STEVEN A. CHOLEWIAK, PH.D.

OBJECTIVE

Seeking a research scientist position in an industrial research group focused on perceptual science.

CONTACT

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RESEARCH EXPERIENCE

Martin S. Banks's Vision Science Research Laboratory — **University of California, Berkeley**
Department of Optometry and Vision Science Program — Berkeley, CA
Assistant Project Scientist (2018-present), Postdoctoral Scholar (2015-2018) — 2015 to present

- Studying the influences of ocular and image-based cues on accommodation (the human eye's focusing reflex).
- Developing and constructing optical testbeds with adaptive focus-tunable optics, Shack-Hartmann wavefront sensors, autorefractors, and varifocal and multi-plane 3D display technology.
- Co-discovered a method of rendering images using chromatic aberration that robustly drives accommodation.
- Investigating methods of mitigating the vergence-accommodation conflict, with applications in head mounted varifocal displays and 3D light field display technology.
- Extensive research experience designing and conducting psychophysical human subject studies utilizing a number of software platforms and frameworks (Python, MATLAB, Jupyter, Psychtoolbox, Mitsuba).

Roland W. Fleming's Perception Research Laboratory — **Justus-Liebig-University Giessen**
Department of Experimental Psychology — Giessen, Germany
Postdoctoral Fellow — 2012 to 2015

- Developed computational models to explain observed strengths and weaknesses of perceived shape from shading and texture using orientation fields.
- Utilized MATLAB, Psychtoolbox, Python, OpenGL, and WebGL to create interactive experiments and demonstrations, including real-time 3D shape reconstruction from local orientation judgments.
- Supported by NSF-BMBF Joint Program in Computational Neuroscience (FKZ: 01GQ1111)

Manish Singh's Perception Research Laboratory — **Rutgers University**
Department of Psychology and Perceptual Science Program — New Brunswick, NJ
Graduate Student — 2007 to 2012

- Investigated perceptual representation of variance and found thresholds were dependent upon sample size and participants were able to estimate orientation variance with essentially no bias.
- Found evidence via perceptual aftereffects that intrinsic properties of complex three-dimensional objects, such as object stability (both 2D and 3D), may be encoded in early visual processing.
- Supported by NIH EY021494 and NSF DGE 0549115 (Rutgers IGERT in Perceptual Science).

Hong Z. Tan's Haptic Interface Research Laboratory — **Purdue University**
Electrical Engineering Department — West Lafayette, IN
Research Associate — 2006 to 2007

- Developed and implemented research studies to investigate the linearity of the human somatosensory system and the role of spatial and temporal Fourier components in touch perception.
- Investigated haptic stiffness and force information transfer and provided parameters for remote telepresence and haptic perceptualization frameworks.

Dennis Proffitt's Perception Laboratory — **University of Virginia**
Department of Psychology — Charlottesville, VA
Research Assistant — 2004 to 2005

- Scheduled and tested participants from the University subject pool for visual perception research.
- Collaborated with coworkers on experimental designs and refinement of experimental setups.

EDUCATION

Ph.D. **Rutgers University**
Doctor of Philosophy (October 2012) New Brunswick, NJ

- Studied how the perception of stability and naïve physics is determined by an objects 3D shape and structure.
- Found evidence that 3D representations of shape and stability may be encoded low-level perceptual variables.
- Thesis: The tipping point: Visual estimation of the physical stability of three-dimensional objects

M.S. **Rutgers University**
Master of Science (May 2010) New Brunswick, NJ

- Investigated statistical variance perception and perceptual summary statistics, finding that the representation of variance is strongly dependent upon sample size.
- Thesis: Perceptual estimation of variance in orientation and its dependence on sample size
- NSF IGERT (Integrative Graduate Education & Research Traineeship) Fellowship Recipient 2007-2009.

B.A. **University of Virginia**
Undergraduate (August 2002 to May 2006) Charlottesville, VA
Bachelor of Arts double major in Psychology and in Physics

- Focus on experimental psychology / research design with extensive undergraduate lab research experience.
- Dean's List Fall 2004, Fall 2005, Spring 2006.

PUBLICATIONS

Referred Journal Papers

Cholewiak, S. A., Shirley, P., McGuire, M., & Banks, M. S. (2019, in preparation). Realtime algorithm for generating color-correct depth-of- field blur. *ACM Transactions on Graphics*.

