

Satoru Suzuki, Ph.D.

Curriculum Vitae

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ACADEMIC CAREER

- 2004-present **Associate Professor of Psychology & Institute for Neuroscience** (member of the graduate faculty), Northwestern University, Evanston, IL
- 1997-2004 **Assistant Professor of Psychology & Institute for Neuroscience** (member of the graduate faculty), Northwestern University, Evanston, IL
- 1995-1997 **Post-doctoral fellow in Perception, Cognition, & Neuropsychology**
Arizona State University, Tempe, AZ and University of Arizona, Tucson, AZ
- 1990-1995 **Ph.D. in Psychology (Visual Perception & Cognition)**
Harvard University, Cambridge, MA
- 1988-1990 **M.S. in Physics (Experimental Condensed Matter)**
University of Massachusetts at Amherst, Amherst, MA
- 1984-1988 **B.A. in Physics**
Wesleyan University, Middletown, CT

GRANTS AND FELLOWSHIPS

ACTIVE

- 2003-2006 **National Institute of Health (National Eye Institute) research grant (R01 EY014110)**. Title: Visual adaptation, selective attention, and shape coding.
PI: Satoru Suzuki, \$450,000 in direct costs

PAST

- 1999-2003 **National Science Foundation research grant (SBR-9817643)**
Title: Coding of global image features by the visual system.
PI: Satoru Suzuki, \$144,921 in direct costs
- 1995-1997 **Japan Society for the Promotion of Science post doctoral research grant (JSPS-3214)**, Tokyo, Japan.
- 1990-1992 **William James Merit Fellowship**, Harvard University, Cambridge, MA.

AWARDS

- 2004 Teaching award, Northwestern Undergraduate Psychological Association (UPA)
- 1999 Honorable Mention Award, Division of Experimental Psychology (Division 3) of the American Psychological Association.
- 1988 Phi Beta Kappa, Wesleyan University.

PUBLICATIONS

- Asterisks indicate invited articles

Kim, Y.-J., Grabowecky, M., & **Suzuki, S.** (In press). Stochastic resonance in binocular rivalry. *Vision Research*.

Goolsby, B. A., Grabowecky, M., & **Suzuki, S.** (2005). Adaptive modulation of color salience contingent upon global form coding and task relevance, *Vision Research*, 45, 901–930.

* **Suzuki, S.** (2005). High-level pattern coding revealed by brief shape aftereffects. In C. Clifford and G. Rhodes (Eds.), *Fitting the mind to the world: adaptation and aftereffects in high-level vision (Advances in Visual Cognition Series, Vol. 2)*, Oxford University Press.

***Suzuki, S.** (2003b). The high and low of visual awareness. *Neuron*, 39(6), 883-884.

Suzuki, S. & Grabowecky, M. (2003b). Attention during adaptation weakens negative afterimages. *Journal of Experimental Psychology: Human Perception and Performance*, 29(4), 793-807.

***Suzuki, S.** & Grabowecky, M. (2003a). Response: Binocular rivalry and perceptual multi-stability. *Trends in Neurosciences*, 26(6), 287-289.

Suzuki, S. & Goolsby, B. A. (2003). Sequential priming is not constrained by the shape of long-term learning curves. *Perception & Psychophysics*, 65(4), 632-648.

Suzuki, S. (2003a). Attentional selection of overlapped shapes: a study using brief aftereffects. *Vision Research*, 43, 549-561.

Suzuki, S. & Grabowecky, M. (2002b). Overlapping features can be parsed on the basis of temporal cues that result in stable emergent percepts. *Vision Research*, 42, 2669-2692.

Suzuki, S. & Grabowecky, M. (2002a). Evidence for perceptual “trapping” and adaptation in multistable binocular rivalry. *Neuron*, 36, 143-157.

