GARRETT SWAN, Ph.D.

Cognitive Modeler
Cubic Defense Applications Inc.
Located in: San Diego, CA
garrett.swan@cubic.com
https://garrettswan.github.io/
https://www.ncbi.nlm.nih.gov/myncbi/1p5vZLTOnw55q/bibliography/public/

EMPLOYMENT

Cognitive Modeler July 2021-present
Cubic Defense Applications Inc.

Lecturer (Non-Senate Faculty) March 2020-present
Courses: Data and Model Programming for Computational Social Science, Visual Cognition, and Illusions and the Brain
Department of Psychology
University of California, San Diego

POSTDOCTORAL TRAINING

Schepens Eye Research Institute of Mass Eye and Ear June 2017-present
Affiliation with Harvard Medical School
Mentor: Alex Bowers, PhD
Project: *Scanning at Intersections*

EDUCATION

Ph.D. **The Pennsylvania State University,** University Park, PA August 2012-2017
Doctoral Student, Cognitive Psychology
Mentor: Brad Wyble, PhD
Dissertation: *Testing Predictions of the Binding Pool Model of Visual Working memory*

M.S. **The Pennsylvania State University,** University Park, PA November 2013
Mentor: Brad Wyble, PhD
Thesis: *The Binding Pool Model of Visual Working Memory*

***Ph.D.** **Syracuse University,** Syracuse, NY August 2011-2012
Doctoral Student, Experimental Psychology
Mentor: Brad Wyble, PhD
*Transferred to Pennsylvania State University with Advisor

B.A.	**North Carolina State University**, Raleigh, NC Bachelor of Arts, Psychology Major Minors: Cognitive Sciences, Biological Sciences	May 2011

AWARDS & HONORS

- **Elsevier/Vision Research Virtual Travel Award** May 2021
  Covers presentation fee for Vision Sciences Society
- **Envision Atwell award** May 2019
  Awarded to junior low-vision ARVO presenter
- **Association for Research in Vision and Ophthalmology Travel award** May 2019
  Knights Templar Eye Foundation
- **Alumni Association Dissertation Award,** $5,000 value Spring 2017
  Graduate School, Pennsylvania State University, University Park, PA
- **Runner-up to Outstanding Teaching Award,** $100 value Spring 2017
  Psychology Department, Pennsylvania State University, University Park, PA
- **NSF: East Asia and Pacific Summer Institute Award,** $5,250 value Summer 2015
  Office of International Science & Engineering
- **Bruce V. Moore Department Travel Award** 2012-2017
  Psychology Department, Pennsylvania State University, University Park, PA

TEACHING EXPERIENCE

* Denotes a graduate level course,

Teaching Instructor, University of California San Diego, Department of Psychology (remote)

- CSS 2: Data and Model Programming for Computational Social Sciences (Spring 2021)
- PSYC 182: Illusions and the Brain (Winter 2021: 164 students)
- PSYC 174: Visual Cognition (Fall 2020: 50 students)
- CSS 2: Data and Model Programming for Computational Social Sciences (Summer 2020: 11 students)
- CSS 2: Data and Model Programming for Computational Social Sciences (Spring 2020: 42 students)

Teaching Instructor, Pennsylvania State University, Department of Psychology, University Park (in-resident)

- PSYCH 256: Introduction to Cognitive Psychology (Spring 2017: 150 students)
- PSYCH 256: Introduction to Cognitive Psychology (Fall 2016: 80 students)

Teaching Instructor, Syracuse University, Department of Psychology, Syracuse (in-resident)

- Psy 205: Foundations of Human Behavior (Fall 2011, Spring 2012: 80 students)

Teaching Instructor, Pennsylvania State University, Department of Psychology, World Campus (remote)

- PSYCH 260: Neurological Bases of Human Behavior (Fall 2014, Spring 2015: 30 students)