Labhishetty, V., **Cholewiak, S. A.**, & Banks, M. S. (2019, under review). Contributions of foveal and non-foveal retina to the human eye's focusing response. *Journal of Vision*.

Cholewiak, S. A., Love, G. D., & Banks, M. S. (2018). Creating correct blur and its effect on accommodation. *Journal of Vision, 18(1),* 1-29. doi: 10.1167/18.9.1

Kunsberg, B., Holtmann-Rice, D., Alexander, E., **Cholewiak, S.**, Fleming, R., & Zucker, S. W. (2018) Colour, contours, shading and shape: Flow interactions reveal anchor neighbourhoods. *Interface Focus*, 8(4). doi: 10.1098/rsfs.2018.0019

Cholewiak, S. A., Love, G. D., Srinivasan, P., & Ng, R., & Banks, M. S. (2017). ChromaBlur: Rendering chromatic eye aberration improves accommodation and realism. *ACM Transactions on Graphics (TOG)*, 36(6). doi: 10.1145/3130800.3130815

Pantelis, P. C., Gerstner, T., Sanik, K., Weinstein, A., **Cholewiak, S. A.**, Kharkwal, G., Wu, C-C, & Feldman, J. (2015). Agency and rationality: Adopting the intentional stance toward evolved virtual agents. *Decision*, 3(1), 40-53. doi: 10.1037/dec0000042

Cholewiak, S. A., Fleming, R. W., & Singh, M. (2015). Perception of physical stability and center of mass of 3-D objects. *Journal of Vision, 15(2),* 1-11. doi: 10.1167/15.2.13

Denisova, K., Kibbe, M. M., **Cholewiak, S. A.**, & Kim, S.-H. (2014). Intra- and intermanual curvature aftereffect can be obtained via tool-touch. *IEEE Transactions on Haptics*. doi: 10.1109/TOH.2013.63

Pantelis, P. C., Baker, C. L., **Cholewiak, S. A.**, Sanik, K., Weinstein, A., Wu, C.-C., Tenenbaum, J. B., & Feldman, J. (2014). Inferring the intentional states of autonomous virtual agents. *Cognition, 130*, 360-379. doi: 10.1016/j.cognition.2013.11.011

Cholewiak, S. A., Fleming, R. W., & Singh, M. (2013). Visual perception of the physical stability of asymmetric three-dimensional objects. *Journal of Vision, 13(4),* 1–13. doi: 10.1167/13.4.12

Kocsis, M. B., **Cholewiak, S. A.**, Traylor, R. M., Adelstein, B. D., Hirleman, E. D., & Tan, H. Z. (2013). Discrimination of real and virtual surfaces with sinusoidal and triangular gratings using the fingertip and stylus. *IEEE Transactions on Haptics, 6(2),* 181-192. doi: 10.1109/TOH.2012.31

Cholewiak, S.A., Kim, K., Tan, H.Z., & Adelstein, B.D. (2010). A frequency-domain analysis of haptic gratings. *IEEE Transactions on Haptics, 3*, 3-14. doi:10.1109/TOH.2009.36

Refereed Conference Papers

Akşit, K., Lopes, W., Kim, J., Spjut, J., Patney, A., Shirley, P., Luebke, D., **Cholewiak, S. A.**, Srinivasan, P., Ng, R., Banks, M. S., & Love, G. D. (2017, July). Varifocal Virtuality: A novel optical layout for near-eye display. In SIGGRAPH '17: ACM SIGGRAPH 2017 Emerging Technologies. Los Angeles, LA. doi: 10.1145/3084822.3084829

Pantelis, P., **Cholewiak, S. A.**, Ringstad, P., Sanik, K., Weinstein, A., Wu, C.-C., & Feldman, J. (2011, July). Perception of intentions and mental states in autonomous virtual agents. In Cognitive Sciences Society 33rd Annual Meeting. Boston, MA.

Cholewiak, S.A., Tan, H.Z., & Ebert, D.S. (2008). Haptic identification of stiffness and force magnitude. Proceedings of the Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, 87-91.

Cholewiak, S., & Tan, H.Z. (2007). Frequency analysis of the detectability of virtual haptic gratings. Proceedings of the 2007 World Haptics Conference. Tsukuba, Japan: WHC, 27-32.

