rare versus common targets. Rare targets were less likely to be detected, but when observers spotted them, LC activity was enhanced and the AB was exacerbated.

74 **Memory for distractors during hybrid search: The effect of target template specificity** | Stephanie M. Saltzmann & Melissa R. Beck
The current research examined how target template specificity affects search guidance and distractor memory during hybrid search. Previous research suggests that distractor processing during visual search increases as target memory set size increases. Participants completed a hybrid search task and were occasionally probed with a memory test for distractors. Eye movement data revealed that participants dwelled longer on and made more revisits to distractors for the large memory set size. Although memory performance was significantly above chance, target memory set size did not impact distractor memory. Target template specificity impacts search guidance but does not affect explicit memory for distractors.

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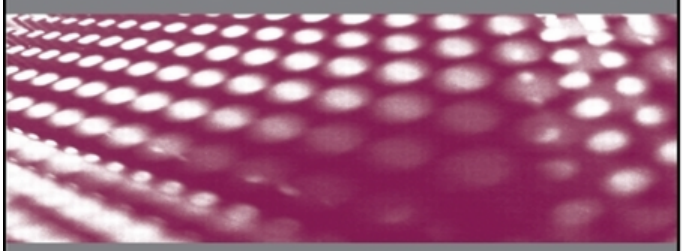

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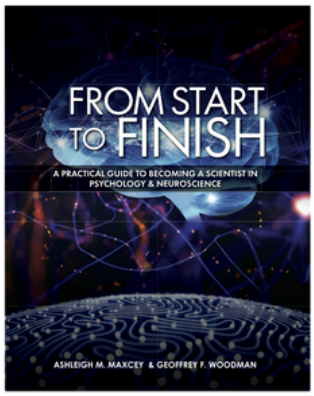

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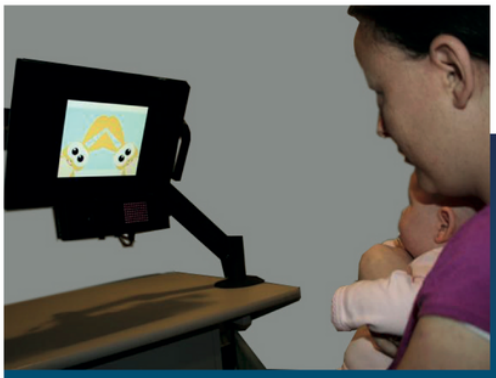

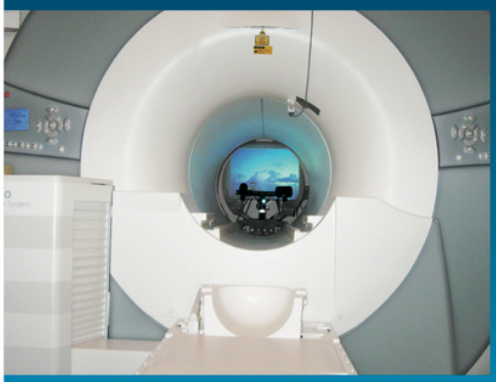

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