Teaching Assistant (TA), Pennsylvania State University, Department of Psychology

- PSYCH 253: Introduction to Psychology of Perception (Spring 2016: 50 students)
- PSYCH 490: Psychology Seminar – Myths of the Mind (Fall 2015: 35 students)

- PSYCH 256: Introduction to Cognitive Psychology (Spring 2014: 150 students)
- PSYCH 260: Neurological Bases of Human Behavior (Fall 2013: 100 students)
- *Psy 508: Analysis of Psychological Data II (Spring 2013: 30 students)
- *Psy 507: Analysis of Psychological Data I (Fall 2012: 30 students)
- PSYCH 100: Introduction to Psychology (Fall 2012: 370 students)

PEER REVIEWED PUBLICATIONS

Savage, S. W., Zhang, L., **Swan, G**., & Bowers, A. R. (*in press*). Head and eye scanning behavior predicts hazard detection safety on approach to intersections. *Human Factors.*

Swan, G., Savage, S. W., Zhang, L., & Bowers, A. R. (*2021*). Driving with hemianopia VII. Predicting hazard detection with gaze and head scanning magnitude. *Translational Vision Science & Technology. 10*(1), 20

Savage, S. W., Zhang, L., Swan, G., & Bowers, A. R. (2020). The effects of age on the contributions of head and eye movements to scanning behavior at intersections. *Transportation Research Part F: Traffic Psychology and Behaviour, 73*, 128-142.

Swan, G., Goldstein, R. B., Savage, S. W., Zhang, L., Ahmadi, A., & Bowers, A. R. (2020). Automatic processing of gaze movements to quantify gaze scanning behaviors in a driving simulator. *Behavior Research Methods*, 1-20.

Swan, G., Shahin, M., Albert, J., Herrmann, J., & Bowers A. R. (2019). The effects of simulated acuity and contrast sensitivity impairments on detection of pedestrian hazards in a driving simulator. *Transportation Research Part F: Traffic Psychology and Behavior, 64*, 213-226.

Ahmad, J., **Swan, G**., Bowman, H., Wyble, B., Nobre, A. C., Shapiro, K. L., & McNab, F. (2017). Competitive interactions affect working memory performance for both simultaneous and sequential stimulus presentation. *Scientific Reports*, *7*(1), 1-16.

Swan, G., Wyble, B., & Chen, H. (2017). Working memory representations persist in the face of unexpected task alterations. *Attention, Perception, & Psychophysics*, *79*(5), 1408-1414.

Rajsic, J., **Swan, G**., Wilson, D. E., & Pratt, J. (2017). Accessibility limits recall from visual working memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *43*(9), 1415.

Wyble, B., **Swan, G**., & Callahan-Flintoft, C. (2016). Measuring visual memory in its native. *Trends in Cognitive Sciences , 20*(11), 790-791.

Swan, G., Collins, J., & Wyble, B. (2016). Memory for a single object has differently variable precisions for relevant and irrelevant features. *Journal of Vision*, *16*(3), 32-32.

Chen, H., **Swan, G**., & Wyble, B. (2016). Prolonged focal attention without binding: Tracking a ball for half a minute without remembering its color. *Cognition*, *147*, 144-148.

Wyble, B., & **Swan, G**. (2015). Mapping the spatiotemporal dynamics of interference between two visual targets. *Attention, Perception, & Psychophysics*, *77*(7), 2331-2343.

Swan, G., Wyble, B. (2014). The binding pool: a model of shared neural resources for distinct items in visual working memory. *Attention, Perception, & Psychophysics*, 2136-2157.

IN PROGRESS PUBLICATIONS

Swan, G., Xu, J., Baliutaviciute, V., & Bowers, A. R. (*revise and resubmit*). Change blindness in simulated driving in those with homonymous visual field loss. *Cognitive Research: Principles and Implications.*

Xu, J., Baliutaviciute, V., **Swan, G**., & Bowers, A. R. (*in preparation*). Effects of intersection cross traffic on scanning and responses to pedestrian hazards by drivers with hemianopia. *Translational Vision Science & Technology* .