Other

Cholewiak, R.W., & **Cholewiak, S.A.** (2009). Cutaneous perception. in E. B. Goldstein (Ed.), *Encyclopedia of Perception*. Sage Publications.

Cholewiak, R.W., & **Cholewiak, S.A.** (2009). Pain: Physiological Mechanisms. in E. B. Goldstein (Ed.), *Encyclopedia of Perception*. Sage Publications.

CONFERENCE PRESENTATIONS

Cholewiak, S. A., Shirley, P., McGuire, M., & Banks, M. S. (2019, May). Real-time blur with chromatic aberration drives accommodation and depth perception. *Vision Sciences Society (VSS) Annual Meeting 2019*.

Labhishetty, V., **Cholewiak, S. A.**, & Banks, M. S. (2019, April). Peripheral stimulation can override foveal stimulation in driving accommodation. *The Association for Research in Vision and Ophthalmology (ARVO) Annual Meeting 2019,* Vancouver, Canada.

Banks, M. S., Love, G. D., & **Cholewiak, S. A.** (2018, May). ChromaBlur: Rendering natural chromatic aberration drives accommodation effectively. *Journal of Vision,* Vol.18, 582. doi: 10.1167/18.10.582

Cholewiak, S. A., Love, G. D., & Banks, M. S. (2018, May). Driving accommodation using simulated higher-order aberrations. *Journal of Vision,* Vol.18, 500. doi: 10.1167/18.10.500

Banks, M. S., **Cholewiak, S. A.**, Love, G. D., Srinivasan, P., & Ng, R. (2017, June). ChromaBlur: Rendering chromatic eye aberration improves accommodation and realism in HMDs. In 3D Image Acquisition and Display: Technology, Perception and Applications (pp. DM2F-1). *Optical Society of America*. doi: 10.1364/3D.2017.DM2F.1

Cholewiak, S. A., Love, G. D., & Banks, M. S. (2017, May). Rendering correct blur. *Journal of Vision,* Vol.17, 403. doi:10.1167/17.10.403

Gibaldi, A., **Cholewiak, S. A.**, & Banks, M. S. (2017, May). Modeling accommodation control of the human eye: Chromatic aberration and color opponency. *Computational and Mathematical Models in Vision (MODVIS)*

Annual Meeting 2017, St. Pete Beach, FL.

Cholewiak, S. A., Vergne, R., Kunsberg, B., Zucker, S. W., & Fleming, R. W. (2015, May). Distinguishing between texture and shading flows for 3D shape estimation. *Journal of Vision*, Vol.15, 965. doi: 10.1167/15.12.965

Cholewiak, S. A., Vergne, R., Kunsberg, B., Zucker, S. W., & Fleming, R. W. (2015, May). Appearance controls interpretation of orientation flows for 3D shape estimation. *Computational and Mathematical Models in Vision (MODVIS) Annual Meeting,* St. Pete Beach, FL.

Cholewiak, S. A., Kunsberg, B., Zucker, S., & Fleming, R. W. (2014, May). Predicting 3D shape perception from shading and texture flows. *Journal of Vision*, Vol.14, 1113. doi: 10.1167/14.10.1113

Fleming, R. W. & **Cholewiak, S. A.** (2014, May). The dark secrets of dirty concavities. *Journal of Vision*, Vol.14, 1317. doi: 10.1167/14.10.1317

Cholewiak, S. A., Fleming, R. W., & Singh, M. (2014, May). Visually judged physical stability and center of mass of 3D objects. *Computational and Mathematical Models in Vision (MODVIS) Annual Meeting,* St. Pete Beach, FL.

Mazzarella, J. E., **Cholewiak, S. A.**, Phillips, F., & Fleming, R. W. (2014, May). Limits on the estimation of shape from specular surfaces. *Journal of Vision*, Vol.14, 721. doi: 10.1167/14.10.721

Cholewiak, S. A., Kunsberg, B., Zucker, S., & Fleming, R. W. (2014, March). Perceptual regions of interest for 3D shape derived from shading and texture flows. *Tagung experimentell arbeitender Psychologen (TeaP, Conference of Experimental Psychologists) Annual Meeting,* Giessen, Germany.