- Suzuki, S.** (2001). Attention-dependent brief adaptation to contour orientation: a high-level aftereffect for convexity? *Vision Research*, *41*, 3883-3902.
- Goolsby, B. A. & **Suzuki, S.** (2001). Understanding priming of color-singleton search: roles of attention at encoding and “retrieval.” *Perception & Psychophysics*, *63*(6), 929-944.
- Suzuki, S.** & Peterson, M. A. (2000). Multiplicative effects of intention on the perception of bistable apparent motion, *Psychological Science*, *11*(3), 202-209.
- Suzuki, S.** & Cavanagh, P. (1998). A shape-contrast effect for briefly presented stimuli. *Journal of Experimental Psychology: Human Perception and Performance*, *24*(5), 1315-1341.
- Suzuki, S.** & Cavanagh, P. (1997). Focused attention distorts visual space: an attentional repulsion effect. *Journal of Experimental Psychology: Human Perception and Performance*, *23*(2), 443-463.
- Suzuki, S.** & Cavanagh, P. (1995). Facial organization blocks access to low-level features: an object inferiority effect. *Journal of Experimental Psychology: Human Perception and Performance*, *21*(4), 901-913.
- Rueckl, J. G., **Suzuki, S.**, & Yeh, S.-L. (1991). On the locus of redundancy effects in a letter-detection task. *Perception and Psychophysics*, *49*(5), 412-421.

Under review

- Behrmann, M., Peterson, M. A., Moscovitch, M., & **Suzuki, S.** Independent representation of parts and the relations between them: evidence from integrative agnosia

In preparation

- Suzuki, S.** & Grabowecky, M. Pre-adaptation and path priming in multistable binocular rivalry.
- Suzuki, S.** & Grabowecky, M. Long-term and short-term plasticity in the dynamics of perceptual alternation in binocular rivalry.
- Smith, E., Grabowecky, M., & **Suzuki, S.** Visual-auditory cross-modal interactions in perception of gender from faces.
- Kim, Y.-J., Krishnakumar, M., Grabowecky, M., Paller, K., & **Suzuki, S.** Is the neural mechanism of spatial attention contrast gain or response gain?: a study using steady-state visual evoked potential.

Kim, Y.-J., Grabowecky, M., Paller, K., & **Suzuki, S.** Steady-state visual evoked potential reveals a fundamental difference between special attention and object-based attention.

Kim, J.-S., Rivest, J., **Suzuki, S.**, & Sharpe, J. A. Abnormal perception of shape distortion after cerebral hemispheric lesions.

PRESENTATIONS

Kim, Y.-J., Grabowecky, M., Paller, K. A., & Suzuki, S. (2005). The different properties of object-based and spatial attention revealed by SSVEPs. The 5th Annual Meeting of the Vision Sciences Society, Sarasota, FL.

Smith, E., Grabowecky, M., & Suzuki, S. (2005). Pitch of concurrent pure tone influences visual gender perception. The 5th Annual Meeting of the Vision Sciences Society, Sarasota, FL.

Grabowecky, M. & Suzuki, S. (2005). Sources of long-term speeding in binocular rivalry. The 5th Annual Meeting of the Vision Sciences Society, Sarasota, FL.

Goolsby, B. A., Grabowecky, M., & Suzuki, S. (2004). Task demands modulate the global-form contingency of the color suppression effect. The 4th Annual Meeting of the Vision Sciences Society, Sarasota, FL.

Kim, Y.-J., Muthu, K., Grabowecky, M., Paller, K. A., & Suzuki, S. (2004). Effects of stimulus contrast and attention on steady-state visual evoked potentials. The 4th Annual Meeting of the Vision Sciences Society, Sarasota, FL.

Suzuki, S. & Grabowecky, M. (2004). Long-term speeding of binocular rivalry mediated by the primary visual cortex. The 4th Annual Meeting of the Vision Sciences Society, Sarasota, FL.

Suzuki, S. & Grabowecky, M. (2003). Pre-adaptation effects in multistable binocular rivalry. The 3rd annual meeting of the Vision Sciences Society, Sarasota, FL.

Kim, Y.-J., Grabowecky, M., & Suzuki, S. (2003). Stochastic resonance in bistable binocular rivalry. The 3rd annual meeting of the Vision Sciences Society, Sarasota, FL.