CONFERENCE PRESENTATIONS

*Denotes that G.S. presented paper at conference.

***Swan, G**., Xu, J., Baliutaviciute, V., & Bowers A. R. (2020, May). Hemianopic field loss and failures of awareness in simulated driving. Abstract accepted at the annual meeting of the Association for Research in Vision and Ophthalmology, Baltimore, MD

Bowers A. R., Zhang, L., **Swan, G.,** & Savage, S. W., (2020, May). Gaze scanning behavior predicts hazard detection safety at intersections. Abstract accepted at the annual meeting of the Association for Research in Vision and Ophthalmology, Baltimore, MD

Xu, J., Baliutaviciute, V., **Swan, G.,** & Bowers, A. R., (2020, May). Effects of intersection cross traffic on scanning and responses to pedestrian hazards by drivers with hemianopia. Abstract accepted at the annual meeting of the Association for Research in Vision and Ophthalmology, Baltimore, MD

***Swan, G**., Shahin, M., Albert, J., Herrmann, J., & Bowers A. R. (2019, May). Predicting early hazard detection from head scanning magnitude in individuals with hemianopia. Paper presentation at the annual meeting of the Association for Research in Vision and Ophthalmology, Vancouver, British Columbia, Canada – **Received Envision Atwell award for best presentation by a junior researcher in Low Vision**

Xu, J., Emmermann, B., Herzog, O., **Swan, G**., Lehsing, C., & Bowers, A. R. (2019) Pilot study of an auditory scanning reminder system for drivers with hemianopia. Poster presentation at the annual meeting of the Association for Research in Vision and Ophthalmology, Vancouver, British Columbia, Canada

Savage, S. W., Zhang, L., **Swan, G**., & Bowers, A. R. (2019) How does age affect the contributions of head and eye movements to scanning at intersections? Paper presentation at the annual meeting of the Association for Research in Vision and Ophthalmology, Vancouver, British Columbia, Canada

Bowers, A. R., Shahin M., Albert J., Herrmann J., & **Swan, G**. (2018) Contrast sensitivity losses impair pedestrian detection more than visual acuity losses. Paper presentation at the annual meeting of the American Academy of Optometry, San Antonio, TX – **Highlighted as a "GEM" of the conference**

Swan, G., Shahin, M., Albert, J., Herrmann, J., & Bowers A. R. (2018, May). The effects of simulated acuity and contrast sensitivity impairments on detection of pedestrian hazards. Poster presentation at the 18th annual meeting of the Vision Sciences Society, St. Pete Beach, FL

Savage, S.W., Zhang, L., **Swan, G**., Pepo, D., Bowers, A. R. (2018) The effects of age and following a lead car on scanning for and detection of motorcycle hazards at intersections. Poster presentation at the annual meeting of the 17th Vision Sciences Society, St. Pete Beach, FL

Swan, G., Wyble, B., & Chen, H. (2017, May). Does an unexpected task reset the contents of visual working memory? Poster presentation at the annual meeting of the 17th Vision Sciences Society, St. Pete Beach, FL

Swan, G., Wyble, B. (2016, Nov). Testing predictions of the binding pool model. Poster presentation at the 58th annual meeting of the Psychonomics Society, Boston, MA

Nijenkamp, R., Nieuwenstein, M., **Swan. G**., Broers, N. (2016, Nov). Precision takes time: evidence for retroactive dual-task interference in a color delayed-estimation task. Poster presentation at the 24th Object, Perception, Attention, and Memory (OPAM) workshop, Boston, MA

Swan, G., Wyble, B. (2016, May). Testing predictions of the binding pool model. Poster presentation at the 16th annual meeting of the Vision Sciences Society, St. Pete Beach, FL