Fleming, R. W. & **Cholewiak, S. A.** (2014, March). Visually disentangling shading and surface pigmentation when the two are correlated. *Tagung experimentell arbeitender Psychologen (TeaP, Conference of Experimental Psychologists) Annual Meeting,* Giessen, Germany.

Mazzarella, J. E., **Cholewiak, S. A.**, Phillips, F., & Fleming, R. W. (2014, April). Effects of varied spatial scale on perception of shape from shiny surfaces. *Tagung experimentell arbeitender Psychologen (TeaP, Conference of Experimental Psychologists) Annual Meeting,* Giessen, Germany.

Cholewiak, S. A. & Fleming, R. (2013). Towards a unified explanation of shape from shading and texture. *Journal of Vision*, 13(9), 258. doi: 10.1167/13.9.258

Pantelis, P., **Cholewiak, S. A.**, Gerstner, T., Kharkwal, G., Sanik, K., Weinstein, A., Wu, C.-C., & Jacob Feldman (2013, May). Evolving virtual autonomous agents for experiments in intentional reasoning. *7th Annual Rutgers Perceptual Science Forum,* New Brunswick, NJ.

Cholewiak, S.A., Singh, M., & Fleming, R. (2012, May). Visual adaptation to the physical stability of objects. *Journal of Vision*, Vol.12, 304. doi: 10.1167/12.9.304

Cholewiak, S.A., Singh, M., & Fleming, R. (2012, May). Visual adaptation to the physical stability of objects. *6th Annual Rutgers Perceptual Science Forum,* New Brunswick, NJ.

Cholewiak, S. A., Singh, M., & Fleming, R. (2011). Perception of physical stability of asymmetrical three-dimensional objects. *Journal of Vision*, Vol.11, 44. doi: 10.1167/11.11.44

Cholewiak, S.A., Fleming, R., & Singh, M. (2011, August). On the edge: Perceived stability and center of mass of 3D objects. *Perception*, Vol.40, 101.

Kibbe, M., Kim, S-H., **Cholewiak, S.A.**, & Denisova, K. (2011, May). Curvature aftereffect and visual-haptic interactions in simulated environments. *Journal of Vision*, Vol.11, 784. doi: 10.1167/11.11.784

Pantelis, P., **Cholewiak, S.A.**, Ringstad, P., Sanik, K., Weinstein, A., Wu, C-C., & Feldman, J. (2011, May). Perception of intentions and mental states in autonomous virtual agents. *Journal of Vision*, Vol.11, 733. doi: 10.1167/11.11.733

Pantelis, P., **Cholewiak, S.A.**, Ringstad, P., Sanik, K., Weinstein, A., Wu, C-C., & Feldman, J. (2011, July). Perception of intentions and mental states in autonomous virtual agents. *Cognitive Sciences Society 33rd Annual Meeting,* Boston, MA.

Cholewiak, S.A., Pantelis, P., Ringstad, P., Sanik, K., Weinstein, A., Wu, C-C., & Feldman, J. (2010, May). Inferring the intention and mental state of evolved autonomous agents. *4th Annual Rutgers Perceptual Science Forum,* New Brunswick, NJ.

Cholewiak, S.A., Pantelis, P., Ringstad, P., Sanik, K., Weinstein, A., Wu, C-C., & Feldman, J. (2010, May). Living within a virtual environment populated by intelligent autonomous agents. *NSF IGERT 2010 Project Meeting*, Washington, DC.

Cholewiak, S.A., Singh, M., Fleming, R., & Pastakia, B. (2010, May). The perception of physical stability of 3D objects and the role of parts [Abstract]. *Journal of Vision*, Vol.10, 77. doi: 10.1167/10.7.77

Cholewiak, S.A., Kim, S.-H., Ringstad, P., Wilder, J., & Singh, M. (2009, September). Weebles may wobble, but conical frustums fall down: Investigating perceived 3-D object stability. *2nd Annual Rutgers Fall Cognitive Festival*, New Brunswick, NJ.

Cholewiak, S.A., & Singh, M. (2009). Perceptual estimation of variance in orientation and its dependence on sample size. *Journal of Vision*, Vol.9, 1019. doi: 10.1167/9.8.1019

Cholewiak, S.A., & Singh, M. (2008, September). Representation of variance in perceptual attributes. *1st Annual Rutgers Fall Cognitive Festival*, New Brunswick, NJ.