Goolsby, B. A., Grabowecky, M., & Suzuki, S. (2003). Further investigations of the distractor color preview effect (DCPE). The 3rd annual meeting of the Vision Sciences Society, Sarasota, FL.

Suzuki, S. (2002). Selective attention linearly weights inputs prior to population coding of shape. The 2nd annual meeting of the Vision Sciences Society, Sarasota, FL.

Suzuki, S. & Grabowecky, M. (2002). Evidence for perceptual “trapping” and high-level neural adaptation in multistable visual rivalry. The 2nd annual meeting of the Vision Sciences Society, Sarasota, FL.

Goolsby, B. A. & Suzuki, S. (2002). The distractor-color “adaptation” effect in color singleton search: what color representation is being adapted? The 2nd annual meeting of the Vision Sciences Society, Sarasota, FL.

- Suzuki, S. (2001). Attentional selection of briefly presented shape. The 42nd annual meeting of the Psychonomic Society, Orlando, FL.
- Goolsby, B. A. & Suzuki, S. (2001). Color priming and adaptation in color-singleton search. OPAM, '01 (Object Perception and Attention Meeting), Orlando, FL.
- Suzuki, S. & Grabowecky, M. (2001). Rapid temporal coincidence of spatially separated shapes can be resolved using sustained emergent percepts. The 1st annual meeting of the Vision Sciences Society, Sarasota, FL.
- Suzuki, S. & Grabowecky, M. (2000). Attention during adaptation weakens negative afterimages. The 41st annual meeting of the Psychonomic Society, New Orleans, LA.
- Goolsby, B. A. & Suzuki, S. (2000). A color singleton attracts attention more quickly when repeated. The 41st annual meeting of the Psychonomic Society, New Orleans, LA.
- Suzuki, S. (2000). Attentional modulation of orientation-based aftereffects. Annual meeting of the Association for Research in Vision and Ophthalmology & Visual Science, Ft. Lauderdale, FL.
- Kim, J. S., Rivest, J., Suzuki, S., Intriligator, J., and Sharpe, J. A. (2000). The shape distortion effect after cerebral hemispheric lesions. Annual meeting of the Association for Research in Vision and Ophthalmology & Visual Science, Ft. Lauderdale, FL.
- Goolsby, B. A. & Suzuki, S. (1999). The role of position cueing in short-term color priming. The 40th annual meeting of the Psychonomic Society, Los Angeles, CA.
- Suzuki, S. (1999). Influences of contexts on a non-retinotopic skew-contrast effect. Annual meeting of the Association for Research in Vision and Ophthalmology & Visual Science, Ft. Lauderdale, FL.
- Rivest, J., Intriligator, J., Suzuki, S., & Warner, J. (1998). A shape distortion effect that is size invariant. Annual meeting of the Association for Research in Vision and Ophthalmology & Visual Science, Ft. Lauderdale, FL.
- Suzuki, S. & Rivest, J. (1998). Interaction among "aspect-ratio channels." Annual meeting of the Association for Research in Vision and Ophthalmology & Visual Science, Ft. Lauderdale, FL.
- Peterson, M. A., Suzuki, S., Zemel, R. S., & Rapsak, S. Z. (1998). Intact and impaired object processing following dorsal visual system damage. The 5th annual meeting of the Cognitive Neuroscience Society, San Francisco, CA.
- Suzuki, S., Peterson, M. A., & Moscovitch, M. (1997). Viewpoint specificity in the identification of simple volumetric objects: Evident in college students, severe in agnosia. The 4th annual meeting of the Cognitive Neuroscience Society, Boston, MA.
- Rivest, J., Intriligator, J., Warner, J., & Suzuki, S. (1997). Color and luminance combine at a common neural site for shape distortions. Annual meeting of the Association for Research in Vision and Ophthalmology & Visual Science, Ft. Lauderdale, FL.