Ahmad, J., **Swan, G**., Bowman, H., Wyble, B., Nobre, A., Shapiro, K., McNab, F. (2016, May). Competitive interactions occur during working memory encoding and iconic memory but not during working memory maintenance. Poster presentation at the 16th annual meeting of the Vision Sciences Society, St. Pete Beach, FL

Swan, G., Wyble, B. (2015, Nov). Coarse-coding of task irrelevant features of multiple objects. Poster presentation at the 23rd annual Object, Perception, Attention, and Memory (OPAM) workshop, Chicago, IL

Swan, G., Wyble, B. (2015, May). Measuring the memory quality of a task irrelevant feature of an attended object. Poster presentation at the 15th annual meeting of the Vision Sciences Society, St. Pete Beach, FL

Swan, G., Wyble, B. (2014, Nov). Testing a model of visual working memory: can extra features be stored without a cost? Poster presentation at the 56th annual meeting of the Psychonomics Society, Long Beach, CA

Swan, G., Wyble, B. (2014, May). The binding pool model of VWM: a model for storing individuated objects in a shared resource pool. Poster presentation at the 14th annual meeting of the Vision Sciences Society, St. Pete Beach, FL

Swan, G., Wyble, B. (2013, Nov). The binding pool model of visual working memory. Poster presentation at the 55th annual meeting of the Psychonomics Society, Toronto, Ontario, Canada

Swan, G., Wyble, B. (2013, May). Simultaneously and sequentially presented colors exhibit similar within-task interference for working memory representations. Poster presentation at the 13th annual meeting of the Vision Sciences Society, Naples, FL

Swan, G., Wyble, B. (2012, Nov). Exploring localized attentional interference in the context of a multiple location RSVP task. Poster presentation at the 54th annual meeting of the Minneapolis, MN

OTHER PRESENTATIONS

Swan, G. (March 2020): *Visual field loss and failures of awareness when driving*. Invited talk at Visual Attention Lab, affiliated with Harvard Medical School and Brigham & Women's Hospital. Cancelled due to pandemic.

Swan, G. (December 2019). *Visual field loss and failures of awareness when driving*. Invited talk at the Aging Special Interest Group, Pennsylvania State University

Swan, G. (December 2019). *Visual field loss and failures of awareness when driving*. Invited talk at the Cognitive Brownbag at the University of California San Diego, San Diego, CA

Swan, G. (June 2016). *Relevant and irrelevant features of attended objects have differently variable precision*. Invited talk at the University of Groningen, Netherlands

Swan, G. (August 2015). *Delayed estimation as a new tool for measuring the quality of visual memories in working memory*. Invited talk at the Centre for Functioning Health Research, Queensland, Australia

Swan, G. (July 2015). *Mechanisms and simulations of the binding pool model of visual working memory.* Invited talk at the University of Queensland, Queensland, Australia

Swan, G. (July 2015). *Mechanisms and simulations of the binding pool model of visual working memory*. Invited talk at the University of Sydney, New South Wales, Australia

RESEARCH EXPERIENCE

Postdoctoral Research Fellow, Bowers Lab, Change blindness while driving Aug 2017- present
Schepens Eye Research Institute, Boston, MA
Mentor: Alex Bowers, PhD

- Investigated change blindness while driving using a virtual world created using Unity software
- Developed paradigm to generate changes that occur while individuals drive in a custom built simulator
- Mentored optometrist in individual research project
- Submitted project for funding to NIH (NRSA F32) and NSF (SBE Postdoctoral research fellowship)

Postdoctoral Research Fellow, Bowers Lab, Scanning at intersections Aug 2017- present
Schepens Eye Research Institute, Boston, MA
Mentor: Alex Bowers, PhD