Cholewiak, S.A., & Tan, H.Z. (2008, May). Haptic identification and information transfer of stiffness and force magnitude. *2nd Annual Rutgers Perceptual Science Forum*, New Brunswick, NJ.

Cholewiak, S.A., & Tan, H.Z. (2007, November). Haptic stiffness identification and information transfer. *Abstracts of the Psychonomic Society, 48th Annual Meeting*, Long Beach, CA.

TEACHING EXPERIENCE

Sensation & Perception Lab New Brunswick, NJ
Department of Psychology, Rutgers University
(Fall, 2009, Spring, 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012)

- Taught students to run experiments replicating seminal findings in psychophysics, including: Line length perception, pitch discrimination, the effect of center of gravity on localization, prism adaptation, extrapolation of motion, attention shift, the effect of crowding and eccentricity on identification, and the P-illusion.
- Taught basic statistical techniques and reporting experiments using APA stylistic guidelines.

ADVISING AND OUTREACH

Fall 2018 - Mentor for UC Berkeley Computer Science undergraduate (Ajay Gopi)

Spring 2018 - Mentor for UC Berkeley postgraduate (Junah Park)

Fall 2017 - Mentor for Optometry Graduate Student (Claire Henry)

Spring 2017 - Mentor for Vision Science Graduate Student (Albert Chin)

Summer 2016 - Mentor for Optometry Graduate Student (Bee Bui)

May 2015 - Presented "Reflections of the environment distort perceived 3D shape" at the Visual Sciences Society (VSS) Annual Meeting 2015 Demo Night with Gizem Küçükoğlu.

May 2014 - Presented "What happens to a shiny 3D object in a rotating environment?" at the Visual Sciences Society (VSS) Annual Meeting 2014 Demo Night with Gizem Küçükoğlu.

Summer 2012 - Mentor for Undergraduate Student (Stamatiki Clapsis)

Fall 2011

Mentor for Computer Science Undergraduate Student (Roy Jung)

Volunteer for Maker Faire NYC

Summer 2011 - Mentor for NYU Undergraduate Student in Rutgers' Research Experiences for Undergraduates Program (Emily Ho)

Spring 2011

Mentor for Psychology Undergraduate Student (Mehwish Ajmal)

Mentor for Computer Science Undergraduate Student (Roy Jung)

Volunteer for Aresty Research Center for Undergraduates 7th Annual Undergraduate Research Symposium

Volunteer for Rutgers Day

Fall 2010

Mentor for Computer Science Undergraduate Student (Roy Jung)

Mentor for Psychology Undergraduate Student (Mehwish Ajmal)

Spring 2010

Mentor for Computer Science Undergraduate Student (Bina Pastakia)

Rutgers Psychology Cognitive Area Graduate Representative

Volunteer for Rutgers Day

Fall 2009

Mentor for Computer Science Undergraduate Student (Bina Pastakia)

Rutgers Psychology Cognitive Area Graduate Representative

Spring 2009 - Rutgers Psychology Cognitive Area Graduate Representative

Fall 2008 - Rutgers Psychology Cognitive Area Graduate Representative

INTERESTS/SKILLS

- Co-author on patent pending serial number PCT/US2017/031117 "Pseudo Light-field Display Apparatus" (https://patents.google.com/patent/WO2017192887A2).
- Strong programming skills in Python, MATLAB, and Psychtoolbox and experience in C, OpenGL, and WebGL, with a design focus on applications intended for human subjects experiments.
- Experience in Mitsuba cluster design with macOS and Debian Linux nodes for parallellized CPU ray tracing and distributed Python image and video processing using Celery and RabbitMQ.
- Online WebGL-based demonstrations of "Shape from X" phenomena (http://steven.cholewiak.com/demos/).
- Experience in Flask-based WSGI online experiment design for both broad deployment (Mechanical Turk) and local usage (quick data collection on university campus using iPads) with NGINX web server development and deployment.
- Developing and maintaining a personal blog with electronics and programming projects (http://www.semifluid.com/).
- Microcontroller circuit design, reverse engineering, and repair.
- CAD-based 3D modeling with Fusion360 and fused filament fabrication 3D printing.
- Photography / graphic design.