- Suzuki, S. & Peterson, M. A. (1997). Intentional (attentional) control of bi-stable apparent motion depends upon retinal location. Annual meeting of the Association for Research in Vision and Ophthalmology & Visual Science, Ft. Lauderdale, FL.
- Suzuki, S. (1996). Why do arrows work?: Perceptual origin of motion caricature. Annual meeting of Investigative Ophthalmology & Visual Science, Ft. Lauderdale, FL.
- Suzuki, S. & Cavanagh, P. (1995). A rapid sequence of two stimuli reveals non-retinotopic shape distortions. Annual meeting of Investigative Ophthalmology & Visual Science, Ft. Lauderdale, FL.
- Suzuki, S. & Cavanagh, P. (1994). Focused attention distorts visual space. Annual meeting of Investigative Ophthalmology & Visual Science, Sarasota, FL.
- Suzuki, S. & Cavanagh, P. (1993). Retinotopic and object-centered specificity of learning differs for threshold and reaction time tasks. Annual meeting of Investigative Ophthalmology & Visual Science, Sarasota, FL.
- Suzuki, S. & Cavanagh, P. (1992). Facial expression as an emergent feature in visual search. Annual meeting of Investigative Ophthalmology & Visual Science, Sarasota, FL.

INVITED PRESENTATIONS

- The 8th Annual Summer Conference in the Midwest, Northwestern University, Evanston IL. (Aug., 2004). Plasticity in the dynamics of visual awareness.
- The 7th Annual Summer Conference in the Midwest, Northwestern University, Evanston IL. (Aug., 2003). The role of internal neural noise in the dynamics of visual awareness.
- The University of Chicago, Computational Neuroscience lecture series. (Feb., 2003). Evidence for perceptual “trapping” and adaptation in multistable binocular rivalry.
- The 6th Annual Summer Conference in the Midwest, Northwestern University, Evanston IL. (Aug., 2002). Path dependence and adaptation in perceptual multistability.
- The 5th Annual Summer Conference in the Midwest, Northwestern University, Evanston IL. (Jul., 2001). Roles of temporal coherence in image segmentation.
- Department of Psychology colloquium series, Universidad Nacional Autonoma de Mexico, Mexico, D. F. (Mar., 2001). A window into neural representations of elementary shapes: bridging the gap between line orientations and faces.
- The 4th Annual Summer Conference in the Midwest, Northwestern University, Evanston IL. (Jul., 2000). Effects of selective attention on perceptual adaptation and aftereffects.
- The University of Chicago, Attention and Eye movements seminar series. (Feb., 2000). Mechanism of shape coding and selective attention investigated using classic aftereffects and shape-contrast effects.
- The 3rd Annual Summer Conference in the Midwest, Northwestern University, Evanston IL. (Jul., 1999). Cognitive influences on perception.

JOURNAL REVIEW

Behavioral Research Methods, Instruments, & Computers

Canadian Journal of Experimental Psychology

Emotion

Journal of Experimental Psychology: General

Journal of Experimental Psychology: Human Perception and Performance

Journal of Experimental Social Psychology

Journal of Vision

Nature Neuroscience

Neuron

Perception

Perception & Psychophysics

PLoS Biology

Psychological Science

Spatial Vision

Trends in Neurosciences

Vision Research

GRANT REVIEW

2003-2004

Serving on the review panel of the Perception, Action, and Cognition Program of the National Science Foundation.

TEACHING

Statistical methods in psychology (for undergraduate students in behavioral sciences).

Perception: a cognitive neuroscience approach (for undergraduate students in psychology, neuroscience, biology, and engineering).

Fundamentals of statistics (for graduate students in behavioral sciences).

Biological and behavioral bases of vision (graduate seminar).

Cognitive neuroscientific approaches to visual awareness (graduate seminar).

PH.D. STUDENTS

Brian A. Goolsby (Ph.D, 2004), currently a post doc at U. of Wales at Bangor

Eric Smith (in progress)

Yee Joon Kim (in progress)

PH.D. ADVISOR

Patrick Cavanagh, Harvard University, Cambridge, MA.

RESEARCH INTERESTS

Psychophysical investigations of global form perception: coding, selection, and dynamics.