- Investigated how individuals with hemianopia and normally-sighted individuals scan when approaching intersections using high-fidelity driving simulator (FAAC) and SmartEye eye tracking
- Developed algorithm called the gaze scan algorithm to automatically quantify the size, magnitude, and frequency of lateral gaze scans
- Used a ground truth set of data using custom MATLAB scripts to manually mark gaze data, optimize parameters of the gaze scan algorithm based on ground truth using a grid-based approach, and then evaluated algorithm using non-parametric (Mann-Whitney U and Kolmogorov-Smirnov) statistics
- Assessed visual field loss using Goldmann perimetry and developed spatial working memory test for those with visual field loss
- Consented and collected data from individuals in the Greater Boston area
- Mentored 1 Masters students in individual research project

Postdoctoral Research Fellow, Bowers Lab, Simulations of vision impairment Aug 2017-Feb 2019
Schepens Eye Research Institute, Boston, MA
Mentor: Alex Bowers, PhD

- Investigated how simulated impairment in contrast sensitivity and visual acuity affected pedestrian hazard detection using high-fidelity driving simulator (FAAC)
- Used different occlusion filters (Bangerter) and plus lenses to simulate vision impairment assessed using a Mars chart to measure contrast sensitivity and Test Chart 2000 Pro to measure visual acuity
- Analyzed data using model comparison (BIC), linear mixed effects models, and repeated measures analysis of variance (ANOVA)
- Consented and collected data from individuals in the Greater Boston area.
- Mentored one optometry student, one medical student, and one field professor in individual research project

Graduate Student Researcher, Wyble Lab, Modeling visual working memory Aug 2012-Aug 2017
Pennsylvania State University, State College, PA
Mentor: Brad Wyble, PhD

- Developed computational model in MATLAB that simulates how visual features of an object can be stored in a distributed layer of neurons (i.e. binding pool) and how features can be individuated during retrieval called the Binding Pool model
- Developed methodology for optimizing parameters of the model using both grid based approaches and Markov chain Monte Carlo (MCMC) methods
- Established Binding Pool model as a general model of visual memory by simulating a variety of findings from studies using change detection and delayed estimation
- Generated set of predictions to test the model and then tested these predictions with psychophysical experiments and in a pilot EEG experiment.

- Analyzed results of experiments by estimating the variance (θ) of mixtures of von Mises distributions using maximum likelihood estimation (MLE) and then comparing θ between conditions with parametric (*t* and *f* tests) statistics and non-parametric (permutation tests, Kolmogorov-Smirnov) statistics

Graduate Researcher, Wyble Lab, Feature-based attention Aug 2014-Aug 2017
Pennsylvania State University, State College, PA
Mentors: Brad Wyble, PhD, Hui Chen, PhD

- Developed psychophysical experiments in MATLAB to test hypothesis that the strength of encoding determines the strength of retrieval
- Analyzed data using parametric (χ^2 and log-linear analyses) to quantify the recognition ability of participants
- Consented and collected data from undergraduate participants
- Mentored 1 undergraduate student on individual research project

Graduate Researcher, Language and Cognition Lab, Statistical learning Aug 2014-Aug 2015
Pennsylvania State University, State College, PA
Mentors: Brad Wyble, PhD, Dan Weiss, PhD, Nancy Dennis, PhD

- Developed alternating serial reaction time (ASRT) task to investigate how bilingualism influences statistical learning
- Consented and collected data from undergraduate participants.
- Conducted experiment and analyzed results using custom scripts in MATLAB

Graduate Researcher, Wyble Lab, Traumatic brain injury and visual memory Aug 2013-Aug 2015
Pennsylvania State University, State College, PA and University of Queensland, Queensland, Australia
Mentors: Brad Wyble, PhD, Frank Hillary, PhD, Jennifer Fleming, PhD,

- Developed psychophysical experiments in MATLAB to test hypothesis that moderate to severe traumatic brain injuries affects the quality of visual memory retrieval.
- Consented and collected data from individuals with moderate to severe traumatic brain injuries at Pennsylvania State University and at Princess Alexandra Hospital
- Managed IRB submission through the Pennsylvania State University IRB and the University of Queensland and Princess Alexandra Hospital

Graduate Researcher, Wyble Lab, Visual attention in time and space Aug 2011-Aug 2012
Syracuse University, Syracuse, NY
Mentor: Brad Wyble, PhD

- Investigated how visual attention is deployed to rapidly presented targets appearing in different spatial locations to determine if the attentional blink occurs in space and time
- Conducted experiments using MATLAB and the Psychophysics toolbox

Research Assistant, Mayhorn Lab, Skill transfer with blood glucometers Aug 2009-Aug 2011
North Carolina State University, Raleigh, NC
Mentor: Chris Mayhorn, PhD

- Investigated the ability of younger and older adults to transfer skills required to calibrate a blood glucometer acquired from one blood glucometer to a different glucometer
- Consented and collected data from undergraduate and older participants
- Coded behavior (e.g. the order of steps to use a blood glucometer, time of each step) from video data

PROFESSIONAL MEMBERSHIP AND ACTIVITIES

Thesis Committee member

- Ting (Christine) Zhang (2020). The effects of age, simulated vision impairment, and distraction on hazard detection while driving. New England College of Optometry. Master of Science

Editorial Review

- *Ad hoc reviewer:* Cognition (2016), British Journal of Psychology (2018), Psychonomic Bulletin and Review (2017), Attention, Perception, and Psychophysics (2013, 2016), Journal of Experimental Psychology: Human Perception and Performance (2013, 2015), Journal of Vision (2015), Cognitive Psychology (2014), Philippine Journal of Science (2020), British Medical Journal Open (2020), and Acta Psychologica (2020), and Accident, Analysis, & Prevention (2021)

Affiliations

- *Vision Sciences Society (VSS)*
- *Psychonomics Society*
- *Association for Research in Vision and Ophthalmology*

Certificates/workshops

- CITI Program – Human Subjects Research
- Science Mentoring Certificate (Spring 2019) from Science Education Office at Harvard University
- CITEC Summer School 2011: Mechanisms of Attention from Experimental Studies to Technical Systems, Bielefeld University, Germany

SERVICE AND LEADERSHIP

- Graduate Student Climate Survey – Data Analysis Representative — Spring 2017
  Pennsylvania State University, State College, PA
- AXONS member and participant in Exploration-U Outreach — Fall 2012-2017
  Pennsylvania State University, State College, PA
- Psychology Club President — Fall 2009-2011
  North Carolina State University, Raleigh, NC

SPECIALIZED COURSEWORK

***** Denotes course taken at Syracuse University

- ESC 527: Brain Computer Interfaces (BSI) Spring 2016
- BIOE 597A: Functional Neuroimaging Spring 2014
- PSY 521: Cognitive Studies Fall 2013
- PSY 511: Seminar in Contemporary Psychology Spring 2013, Fall 2013
- KINES 566: Psychophysiology of Movement Spring 2013
- PSY 525: Cognitive Psychology Seminar Fall 2012, Spring 2014
- PSY 524: Proseminar in Cognitive Psychology Fall 2012
- * PSY 655: Statistical Methods III Spring 2012
- * PSY 655: Statistical Methods II Fall 2011
- * PSY 696: Neuropsychology Fall 2011

SKILLS

- Expertise in MATLAB using toolboxes such as Psychtoolbox, in Python 3.0 using NumPy, Pandas, Matplotlib, Seaborn, Beautiful Soup, and SciKit-learn, SPSS, HTML, CSS, R, and Microsoft Word, Powerpoint, and Excel
- Proficient with SQL, SmartEYE eye and head tracking, Tobii eye tracking, FAAC driving simulator, Unity game engine, Scenario Toolbox, Goldmann Perimetry, Peli-Robson Contrast Sensitivity, and Test Chart Pro 2000