A major goal of my research has been to understand the cortical mechanisms that enable people to perceive coherent global forms from retinal illumination patterns that are often ambiguous as to what meaningful forms and configurations are present. Strategically, I have broken down the problem of **global form perception** into several (non-exhaustive) component processes: (1) encoding of global geometric features, (2) voluntary (attentive) and involuntary (driven by pattern salience modulated by context and experience) selections of global forms into awareness, and (3) maintenance of the multistability of visual awareness (effectively balancing exploration of multiple potential scene interpretations with persistence of a single interpretation). I have used psychophysical paradigms, recently combined with computational modeling, that allow for parametric comparisons of my behavioral results with known physiological properties of visual neurons. Specific experimental techniques used are, (a) brief shape aftereffect paradigms (for probing population coding and attentional selection of global form features), (b) multistable binocular rivalry (for understanding how the course of spontaneous shifts in visual awareness across different global forms and scene interpretations are influenced by the organization of form coding, prior experience, and cognitive factors such as attention and intention), (c) rapid flicker paradigms (for understanding potential roles of temporal coding in segregating and preserving multistable representations), (d) stochastic resonance paradigms (for investigating the mechanisms that control the dynamics of spontaneous shifts in visual awareness), and (e) visual search paradigms including priming and adaptation manipulations (for understanding experiential factors that adaptively modulate pattern salience and influence automatic pattern selection). These lines of research will provide insights into the ultimate questions of (1) how neural activity throughout the ventral visual stream (the “what” pathway: V1, V2, V4, and IT) generates a seemingly coherent and unitary visual awareness while responding concurrently to different components and aspects of retinal stimulation, and (2) how visual awareness is maintained in a meta-stable state so that it shifts from one coherent scene interpretation to another (driven spontaneously or by attention) at a rate optimized for efficient analyses of the visual environment.

My ongoing research includes investigations of:

- > **the organization of direct population coding of global form features in mid-level visual processing** (beyond coding of local features in early cortical areas), using brief-shape-aftereffect paradigms (e.g., Suzuki & Cavanagh, 1998; Suzuki, 2001, 2003a).
- > **the perceptual consequences of feature multiplexing and inhibitory interactions in late stages of the ventral form-processing pathway**, through examinations of the context/task dependence of adaptation effects in visual search (e.g., Goolsby, Grabowecky, & Suzuki, 2004; also see Goolsby & Suzuki, 2001, and Suzuki & Goolsby, 2003 for some ground work).

- > **the influences of selective attention on neural adaptation at different stages of visual processing**, by comparing attentional modulations of brief and prolonged pattern adaptation effects (e.g., Suzuki, 2001, 2003a; Suzuki & Grabowecky, 2003b).
- > **the neural mechanisms that initiate spontaneous image transitions and maintain temporary meta-stability during perceptual competition** (e.g., binocular rivalry), using perturbation paradigms including induction of stochastic resonance, and computational modeling (e.g., Suzuki & Grabowecky, 2002b; Kim, Grabowecky, & Suzuki, VSS 2003).
- > **how visual awareness (e.g., dominant perceptual organization, focus of attention, and scene interpretation) shifts among multiple states**, by examining how the duration of the current dominant percept and the identity of the subsequent dominant percept are influenced by (a) the organization of form representation, (b) pattern adaptation, (c) perceptual grouping, (d) path priming, (e) random noise (neural and environmental), and (f) intentional effort (e.g., Suzuki & Grabowecky, 2002a; Suzuki & Grabowecky, VSS 2003).
- > **the functions and regulations of internal neural noise** in relation to selective attention, visual imagery, and perceptual multistability.
- > **the neural correlates of global form selection**, through examinations of the topography and dynamics of enhancement, suppression, and synchronization of neural activity during (a) attentional selection, (b) perceptual shifts (multistability), and (c) adaptive modulations of pattern salience, by measuring EEG using frequency-tagging techniques such as the steady-state visual evoked potential method (e.g., Kim, Grabowecky, Muthu, Paller, & Suzuki, VSS 2004).